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Castleconnell Flood Relief Scheme

EIAR – Volume 3 Appendices

Final Report

November 2024

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Tionscadal Éireann Project Ireland 2040

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Contract

This report relates to the Castleconnell Flood Relief Scheme commissioned by Limerick City and County Council, on behalf of the Office of Public Works. Conor O'Neill and Bernadette O'Connell of JBA Consulting compiled this report, which was prepared by the competent experts listed in Table 1-1 of Chapter 1 of the EIAR, Volume II.

Purpose

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Abbreviations

AA	Appropriate Assessment
AEP	Annual Exceedance Probability
CFRAM	Catchment Flood Risk Assessment and Management
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
FRS	Flood Relief Scheme
GHS	Geological Heritage Site
GIS	Geographic Information System
GSI	Geological Survey Ireland
EIS	Environmental Impact Statement
MCA	Multi-Criteria Assessment
EIA	Environmental Impact Assessment
NHA	Natural Heritage Area
NIAH	National Inventory of Architectural Heritage
NPWS	National Parks and Wildlife Service
OPW	Office of Public Works
PCD	Public Consultation Day
PE	Population Equivalent
pNHA	Proposed Natural Heritage Area
QI	Qualifying Interest
RBMP	River Basin Management Plan
SAC	Special Areas of Conservation
SFRA	Strategic Flood Risk Assessment
SPA	Special Protection Areas
UWWTP	Urban Wastewater Treatment Plant
WFD	Water Framework Directive
WWTP	Wastewater Treatment Plant
ZoI	Zone of Influence

1 Introduction

This document includes all appendices to the Castleconnell Flood Relief Scheme (FRS) Environmental Impact Assessment Report (EIAR). The EIAR is presented over three volumes.

- Volume I: Non-Technical Summary
- Volume II: Main Report
- Volume III: Appendices (this document)

Appendices are presented for the following EIAR Chapters:

- Chapter 5, Consultation
- Chapter 6, Construction Impacts
- Chapter 8, Biodiversity
- Chapter 11, Material Assets
- Chapter 12, Cultural Heritage,
- Chapter 13, Landscape and Visual Impact Assessment.

The appendices are laid out in the following sections, numbered in the same order as the EIAR chapters in Volume II, Main Report.

2 Legislation and Planning Policy Appendices

No appendices.

3 Examination of Alternatives Appendices

No appendices.

4 Description of Proposed Development Appendices

No appendices.

5 Consultation Appendices

5.1 Development Applications Unit Cultural Heritage – Scoping Response

An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

Your Ref: **19104-JBAI**
Our Ref: **G Pre00273/2023** (Please quote in all related correspondence)

7 November 2023

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Proposed Pre Planning Development: Limerick Co Co & OPW: EIAR Scoping Report for a proposed Flood Relief Scheme: Castleconnell, Co. Limerick

A chara

I refer to correspondence received in connection with the above. Outlined below are heritage-related observations/recommendations co-ordinated by the Development Applications Unit under the stated headings.

Archaeology – Underwater Unit

The Department refers to the above consultation. The submission documents have been reviewed by the Underwater Archaeology Unit of the Department of Housing, Local Government and Heritage. The Department, is the state body with responsibility for the protection and preservation of archaeological heritage, including underwater cultural heritage, in Ireland and its territorial waters. The Department has responsibility for, *inter alia*:

Implementing legislation in relation to the protection of monuments and sites, including historic wrecks and underwater archaeological sites.

Regulating archaeological excavations, use of detection devices for archaeological purposes, diving on historic wrecks and on underwater archaeological sites or for archaeological purposes.

Providing advice to planning authorities on development proposals (development plans, heritage plans and individual planning applications) that may have implications for the archaeological heritage.

The role of the Department's Underwater Archaeology Unit (UAU) is to manage and ensure the protection of underwater archaeological heritage. Where Flood Relief Scheme (FRS) projects are concerned, the brief spans underwater, terrestrial and intertidal archaeological

heritage as well as marine/underwater built heritage; certain built heritage aspects are dealt with by the National Built Heritage Service of the Department of Housing, Local Government and Heritage. Applications and consultations, which can include FRS pre-design scoping, various archaeological assessment reports, Underwater Archaeological Impact Assessment (UAIA) reports, EIAs and EIARs are received by the UAU through the Development Applications Unit (DAU).

The Department assesses FRS applications/consultations received and makes observations, submissions and recommendations for assessment and mitigation that will, in turn, be issued by the DAU to the relevant applicants/authorities. To ensure consistency, all planning consultations on FRS projects should be channelled through the DAU, which will forward consultations to the Department and, where relevant, to an officer in the National Built Heritage Service of the department.

- Assessment of consultations received may include a review for approval of UAIA reports, geophysical survey reports, archaeological assessment of geotechnical investigation reports, EIARs, test-excavations reports, built heritage assessments and other reports undertaken as part of the EIA process or for ongoing FRS projects.
- The Department vets all licence applications received, that is, detection device, underwater, excavation or Ministerial Consent applications, including submitted Method Statements (MSs) and requests for extensions. All licence applications should be sent to the archaeological licencing section of the Department. The Department will vet, discuss, and approve licence/consent applications and attendant MSs submitted.
- The Department will review and may, if necessary, issue observations/comments/further requirements on archaeological reports received pertaining to licenced works.
- Further requirements will be issued by the Department, ideally through the DAU or directly to the relevant authority or entity (planning authority and/or engineering and environmental consultant, archaeological consultant), if applicable.
- The Department may carry out inspections of licenced archaeological works to ensure that they are being undertaken in compliance with the conditions of licences, consents and the methodologies described in their attendant method statements.
- The Department will review and provide feedback on all information submitted pertaining to FRS projects, including early or pre-design scoping documentation.
- The Department may be invited to attend pre-design scoping meetings and workshops to become better informed on a scheme, to discuss same and to engage with the main stakeholders.

Please note this submission provides general recommendations relating to the assessment of underwater cultural heritage for the EIAR and should not be taken to infer approval of the project by this Department. We will comment in detail on subsequent consultations and submissions.

Having considered the submitted EIAR scoping document, please find below the initial observations and recommendations of the Underwater Archaeology Unit of the National Monuments Service of the Department of Housing, Local Government and Heritage.

Project Archaeologist

It is advised that the Office of Public Works Project Archaeologist (PA) team is engaged with by the design team to advise on all aspects of this scheme from design, through EIAR compilation to construction.

Scope of Archaeological Heritage in EIAR

In defining the scope of the EIAR for the Castleconnell FRS it is vital that the entirety of what constitutes underwater and terrestrial archaeological and cultural heritage is reflected in its content. For each FRS a detailed assessment of the existing environment, including archaeological and underwater cultural heritage, undertaken by suitably qualified specialists, is required during the pre-design and/or design phase, as part of the EIA (Stage I). The purpose of such assessments is (at the earliest opportunity) to identify, describe and assess the likely significant effects on archaeological heritage resulting from, *inter alia*, the construction and operation of a project. This is to ensure that significant adverse effects can be avoided, reduced or offset, and that mitigation measures can be embedded into the design, wherever possible.

Assessment should address direct and indirect effects, both positive and negative, and should include issues such as SIs, enabling works, vibration, hydrological change, and any cumulative effects. In many case, cumulative or indirect (secondary) impacts and enabling works may be more significant than direct impacts from a scheme (for example, the installation of cofferdams to enable the underpinning of a bridge; the locating of compounds close to monuments, within or close to historic towns or riverbanks; or the temporary placement of haul roads and bunds within watercourses).

Each phase of an FRS project will have its own elements for consideration. The risk of unforeseen or unplanned effects also needs to be addressed, including the potential for a project to cause risks to archaeology due to its vulnerability to external accidents or disasters (for example, the flooding of a site due to a burst dam). Consideration should be given, as far as reasonably practical, to down- and up-river effects, including on archaeological heritage outside a given study area. For instance, will the construction of flood defences at one location cause increased flooding or flow rates downstream; and, if so, will this impact archaeology in that location? Riverbed scouring because of new bridge piers or flood walls should also be assessed, and in this regard any hydrological studies carried out for a scheme should be consulted by the archaeologist and the results incorporated into the assessments and EIAR.

Hydrological assessment should also form part of the consideration for all schemes regarding potential impacts on both terrestrial and underwater cultural heritage. Consideration should also be given to whether the dredging of riverbeds or tidal zones and the subsequent lowering

of water levels could result in known or potential submerged archaeology becoming exposed, particularly during dry spells or summer months. Furthermore, such works might lead to de-watering altogether, which could potentially result in degradation of in situ archaeological remains. It is particularly important to assess this potential effect in urban areas, where rich organic archaeological remains may be preserved in situ. The impact of vibrations on upstanding archaeological monuments or built heritage during FRS works would also need to be considered and mitigated in advance, particularly regarding upstanding structures such as town walls.

Similarly, in consultation with landscape specialists, as required, impacts on the setting of archaeological monuments and on views of and from monuments arising from new or upgraded FRS infrastructure (such as flood defence walls or embankments) also need to be assessed and mitigated, where necessary. This is particularly important where there is the potential for the setting of a National Monument or significant views within and of a historic town to be affected by an FRS project. Any interactions between impacts on archaeological heritage and other environmental factors should also be documented for each asset and captured in a matrix of interactions (for example, an archaeological monument may have amenity value, which would need to be assessed under Population and Human Health in the EIAR).

It is essential that the description of effects is precise and concise and focuses on effects that are probable or likely to occur, including the reasonably foreseeable worst-case scenario. Discussion of negligible effects should be avoided. Further information on describing effects is given in the Environmental Protection Agency (EPA's) *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2022).[1] Assessment should also include a description of proposed mitigation measures for a given programme of works, consideration of a do-nothing scenario, and alternatives to avoid or reduce significant adverse effects.

Archaeological Heritage and Flood Relief Schemes

Whether urban or rural, there is a potential for all FRS works to impact upon terrestrial and underwater archaeological heritage.[2] Historic towns, such as Castleconnell, can contain cultural layers that have built up over time and this can be particularly the case in waterways and in areas that have been subject to flooding in the past. Rural areas may also contain well-preserved layers of cultural material. Even within reclaimed areas that are now land but were formally wet zones there is a potential that previously undiscovered waterway-related archaeology may be found. For example, infill (such as dredged spoil) used to reclaim an area of former river floodplain may retain cultural material, including the remains of abandoned vessels (called hulks) and wrecks used as part of the reclamation process or buried in the underlying original sediments.

[1] Available for download at:
https://www.epa.ie/publications/monitoring--assessment/assessment/guidelines-on-the-information-to-be-contained-in-environmental-impact-assessment.php

[2] Further information on Ireland's underwater archaeology is contained in the booklet produced by the Department entitled *Advice to the Public on Ireland's Underwater Archaeological Heritage*:
https://assets.gov.ie/239954/5bd23936-3d87-46bb-8acd-90dd796bbb9a.pdf

An historic town or the frequency of certain types of monuments within a given landscape (such as Bronze Age sites) forming the study area for an FRS can be strong indicators of previously unknown sites and artefacts remaining within proposed project areas. Assessment of archaeological potential, therefore, is not just site specific but must also include the landscape within which monuments are located, including watercourses. Similarly, because the bulk of FRS projects include urban riverine environments, a range of archaeological, built, and cultural heritage can typically occur in these contexts and should be considered, where appropriate, both in the assessment process and in the compilation of EIARs and other assessments.

Urban riverscapes are characteristically repositories of dense concentrations of a diverse range of archaeological heritage in a variety of settings, including terrestrial, underwater, reclaimed ground, floodplains, industrial, vernacular, estuarine and maritime. Typically, the vast bulk of this heritage does not enjoy formal protection/designation in the Record of Monuments and Places (RMP) and Record of Protected Structures (RPS). It is therefore essential that archaeologists look beyond standard sources such as the SMR/RMP/NIAH when constructing baseline inventories (and their attendant mapping) of the archaeological, built and cultural heritage within a given study area. Field surveys, including those conducted underwater and by canoe/boat, and historical (including research on primary sources) and historic cartographic sources can be of particular importance for mapping topographical, built heritage, industrial and vernacular cultural heritage receptors, both extant and in their former locations, within urban riverine environments. Local knowledge is another key source that should be included in all assessments.

The exclusion of post-1700/post-medieval archaeological heritage (including archaeological monuments, areas of archaeological potential, underwater archaeology and built heritage) from assessment in FRS projects is contrary to the EPA *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA 2022) and the *Frameworks and Principles for the Protection of the Archaeological Heritage* (Government of Ireland 1999). Section 3.3.6 of the above *Guidelines* (EPA 2022, 32) states that EIAR cultural heritage chapters should contain the following:

Cultural Heritage

Archaeology

Known archaeological monuments

Areas of archaeological potential (including unknown archaeology)

Underwater archaeology

Architectural heritage

Designated architectural heritage

Other significant architectural heritage

Folklore and history

Designations or sensitivities

The Landscape

Landscape Appearance and Character

Landscape Context

Views & Prospects

Historical Landscapes."

Furthermore, Section 3.6.4 of *Frameworks and Principles for the Protection of the Archaeological Heritage* (Government of Ireland 1999) states, in relation to the scope of archaeological assessments, that they:

"may, as appropriate, include documentary research, field-walking, examination of upstanding or visible features or structures, examination of existing or new aerial photographs or satellite or other remote sensing imagery, geophysical survey, topographical assessment, general consideration of the archaeological potential of the area or areas effected by a development based on their environmental characteristics, or archaeological testing."

Section 1.1 of the same document specifically notes that the:

"… date is not in itself a determinant of archaeological significance or interest. Any material remains which can contribute to understanding past societies may be considered to have an element of archaeological significance."

Therefore, all assessments need to include all elements of archaeological, built and cultural heritage, including post-c. 1700 receptors, to be sufficiently accurate in providing a reliable reference against which the effects of a project can be assessed.

Below are examples of the various types of archaeological, architectural and cultural heritage receptors, arranged under broad categories, that are typically represented within urban riverine environments and which, if present, would require consideration:

WATER POWER

- Mills (cereals, rape, wool, cloth, wood, paper and stone).
- Distilleries.
- Breweries.
- Mill buildings.

- Mill wheels.
- Millers'/brewers'/distillers' houses.
- Revetments.
- Millraces.
- Weirs.
- Artificial/modified mill islands.
- Millponds.
- Warehouses.

CANALS/NAVIGATIONS

- Canal cuts.
- Locks.
- Revetments.
- Aqueducts for stream diversions (often beneath canals).
- Canal bridges.
- Steps into canals.
- Floodgates.
- Sluices.
- Canal quays.
- Canal weirs.
- In-river canalisation/dredging channels.
- Contiguous tow paths.
- Canal construction camps.

CROSSINGS

- Road and footbridges (stone, timber, metal, "stick bridges", clapper bridges).
- Abutments, fragments of earlier bridges (underwater, in banks, and incorporated into existing bridges).
- Fording points and infrastructure.
- Fording pavements (in-stream).
- Construction remnants (bunds, construction waste, revetments).

BOATS AND BOATING INFRASTRUCTURE

- Wrecks (including logboats).
- Traditional boats (wrecks and in use).
- Snap net/cot fishing – flat-bottomed cot boats.
- Barges (wrecks and in use).
- Reused elements of boats/ships, including hulks.
- Fragments of wreckage.
- Ballast mounds.
- Cargo.
- Boat jetties.
- Moorings (stone/timber).
- River piers.
- Formal quays (with integral slips, steps to river, mooring posts/rings).
- Artificial river harbours/inlets.

FISHING BUILT HERITAGE

- Fish weirs.
- Fish traps.
- Tidal head weirs (V-shaped, L-shaped, or C-shaped).
- Non-tidal riverine weirs (generally V-shaped).
- Fishing mill dams.
- Draft net fishing infrastructure: watchtowers, cranes.
- Rod-fishing stands.

DESIGNED LANDSCAPES

- Waterways as integral part of designed landscapes for country houses.
- Designed landscape relics (such as shelter belts or avenues) aligned on rivers.
- Cultural landscapes and walks/promenades along rivers.
- Shared amenity, pleasure grounds.
- “Eye catchers”.
- Views and vistas.

HISTORIC FLOODPLAIN MANAGEMENT

- Managed water-meadows for winter grazing.
- Drainage and reclamation of floodplains for agricultural land in “age of improvement”.
- Historic flood embankments (usually earthen).
- Rivers rerouted leaving behind relic channels.
- Palaeo river channels.

EXTRACTION IN AND ALONG RIVER CHANNELS

- Gravel quarries (in stream and adjacent).
- Stone quarries from riverbanks.
- Lime kilns and lime kiln quarries (adjacent rivers).
- Brick manufactories (adjacent rivers).

WOODLAND/VEGETATION MANAGEMENT

- Osieries, such as willow or hazel (some still in use).
- Managed reed beds (some still in use).

WASTE DISPOSAL

- Urban disposal (such as downstream artefact “traps”).
- Casual losses, such as weapons, at bridge/fording point crossings.

AGRICULTURAL BUILT HERITAGE

- In-stream cattle enclosures.
- Sheep-dips.
- Sheep pounds.

INTANGIBLE HERITAGE: COLLECTIVE MEMORY

- River names (local names given to various parts of the river).
- Fishing heritage in traditional river names.
- Drownings, battles, folklore and other elements in traditional river names.

Wrecks

Ireland's long and varied maritime history has bestowed extensive records for shipwrecks along its coast and offshore waters (and freshwater environments). With over 18,000 documented losses, shipwrecks are the most abundant type of underwater archaeological site found in Irish waters. Wrecks include ancient logboats and wooden sailing, fishing and trading vessels, steamships, ocean-liners and ships and submarines connected with both world wars. Many contain relic cargoes, objects and human remains.

The Department has compiled an inventory of recorded historic wrecks - the Wreck Inventory of Ireland Database - for the coastal and inland waters of Ireland. Records from the database are available to view through the Department's web site (https://www.archaeology.ie/underwater-archaeology/wreck-viewer). It is important to note that the Wreck Viewer displays only wrecks for which there is a recorded location and these are represented on the map canvas as red dots. Due to the nature of the available primary and secondary source material pertaining to wrecks, the vast bulk of these relate to the eighteenth-twentieth centuries, but this should cannot be taken to infer that losses belonging to earlier periods are not present. Similarly, wrecks with known locations account for only approximately 22% of the total number of records contained in the WIID; there is data held within the WIID on a large number of wrecks for which we have no precise recorded location, co-ordinate or known extent. Information on these wrecks is not displayed in the viewer but is available from the Wreck Viewer.

In compiling the EIAR it is vital, therefore, that all recorded (located and unlocated) losses from the study area and its environs are comprehensively assessed by reviewing the WIID, relevant primary and secondary archival sources, results of geophysical and bathymetric surveys, prior archaeological investigations, local information and other relevant sources in order to determine, as accurately as sources allow, the locations and attendant zones of potential, of all historic wrecks. Assessment should also include areas of high potential for previously unrecorded shipwreck sites within the FRS study area – eg. sandbanks, areas of high concentration of recorded wrecks.

EIAR Methodology

Desk-based Assessment

As a first step in the EIA process (Stage I), a baseline study DBA should be carried out to ascertain the existence, location, character, condition and extent of any recorded and previously unrecorded archaeological features/deposits, sites/monuments or objects, built heritage or cultural heritage within a defined study area. This will involve a DBA of the land and waters effected by the FRS and wider landscape and will inform requirements for further archaeological investigation, assessment, and mitigation, either in advance of or during the FRS.

Given the broad variety of environments that an FRS project typically encompasses the DBA may require inputs from a range of suitably qualified and experienced archaeologists,

historians, underwater archaeologists, and other specialists. It is essential that the DBA capture as comprehensively as possible the archaeological, built and cultural heritage landscape of the proposed FRS project area and it should include the outcome – utilising primary and secondary sources – of ample historical and archaeological research in order to identify sites and locations of potential. These should be accurately mapped (using a sequential numbering system) and inventoried. Where substantive archaeological heritage issues are identified, they should be flagged with the Department at the earliest opportunity. When the DBA has been completed and its recommendations considered and agreed, further archaeological assessment by way of field survey and impact assessment will be required. The nature and extent of these investigations will be defined by the DBA.

Archaeological Investigations

Archaeological investigations (including topographical and geophysical surveys and test excavations) and site inspections (both terrestrial and underwater) should be carried out at the earliest opportunity and undertaken by suitably qualified and experienced archaeologists. Where large-scale, in-water impacts are proposed, these surveys should include the recording, inspection, and mapping of the extent of all sites recorded in the DBA and the identification of any new, previously unrecorded and potential archaeological heritage sites, including those underwater. The field survey should include a visual inspection of any riverbanks and riverbeds and other waterbodies (by boat, if required), where they are visible. This is best carried out following vegetation clearance (where permitted) or during winter, when vegetation cover is less dense.

The investigations should ascertain the existence, location, character, condition and extent of any recorded and previously unrecorded archaeological features/deposits, sites/monuments or objects, built heritage or cultural heritage within a study area and likely to be affected by the proposed works (including any associated temporary works, SI works). The field survey should also facilitate accurate mapping and inventorying (including photography) of any recorded and previously unrecorded archaeological features/deposits, sites/monuments, or objects, built heritage or cultural heritage. Findings should be presented in map and inventory form with associated geospatial data, and it is essential that, where possible, the full (known) extent of the archaeology identified be mapped and described.

A report that combines the results of the DBA and field surveys should be collated and, with the contracting authority's approval, be submitted first to the PA for review and then to the Department for comment. This report should identify the likely effects on archaeological, built, and cultural heritage sites, and it should recommend appropriate measures (such as archaeological exclusion zones) for the avoidance of these remains or, where this cannot be achieved, measures to mitigate the impact of the works. The report should also include proposals for further investigations, as required, as part of the assessment process. All proposals for mitigation and further investigation will be reviewed by the PA and the Department.

Underwater Archaeological Impact Assessment

It is essential that an UAIA be carried out – as early in the EIA process as possible – for the Castleconnell FRS project if any watercourses are being impacted or where the potential

exists for underwater archaeological remains to be affected. This will be particularly important where major elements of a scheme take place in-water, as fisheries or weather restrictions may limit in-water archaeological works at construction stage. In urban areas where extensive reclamation of rivers and their floodplains has been undertaken the scope of underwater assessment may extend into what are now terrestrial areas. This will ensure that a full assessment of the archaeological potential of the project area be produced at the earliest stage possible. It will also enable the appropriate mitigation strategies to be put in place (avoidance, preservation in situ or excavation). Such assessments need to be carried out by suitably qualified and experienced archaeologists, under the appropriate licences, to ensure compliance with the National Monuments Acts.

Other Types of Investigation

Other investigations that could inform the EIA and other assessments during various phases of the FRS include (and are not limited to):

Geophysical surveys (both land-based and water-based).

Test excavations.

Metal detection surveys.

Archaeological building/structural surveys.

Photogrammetric surveys.

Specialist historical research.

LiDAR assessments.

Assessment and monitoring of SI works (such as geotechnical investigations).

Monitoring of groundworks (may follow on from some of the recommendations made in an EIAR/UAIA).

Digital Elevation Models/Digital Surface Models/Digital Terrain Models data collection and assessment.

Visual impact assessment and assessment of impact on setting.

All such investigations, when employed, should be carried out by appropriately qualified and competent professionals under licence from the Department, where required. The need for, and scope of, such investigations are considered by the contracting authority on a case-by-case basis, in close liaison with the PA. With the contracting authority's approval, the PA will seek approval from the Department through the licensing process and approval of submitted methodologies. All archaeological methodologies accompanying the required licence or consent applications should be submitted to the contracting authority and reviewed by the PA before being submitted to the Department for approval.

EIAR Cultural Heritage Chapter

The EIAR chapter on Cultural Heritage should include a description of the full gamut of terrestrial and underwater cultural heritage (as described above), a synthesis of all prior investigations and assessments and a detailed impact statement and mitigation

recommendations. Detailed final reports on all prior investigations should be included as appendices. The chapter should include, as a minimum, the following:

A synthesis of desktop study to include historical and cartographic research, research on primary and secondary archival sources, and the results of a review of the Wreck Inventory of Ireland Database, Record of Monuments and Places/ Sites and Monuments Record, National Inventory of Architectural Heritage and the Record of Protected Structures.

A synthesis of all underwater surveys, intertidal surveys and any other assessments undertaken.

An inventory of all underwater cultural heritage assets, including archaeological monuments, architectural heritage sites and areas, wrecks, submerged palaeolandscapes, archaeological features/deposits, sites/monuments, or objects and marine built heritage. All sites should be accompanied by mapping with associated geospatial data; where possible, the full (known/predicted) extent of archaeology identified should be mapped using polygons. For ease of use each item, regardless of designation, should be numbered using a sequential system of identifiers.

A detailed Impact Statement, which includes drawings/mapping that clearly show impacts/ effects, and recommendations for appropriate mitigation of any adverse impacts and effects to known or potential archaeological heritage.

Mitigation

FRS projects can lead to significant adverse effects on a broad range of underwater cultural heritage (see above), requiring comprehensive and proactive mitigation informed by a comprehensive archaeological assessment process. It is national policy, as set out in the *Frameworks and Principles for the Protection of the Archaeological Heritage* that 'there should always be a presumption in favour of avoiding developmental impacts on the archaeological heritage' and it is essential that this overarching, core principle is proactively embedded within the design process. Assessment and an attendant mitigation strategy should therefore aim to avoid or reduce effects on the underwater cultural heritage and inform the design of a given scheme with reasonable alternatives that achieve the maximum amount of preservation in situ. The risk of adverse effects on archaeological heritage, and attendant cost and delay implications for an FRS project progression, can be reduced through carrying out mitigation as early as possible and ideally in the design stage.

Once the likely direct, indirect and cumulative impacts and effects on underwater cultural heritage have been identified and assessed, measures to mitigate any adverse effects should be devised and embedded within the overall EIAR. EIARs will include a Schedule of Environmental Commitments detailing specific measures to be undertaken to mitigate any adverse effects on underwater cultural heritage. The archaeological elements of the Schedule of Environmental Commitments should be reviewed in advance of EIAR submission to the planning authority by the Department as part of the consultative process. The Schedule of Environmental Commitments should comprise of a list of relevant measures that the FRS developer is obligated to undertake to mitigate adverse effects. It is in the

developer's interest to ensure that all undertakings to mitigate are fully understood and accepted and that the resources are available to ensure compliance with such commitments (such as preservation in situ, test-excavations, monitoring, archaeological excavation, post-excavation requirements and, where relevant, publication of results and other forms of dissemination).

The report should make recommendations for further archaeological mitigation, which may include some or all the following:

Mitigation by Avoidance ('Preservation in situ')

When no impact is caused, often through consideration of alternatives (that is, a design solution), mitigation by avoidance/preservation in situ is achieved. This is generally the most time- and cost-effective form of impact mitigation. Preservation in situ of archaeological and underwater cultural heritage, and all cultural heritage assets, should be a primary objective of the archaeological heritage assessment component of FRS projects. This approach is embedded in the EIA process and across other established guidance, including the *UNESCO Convention on the Protection of the Underwater Cultural Heritage* and its Annex Rules and the UNESCO 1992 *Convention for the Protection of the Archaeological Heritage of Europe* (revised). It is also consistent with government policy as outlined in the *Framework and Principles for the Protection of the Archaeological Heritage* (DAHGI 1999, 33), which requires a presumption in favour of avoidance of impacts.

Mitigation by avoidance should occur, to the greatest extent possible, during the FRS project pre-design or design phases, when the presence, location, and extent of archaeological or other cultural heritage assets are known (such as recorded sites or those identified during SI works).

Avoidance will, in general, be designed into the FRS design at an early stage, and may require defined Archaeological Exclusion Zones, buffers, vibration monitoring and periodic inspection. The extent of an Archaeological Exclusion Zone is dependent on the character and extent of the underwater cultural heritage asset requiring its implementation and each case requires bespoke exclusion zones, based on the fullest understanding of the asset.

Whilst it is essential that the implementation of Archaeological Exclusion Zones will have been finalised as part of the EIA process, due to practical concerns it may be necessary to carry out additional, post-consent, investigations in order to facilitate preservation in situ of archaeological and underwater cultural heritage. Investigations may be required in order to characterise and determine the full extent of an archaeological or underwater cultural heritage asset. Such investigations may include further archival research, geophysical surveys, dive surveys, metal detection surveys, and underwater test-excavations. In addition, archaeological dive surveys may be required to ensure areas to be impacted upon by construction works are devoid of underwater cultural heritage. Where these mitigations are required they should be itemised clearly within the Schedule of Environmental Commitments and agreed in advance with the Department.

Preservation in situ may also be used where archaeology discovered during construction can be preserved with suitable measures, such as changing the construction design, avoiding impacts using buffer zones, physical protection, once this is agreed with the Department (and the NMI, where relevant). However, preservation in situ after the discovery of archaeological heritage within construction stage will normally require a variation to the design and construction, which can be costly and impact on the programme of works, and should therefore be avoided, where possible, through adequate prior archaeological assessments. This is particularly critical when dealing with sites underwater.

Mitigation by Remedy/Offsetting ('Preservation by Record', Archaeological Monitoring)

Mitigation by remedy/offsetting is achieved when an adverse effect is compensated for by a remedial action and balanced by a positive effect. For example, gaining and disseminating new knowledge of the past from archaeological excavation or carrying out conservation works on a built heritage structure that is effected, can be considered as mitigation by remedy/offsetting.

Mitigation by remedy or offsetting may be the only option available for FRS projects that cannot avoid significant adverse effects on terrestrial or underwater cultural heritage due to their need to be located on a particular site or within a particular area. However, it is essential that all reasonable alternatives to adverse impacts are fully explored by the design team before this form of mitigation is proposed and it is advisable to consult with the Department when this scenario arises.

The two forms of archaeological mitigation by remedy/offsetting are archaeological excavation ('preservation by record') and archaeological monitoring.

Archaeological Excavation ("Preservation by Record")

Where archaeological or underwater cultural heritage require removal due to FRS development then it is essential that the approach of preservation by record be applied, i.e. that appropriate archaeological excavation and recording take place. Where adverse impacts cannot be avoided, a full excavation should be carried out to mitigate the impact of the works by preserving the archaeological remains to be impacted upon (with an appropriate buffer) by record.

Preservation by record is a mitigation of last resort and this principle is an important part of state policy in relation to archaeological heritage. Archaeological excavation can be logistically complex, resource intensive and costly for both excavation and post-excavation phases of a project. Therefore, all reasonable options to avoid impacting upon archaeological and underwater cultural heritage must be first considered, and only when these alternatives have been proven unviable in the judgement of the Department will preservation by record be permitted. Before an approval is provided for full archaeological excavation the Department will require sufficient evidence that all options for preservation in situ have been

exhausted. Mitigation relating to residual impacts of the excavation on remaining archaeological deposits/features/structures may also need to be addressed.

It is stated in the Department's *Policy and Guidelines on Archaeological Excavation* (1999),[3] in all cases the proposed methods of excavation must be appropriate to the types of archaeology within the site and designed to maximise the amount of new knowledge of the past – the 'research dividend' - that can be obtained from the archaeological investigation. The methodology to be used in the excavation should be informed by any prior desk based study and assessments, field survey, and other investigations such as geophysical surveys, historical research, and archaeological test investigations.

The methodology for the excavation will require approval as part of the archaeological licensing process or Ministerial Consent process (National Monuments Acts 1930 to 2014). A licence must be applied for with a site-specific methodology that outlines the strategy to be employed during the proposed excavation. Such a strategy, as outlined in the Department's *Policy and Guidelines on Archaeological Excavation* (1999), should include (at a minimum) information under the following headings:

Archaeological and historical background to the proposed excavation.

Archaeological research priorities of the proposed excavation, based on prior research, historical and archaeological background.

The size, location, and scope of the proposed excavation.

The methods of underwater excavation envisaged, to include how the site will be excavated to maximise recovery methods (for example by hand-tools or by suction dredge with sieving of spoil on the surface). How structures/features/deposits/objects will be surveyed on site.

The proposed artefact-recovery strategy (metal detection is a standard requirement on all FRS related excavations) and how material will be safely recovered (in accordance with *Standards for the care and treatment of archaeological objects from excavations* (National Museum of Ireland, April 2022)).

Proposed sampling strategies and proposals for dealing with organic materials and human remains in the event of them being encountered.

Details on the size and experience of the underwater archaeological dive team.

How the site will be protected during downtime until excavation has been completed.

The proposed publication/public dissemination programme.

Archaeological Monitoring

Archaeological monitoring is generally undertaken following prior archaeological assessments being carried out for the EIAR/UAIA, with the objective of identifying and protecting previously unidentified archaeological and underwater cultural heritage,

[3] https://www.archaeology.ie/sites/default/files/media/publications/excavation-policy-and-guidelines.pdf

archaeological deposits, features, structures, objects, wrecks, and other materials which may be encountered or otherwise affected by the FRS works.

As archaeological monitoring is generally undertaken during the construction programme, it is essential that it is not carried out as a primary means of mitigation but rather as a method of dealing with any residual risks to archaeological and underwater cultural heritage that remain following the completion of prior assessments and mitigations. When archaeology is discovered during monitoring of construction works it can often lead to delays whilst the impacts are mitigated. It is critical that, where possible, detailed cultural heritage assessments and mitigations are carried out to identify and manage these risks.

All archaeological monitoring should be carried out under licence. This will ensure that there are no avoidable delays arising from the subsequent application for a licence to mitigate the impacts of the development on any archaeology that may be discovered. If the impacted archaeology is under water, both a Section 26 (National Monuments Act 1930) licence and Section 3 (National Monuments Act (amendment) 1987) licence may be required.

In certain cases, the archaeological monitoring methodology for an FRS project should include the archaeological assessment of dredged/excavated spoil that is removed from the river/seabed. This material, particularly in proximity to urban areas, can be very rich in archaeological materials and objects, including organic materials. It is generally the approach of the Department, in consultation with the NMI, that dredged spoil is assessed by means of spreading, searching for objects, and metal detection (for metal objects). In order for artefacts to be accurately provenanced, where practicable, searching and metal detection should take place before bulk excavations occur, for instance where intertidal areas have been temporarily exposed. The following general approach is applied on a case-by-case basis, where dredged spoil is being removed off-site:

100% volume assessment of spoil – all spoil from areas being dredged within the Zone of Archaeological Potential for an historic town, within or in proximity of a wreck or of a Zone of Notification of a Recorded Monument, at or near a monument that is subject to Section 14 of the National Monuments 1930-2014 Acts, or in areas that are traditionally known to have high potential to contain underwater cultural heritage (e.g areas where there are concentrations of shipwrecks).

25% volume assessment of spoil from all other areas.

Scaling of assessment of dredged spoil. In general, the Department will consider the scaling up or down of 25% volume assessment of the dredged spoil based on the artefactual retrieval results over an agreed time.

Follow-up Inspections

There may be a need for periodic follow-up inspections after the main works have been completed on an FRS project, as part of the agreed mitigation. These may be required to assess the effectiveness of certain mitigation measures that were put in place (for example, stabilisation mechanisms for underwater sites or features) or to inspect newly discovered sites/features/objects that were preserved in situ to ensure that no unforeseen residual impacts are occurring.

The above observations/recommendations are based on the papers submitted to this Department on a pre-planning basis and are made without prejudice to any observations that the Minister may make in the context of any consultation arising on foot of any development application referred to the Minister, by the planning authority/ies, in the role as statutory consultee under the Planning and Development Act, 2000, as amended.

You are requested to send further communications to the Development Applications Unit (DAU) at **manager.dau@housing.gov.ie**.

Is mise le meas**,**

Diarmuid Buttimer
Development Applications Unit
Administration

5.2 Uisce Éireann – Scoping Response

For the attention of Leanne Leonard & Conor O'Neill

JBA Consulting,
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T: +353 1 89 25000
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www.water.ie

Date: 26th October 2023

By Email: Leanne.Leonard@jbaconsulting.ie & Conor.oneill@jbaconsulting.ie

Re: Castleconnell Flood Relief Scheme – EIAR Screening and Scoping in County Limerick

Dear Leanne Leonard,

Uisce Éireann has received notification of your Environmental Impact Assessment (EIA) scoping request relating to the forthcoming planning application for the Castleconnell Flood Relief Scheme (FRS) in County Limerick.

Please see attached, Uisce Éireann's scoping opinion in relation to Water Services. On receipt of the planning referral, Uisce Éireann will review the finalised Environmental Impact Assessment Report (EIAR) as part of the planning process.

Further, appended are the items discussed between both parties as part of the initial stakeholder engagement/environmental consultation period and noted in a letter dated 14th November, 2022. Much of the items contained within the Appended letter remain valid, with some updates provided in this current iteration.

Queries relating to the terms and observations above should be directed to planning@water.ie

Yours sincerely,

PP Ali Robinson

Signed on behalf of Yvonne Harris

Connections and Developer Services

Uisce Éireann's Response to EIA Scoping Requests

At present, Uisce Éireann does not have the capacity to advise on the scoping of individual projects. However, in general the following aspects of Water Services should be considered in the scope of an EIA/design proposals where relevant;

a) Flood Relief Schemes would generally protect key infrastructure such as Wastewater Pumping Stations and ESB cabinets.

b) There is an existing UÉ abstraction asset (Clareville – Water Supply Project) in proximity to the proposed works and as such the FRS Environmental Impact Assessment Report (EIAR) should consider any indirect/ cumulative effects.

c) Road drainage must also be considered by Flood Relief Scheme - i.e. storm pumps to cater for river flood level. The current river peak flow level should be identified as well as the identification of what the peak river flows will be after the Flood Relief Scheme works are in place.

d) The potential impacts to Uisce Éireann assets as result of flood level rise should be considered as well as identifying proposed mitigation measures that will protect Uisce Éireann assets.

e) Where the development proposal has the potential to impact an Uisce Éireann Drinking Water Source(s), the applicant shall provide details of measures to be taken to ensure that there will be no negative impact to Uisce Éireann's Drinking Water Source(s) during the construction and operational phases of the development. Hydrological / hydrogeological pathways between the applicant's site and receiving waters should be identified as part of the report.

f) Where the development proposes the backfilling of materials, the applicant is required to include a waste sampling strategy to ensure the material is inert.

g) Mitigations should be proposed for any potential negative impacts on any water source(s) which may be in proximity and included in the environmental management plan and incident response.

h) Any and all potential impacts on the nearby reservoir as public water supply water source(s) are assessed, including any impact on hydrogeology and any groundwater/ surface water interactions.

i) Impacts of the development on the capacity of water services (*i.e. do existing water services have the capacity to cater for the new development*). This is confirmed by Uisce Éireann in the form of a Confirmation of Feasibility (COF). If a development requires a connection to either a public water supply or sewage collection system, the developer is advised to submit a Pre-Connection Enquiry (PCE) enquiry to Uisce Éireann to determine the feasibility of connection to the

Irish Water network. All pre-connection enquiry forms are available from https://www.water.ie/connections/connection-steps/.

j) The applicant shall identify any upgrading of water services infrastructure that would be required to accommodate the proposed development.

k) In relation to a development that would discharge trade effluent – any upstream treatment or attenuation of discharges required prior to discharging to an Uisce Éireann collection network.

l) In relation to the management of surface water; the potential impact of surface water discharges to combined sewer networks and potential measures to minimise and or / stop surface waters from combined sewers.

m) Any physical impact on Uisce Éireann assets – reservoir, drinking water source, treatment works, pipes, pumping stations, discharges outfalls etc. including any relocation of assets.

n) When considering a development proposal, the applicant is advised to determine the location of public water services assets, possible connection points from the applicant's site / lands to the public network and any drinking water abstraction catchments to ensure these are included and fully assessed in any pre-planning proposals. Details, where known, can be obtained by emailing an Ordnance Survey map identifying the proposed location of the applicant's intended development to datarequests@water.ie

o) Other indicators or methodologies for identifying infrastructure located within the applicant's lands are the presence of registered wayleave agreements, visible manholes, vent stacks, valve chambers, marker posts etc. within the proposed site.

p) Any potential impacts on the assimilative capacity of receiving waters in relation to Uisce Éireann discharge outfalls including changes in dispersion / circulation characterises. Hydrological / hydrogeological pathways between the applicant's site and receiving waters should be identified within the report.

q) Any potential impact on the contributing catchment of water sources either in terms of water abstraction for the development (*and resultant potential impact on the capacity of the source*) or the potential of the development to influence / present a risk to the quality of the water abstracted by Uisce Éireann for public supply should be identified within the report.

r) Where a development proposes to connect to an Uisce Éireann network and that network either abstracts water from or discharges wastewater to a "protected"/ sensitive area, consideration as to whether the integrity of the site / conservation objectives of the site would be compromised should be identified within the report.

s) Mitigation measures in relation to any of the above ensuring a zero risk to any Uisce Éireann drinking water sources (Surface and Ground water).

This is not an exhaustive list.

Please note;

• Where connection(s) to the public network is required as part of the development proposal, applicants are advised to complete the Pre-Connection Enquiry process and have received a Confirmation of Feasibility letter from Uisce Éireann ahead of any planning application.

• Uisce Éireann will not accept new surface water discharges to combined sewer networks.

Further Considerations to be addressed as part of the Formal Planning Application

Build Over/Diversions

There is an overlap of approximately 0.5km of the proposed FRS scheme with existing UÉ infrastructure of various sizes and material. Where building near / building over / diversions of existing UÉ assets are proposed, the associated designs need to be agreed with the Diversions team in UÉ and where appropriate an associated Build Over Agreement / Diversion Agreement executed between the applicant and UÉ . Further details on the process to be followed are outlined on the UÉ website at https://www.water.ie/connections/developer-services/diversions/. An associated application form can be downloaded from this location, and it should be submitted, along with associated design drawings, to diversions@water.ie. Design proposals are required to be in accordance with UÉ Standard Details and Codes of Practice.

Storm Drainage Proposals

In Castleconnell, the FRS work proposals do protect the main Pumping Station site. However, evidence of any storm drainage proposals generally do not seem to have been provided. The roads in the town currently drain to the river via a separate storm system. The FRS project needs to ensure that is still the case during river flood events via storm pumps and possibly storm drainage upgrades. The current Casleconnell FRS maps suggests three storm outfalls to the Shannon river and three storm outfalls to three tributaries. All of these will need to be protected/upgraded to avoid surface flooding. The Castleconnell Waste Water Pumping Station (WWPS) Storm Water Overflow (SWO) may also be linked to the road storm system, and drainage design should take account of all contributing flows.

Appendix A

Letter from Irish Water 14th November 2022- initial stakeholder engagement/environmental consultation

Re: Castleconnell Flood Relief Scheme

A Chara,

We note the recent public participation day on the Castleconnell Flood Relief Scheme options and would like to draw your attention to the points below that should be taken into consideration in the design of the flood scheme in the interest of protecting public water services and assets.

Irish Water kindly request continued engagement through the feasibility, design and construction stages in order to ensure public water services and sources are protected and access is maintained.

a) Details of public water services assets, where known, can be obtained by emailing an Ordinance Survey map identifying the proposed location of your intended development to datarequests@water.ie. Other indicators or methodologies for identifying infrastructure located within your lands are the presence of registered wayleave agreements, visible manholes, vent stacks, valve chambers, marker posts etc., within the proposed site.

b) Any physical impact on IW assets – drinking water source, treatment works, pipes, pumping stations, discharges outfalls etc. This includes any potential increase or decrease to the level of overburden on assets as well as the impact of any changes in river levels on stormwater overflows, WWTP outfalls, WTP intake, etc.

   The intake for the Limerick Water Resource Zone is about 2km downstream at Clareville. There is public water and wastewater networks infrastructure in Castleconnell, including a strategic rising main from Castleconnell Pumping Station No.1 to Castletroy WWTP, which may be impacted by the scheme. Of note, the proposed solutions include works in the vicinity of Castleconnell Pumping Station No.1 and overflow.

   All necessary measures to protect and maintain access to Irish Water infrastructure and water sources shall be undertaken and incorporated into the design. Where an Irish Water asset is altered or diverted a Diversion Agreement is required. Details on this process can be found at https://www.water.ie/connections/developer-services/diversions/. Any design proposal to divert an Irish Water asset must be completed in accordance with IW Standard Details and Codes of Practice which are available on the Irish Water website.

c) The potential impact of existing surface water discharges to combined sewer networks & potential measures to minimise/stop surface waters inflow to combined sewers. The removal of surface water from combined networks frees capacity for foul drainage from new developments, supporting the achievement of compact growth objectives set out in the National Planning Framework. Irish Water will not accept new surface water discharges to combined sewer networks. The provision of Blue Green infrastructure/ SUDS is encouraged.

d) Any potential impacts on the assimilative capacity of receiving waters in relation to Irish Water discharge outfalls, including changes in dispersion /circulation characteristics.

e) Any potential impact on the contributing catchment of water sources either in terms of water abstraction for the development (and resultant potential impact on the capacity of the source) or the potential of the development to influence/ present a risk to the quality of the water abstracted by IW for public supply.

f) Any upgrading of water services infrastructure that would be required to accommodate the development.

g) Where a development proposes to connect to an IW network and that network either abstracts water from or discharges wastewater to a “protected”/sensitive area, consideration as to whether the integrity of the site/conservation objectives of the site would be compromised.

h) Mitigation measures in relation to any of the above.

i) If a development will require a temporary or permanent connection to either a public water supply or wastewater collection system the developer is advised to submit a Pre Connection Enquiry (PCE) enquiry to IW to determine the feasibility of connection to the Irish Water network. All pre-connection enquiry forms are available from https://www.water.ie/connections/get-connected/.

j) With regard to upcoming IW projects in the area, sewer and watermains rehabilitation works are carried out on a nationally prioritised basis, works will be progressed within the scheme area over the coming years.

k) Correspondence at planning application stage should be submitted to planning@water.ie.

Yours Sincerely,

Elaine Heneghan

Elaine Heneghan
Regional Forward Planning Specialist

5.3 Transport Infrastructure Ireland – Scoping Response

Email received from TII 03/011/2023:

Dear Mr. O'Neill,

Thank you for your correspondence of 11 October 2023 regarding the above. Transport Infrastructure Ireland's (TII's) position in relation to your enquiry is as follows.

TII wishes to advise that it is not in a position to engage directly with planning applicants in respect to proposed developments. TII will endeavour to consider and respond to planning applications referred to it, given its status and duties as a statutory consultee under the Planning Acts. The approach to be adopted by TII in making such submissions or comments will seek to uphold official policy and guidelines, as outlined in the Section 28 Ministerial Guidelines 'Spatial Planning and National Roads Guidelines for Planning Authorities' (DoECLG, 2012). Regard should also be had to other relevant guidance available at www.TII.ie.

The issuing of this correspondence is provided as best practice guidance only and does not prejudice TII's statutory right to make any observations, requests for further information, objections or appeals, following the examination of any valid planning application referred.

With respect to EIAR/Environmental Constraints Scoping issues, the recommendations indicated below provide only general guidance for the preparation of an EIAR, which may affect the national road network.

The developer should have regard, inter alia, to the following:

- Consultations should be had with the relevant Local Authority/National Roads Design Office with regard to the locations of existing and future national road schemes in the area.
- TII would be specifically concerned as to potential significant impacts the development would have on the national road network (and junctions with national roads) in the proximity of the proposed development.
- The developer should assess visual impacts from existing national roads.
- The developer should have regard to any Environmental Impact Assessment Report/Statement and all conditions and/or modifications imposed by An Bord Pleanála regarding road schemes in the area. The developer should, in particular, have regard to any potential cumulative impacts.
- The developer, in conducting Environmental Impact Assessment, should have regard to TII Publications (formerly DMRB and the Manual of Contract Documents for Road Works).
- The developer, in conducting Environmental Impact Assessment, should have regard to TII's Environmental Assessment and Construction Guidelines, including the 'Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes' (National Road Authority (NRA), 2006).
- The EIAR should consider the 'Environmental Noise Regulations 2006 (SI 140 of 2006)' and, in particular, how the development will affect future action plans by the relevant competent authority. The developer may need to consider the incorporation of noise barriers to reduce noise impacts (see 'Guidelines for the Treatment of Noise and Vibration in National Road Schemes' (1st Rev., NRA, 2004)).
- Where new structures may be proposed on national roads, the developer is reminded of the requirements of TII Standard: 'Technical Acceptance of Road Structures on Motorways and Other National Roads'. This Standard specifies the procedures to be followed in order to obtain Technical Acceptance for structures on motorway and other national road schemes and for the submission of as built records. The procedures cover the design of all road structures, including bridges, tunnels, subways, culverts, buried corrugated steel structures, retaining walls, reinforced earth structures, gantries, environmental noise barriers and temporary structures under or over motorways or other roads carrying public traffic.
- The developer should also be aware that there are Technical Acceptance requirements relating to the assessment, alteration, modification, strengthening and repair of all existing road structures (national roads) and same shall be agreed with the Bridge Management Section of TII. In that regard, although TII has not identified any national road structures within the Scheme Area, however, there are a number of structures on the nearby M7 Motorway:

  - Structure ID: LC-M07-017.00 (Ballynacourty Culvert)
  - Structure ID: LC-M07-018.00 (Sallymount Bridge)
  - Structure ID: LC-M07-019.00 (Woodpark Bridge)
  - Structure ID: LC-M07-020.00 (Coolreiry Bridge)
- A hydraulic analysis should be undertaken to identify the impact of proposed flood alleviation works on the hydraulic capacity of any TII Structures impacted and the potential for scour at the structure.
- An assessment of scour and other hydraulic actions on national road structures in accordance with UK BD 97/12 should be undertaken where necessary. Scour prevention measures will be required if the assessment illustrates the potential for scour beneath the foundations.
- It would be important that, where appropriate, subject to meeting the appropriate thresholds and criteria and having regard to best practice, a Traffic and Transport Assessment (TTA) be carried out in accordance with relevant guidelines, noting traffic volumes attending the site and traffic routes to/from the site, with reference to impacts on the national road network and junctions of lower category roads with national roads. TII's 'Traffic and Transport Assessment Guidelines' (2014) should be referred to in relation to proposed development with potential impacts on the national road network. The scheme promoter is also advised to have regard to Section 2.2 of TII's TTA Guidelines, which addresses requirements for sub-threshold TTA.
- The designers are asked to consult TII Publications to determine whether a Road Safety Audit is required.
- In the interests of maintaining the safety and standard of the national road network, the EIAR should identify the methods/techniques proposed for any works traversing/in proximity to the national road network.
- In relation to haul route identification, the applicant/developer should clearly identify haul routes proposed and fully assess the network to be traversed. Where abnormal loads are a feature of the proposed development, separate structure approvals/permits and other licences may be required in connection with the proposed haul route and all structures on the haul route should be checked by the applicant/developer to confirm their capacity to accommodate any abnormal load.

Notwithstanding, any of the above, the developer should be aware that this list is non-exhaustive, thus site and development specific issues should be addressed in accordance with best practise.

I hope that this information is of assistance to you.

Yours sincerely,

_____

Andrew Moore

Senior Regulatory & Administration Executive

5.4 National Environmental Health Service – Scoping Response

Environmental Health Service
Health Service Executive West
Civic Offices Limerick Road
Nenagh
Co. Tipperary
Phone: 067 46619
E-Mail: andrew.sulley@hse.ie

21/11/2023

J B A Consulting
24 Grove Island
Corbally
Co. Limerick

EHS Ref: ID3468

HSE Submission on Scoping of EIA Flood Relief Scheme for Castleconnell along the River Shannon

The following HSE stakeholders were consulted on the scoping on the 11th October 2023:

HSE Emergency Planning

HSE Estates

Director of National Health Protection

Community Health Organisation

Clarification on the content of this submission should be made to Andrew Sulley at Andrew.sulley@hse.ie

The Environmental Service recommends a dedicated website is set up that details the project and includes all the environmental assessment documentation and the outcomes of public consultation. Documents uploaded to planning websites are often difficult to navigate and scroll through text for members of the public.

The EHS has received correspondence from Uisce Éireann with regard to the extraction of water to supply Dublin from Parteen in the lower Shannon basin. The EIA for this project is currently being scoped. Any potential implications of this project and/or cumulative effects of construction should be considered as part of the EIA.

The following documents should be taken into consideration when preparing the Environmental Impact Assessment Report:

Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment

https://www.housing.gov.ie/sites/default/files/publications/files/guidelines_for_planning_authorities_and_an_bord_pleanála_on_carrying_out_eia_-_august_2018.pdf

EU publication: Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report, EU, 2017

http://ec.europa.eu/environment/eia/pdf/EIA_guidance_EIA_report_final.pdf

Adoption of the Directive (2014/52/EU) in April 2014 initiated a review of the National Guidance for EIA and the EIAR accompanying a planning application. New guidelines can be seen at:

https://www.epa.ie/publications/monitoring--assessment/assessment/guidelines-on-the-information-to-be-contained-in-environmental-impact-assessment.php

The introduction of the new Guidance is supported by a Webinar produced by the EPA and can be found at:

https://www.youtube.com/embed/ejKVFUztxBY

Generally the Environmental Impact Assessment should examine all likely significant impacts and provide the following information for each:

a) Description of the receiving environment;

b) The nature and scale of the impact;

c) An assessment of the significance of the impact;

d) Proposed mitigation measures;

e) Residual impacts.

Directive 2014/52/EU has an enhanced requirement to assess likely significant impacts on Population and Human Health. It is the experience of the Environmental Health Service (EHS) that impacts on human health are often inadequately assessed in EIAs in Ireland. It is recommended that the wider determinants of health and wellbeing are considered in a proportionate manner when considering the EIA. Guidance on wider determinants of health can be found at www.publichealth.ie

Any opportunities for health gain from the project should be considered. For example:

Improving pedestrian or cycling connectivity and infra structure

Improving access to green areas

In addition to any likely significant negative impacts from the proposed development, any positive likely significant impacts should also be assessed.

The HSE will consider the final EIAR accompanying the Planning application and will make comments to the Local Planning Authority on the methodology used for assessing the likely significant impacts and the evaluation criteria used in assessing the significance of the impact.

The EHS recommends that the following matters are included and assessed in the EIAR:

- Public Consultation – outcomes and methodology
- Decommissioning phase
- Noise & Vibration
- Air Quality
- Surface and Groundwater Quality
- Geological Impacts
- Ancillary facilities
- Cumulative impacts

Public Consultation

It is recommend that early and meaningful public consultation with the local community is undertaken to ensure all potentially significant impacts of the proposed development have been adequately addressed.

Sensitive receptors and other stakeholders should be identified to ensure all necessary and appropriate mitigation measures are put in place to reduce the likelihood of any complaints about the proposed development in the future.

The Environmental Health Service expects that meaningful public consultation, where the local community is fully informed of the proposed development, will be undertaken.

The Environmental Impact Assessment Report (EIAR) should clearly demonstrate the link between public consultations and how those consultations have influenced the decision-making process in the EIA.

To assist with the consultation and planning process it is recommended that the applicant develops a dedicated website for the proposed development. All correspondence, maps, project updates and documentation including the EIAR should be uploaded to the website.

The EIAR should state the period of planning permission sought, the length of time construction is estimated to take and if it is anticipated that the development will be decommissioned and removed or will continue to operate (following any further planning consent) at the end of this period of planning permission (should permission be granted)

Assessment of Consideration of Alternatives

The EIAR should consider an assessment of alternatives.

Noise & Vibration

The potential significant impacts for noise and vibration from the proposed development on all noise sensitive locations must be clearly identified in the EIAR. The EIAR must also consider the appropriateness and effectiveness of all proposed mitigation measures to minimise noise and vibration.

Noise from construction should be controlled by the limiting of construction times. The proposed times should be specified in the EIAR.

Air Quality

Due to the nature of the proposed construction works generation of airborne dust has the potential to have significant impacts on sensitive receptors. A Construction Environmental Management Plan (CEMP) should be included in the EIAR which details dust control and mitigation measures. Measures should include:

- Sweeping of hard road surfaces
- Provision of a water bowser on site, regular spraying of haul roads
- Wheel washing facilities at site exit
- Restrict speed on site

- Provide covers to all delivery trucks to minimise dust generation
- Inspect and clean public roads in the vicinity if necessary
- Material stockpiling provided with adequate protection from the wind
- Dust monitoring at the site boundary
- Truck inspection and maintenance plan
- Details of a road maintenance agreement between the developer and the Local Roads Authority to clarify responsibility for the upkeep and repair of access roads during the construction phase of the project

Surface and Ground Water Quality

The proposed development has the potential to have a significant impact on the quality of both surface and ground water. All drinking water sources that are likely to be impacted, both surface and ground water, must be identified. Public and Group Water Scheme sources and supplies should be identified in addition to any private wells supplying potable water to houses in the vicinity of the proposed development. Measures to ensure that all sources and supplies are protected should be described. The Environmental Health Service recommends that a walk over survey of the site is undertaken in addition to a desktop analysis of Geological Survey of Ireland data in order to identify the location of private wells used for drinking water purposes.

Any potential significant impacts to drinking water sources should be assessed.

Any likely significant impacts on surface water as a result of the construction should be identified and any mitigation required identified in the EIAR.

Ancillary Facilities

The EIAR should include details of the location of all site office, construction compound, fuel storage depot, sanitary accommodation and canteen, First Aid facilities, disposal of wastewater and the provision of a potable water supply to the site canteen.

Cumulative Impacts

The EIAR should include a detailed assessment of any likely significant cumulative impacts of the proposed development with existing or proposed development.

Climate

The EIA should assess the vulnerability of the proposed development against the predicted impacts of a warming climate. The applicant should outline proactive adaption measures to ensure the long term resilience of the proposed infrastructure to the impacts climate change.

Yours sincerely

5.5 National Parks and Wildlife Service

An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

Your Ref: **Castleconnel Flood Relief Scheme**
Our Ref: **G Pre00155/2022** (Please quote in all related correspondence)

2 February 2024

JBA Consulting
Unit 8, Block 660
Greenogue Business Plaza
Greenogue Business Park
Rathcoole
Dublin
D24 YN81

Via email: Conor.oneill@jbaconsulting.ie

Proposed Pre Planning Development: Limerick City and County Council to develop a flood relief scheme for Castleconnell.

A chara

I refer to correspondence received in connection with the above. Outlined below are heritage-related observations/recommendations co-ordinated by the Development Applications Unit under the stated headings.

Nature Conservation

Further to your e-mail of 3 January 2024, concerning the proposed preferred option for the Castleconnell flood relief scheme (as outlined in the Public Participation Day at Castleconnell on 6 September 2024), please see response to consultation with the National Parks and Wildlife Service (NPWS). Note that the response is based on the website map[1].

1. *Wall replacement on the Elvers Road (NIS)*

The boundary of the Lower River Shannon Special Area of Conservation (SAC no. 2165[2]) is directly adjacent to the existing wall of the Elvers Road. As outlined in the key ecological features map, the habitat on the riverside of this existing road wall is alluvial woodland, a priority habitat for which it is a conservation objective of the SAC to protect[3].

It is proposed to demolish the existing wall, and reconstruct the new flood wall offset inwards, without impacting the SAC. A detailed description of how these works are to be carried out

[1] 19104-jbai-xx-xx-fg-z-02712_preferred_option_p03.pdf
[2] Designated under S.I. No. 328 of 2023.
[3] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002165.pdf

without damaging the alluvial woodland soil or local hydrology, especially with regard to the foundations of the wall, will be required in order to fully assess the effects of the proposal. While it is recognised that a gap exists[4] for the placement of scaffolding, debris trays and terram, for instance, and to allow equipment and personnel access, nevertheless any localised impacts need to be avoided by careful mitigation.

Also, it is recommended, as an aftercare measure, that monitoring is carried out both for alluvial woodland ground vegetation, as well as for any inadvertent establishment of invasive plant species, in the first and second year after completion of the works.

2. *Embankment south of Island House (NIS)*

There is a slight overlap between the proposed embankment and the SAC. Although the habitat where the embankment overlaps the boundary appear to be not related to habitats or species to which the conservation objectives of the SAC apply, nevertheless this needs to be clearly detailed in the Natura Impact Statement. Also, any potential impacts of increased public access into the alluvial woodland mapped in the key ecological features map, needs to be assessed. The same recommendation relating to invasive plant species above, is made for this location.

3. *Otter survey (NIS & EIAR)*

In addition to there being a conservation objective of the SAC to protect the habitat of this species, the otter is also a strictly protected species listed in Annex IV of the EU Habitats Directive. A thorough survey, following up-to-date best practice, for breeding and resting places of otters throughout the length of the wetland adjacent and close to the proposed flood relief works, will be necessary. Also, any potential indirect effects of the proposed scheme layout, on increasing otter mortality due to road traffic, needs to be assessed in the EIAR. A pre-construction otter survey is also recommended, as there may be changes in habitat use in the period between the initial survey and construction.

4. *Heron nests & timing of embankment works (EIAR)*

As mapped in the key ecological features map, there are nesting herons in trees very close to the proposed embankment south of Island House. Mitigation proposals should be considered which avoid disturbance to this species during the breeding season (e.g. seasonal restriction on construction works in the area). Also, any potential impacts of increased public access into the area under the trees should be assessed in the EIAR.

5. *Coolbane Woods (EIAR)*

The history of the area where the embankment is proposed appears to be afforested rather than being natural Shannon floodplain woodland, despite the recolonization of willows, etc. It would be useful to obtain documentation on this (note that this is not considered regularly hydrologically linked to the SAC alluvial woodland in the sense that it is regularly flooded by the River Shannon).

[4] 19104-jbb-xx-xx-dr-c-02262_mall_house_layout_plan_ppd_p01.pdf

6. *Hydrological impacts of restricting river floodplain during floods (NIS & EIAR)*

Any indirect hydrological impacts within the SAC, such as greater erosion due to faster flows, or changes in floodplain duration of flooding (upstream and downstream), should be considered, which may result from restricting the extent of the floodplain as a result of the scheme. Advice should be sought from Inland Fisheries Ireland (IFI) in relation to potential impacts of salmon redds and other fish species, in particular lamprey and eel.

7. *Removal of old beech trees and repointing causeway (EIAR)*

If any mature or overmature trees, in particular beech, are to be felled and removed, a survey for bats must be carried out according to best practice. Similarly, a survey of the causeway to Island House, which is proposed for repointing, should be carried out according to best practice. Where bat roosts are found in such trees and/or the causeway, contact should be made with the NPWS.

The above observations/recommendations are based on the papers submitted to this Department on a pre-planning basis and are made without prejudice to any observations that the Minister may make in the context of any consultation arising on foot of any development application referred to the Minister, by the planning authority/ies, in the role as statutory consultee under the Planning and Development Act, 2000, as amended.

You are requested to send further communications to the Development Applications Unit (DAU) at **manager.dau@housing.gov.ie**.

Is mise le meas**,**

Diarmuid Buttimer
Development Applications Unit
Administration

6 Construction Impacts Appendices

6.1 Construction volumes and calculations

Volume of demolition works:				
Area of works	**Stone walls**	**Concrete**	**Paving / Road works**	**Total Volume (m3)**
Northern properties	159	27	33	**219**
Cedarwood Culvert	0	5	0	**5**
Mall House	115	4	0	**119**
Mall Road North	304	46	152	**502**
Island House	0		20	**20**
Scanlon Park Junction	0	5	0	**5**
Mall Road South	212	32	106	**350**
Maher's Pub	106	0	53	**159**
Meadowbrook Estate	93	0	0	**93**
Stormont House	0	0	47	**47**
Coolbane Woods Junction	0	10	0	**10**
Coolbane Woods Embankment	0	0	0	**0**
Ancillary Works (Pipe diversion etc.)	0	0	120	**120**
Total Volume (m3)	**989**	**129**	**531**	**1649**

7 Population and Human Health Appendices

No appendices.

8 Biodiversity Appendices

8.1 NBDC data

8.1.1 Protected Species recorded within 5km of the site over the last 10 years (NBDC, 2023)

Species name	Date of last record	Dataset	Designation
Amphibians			
Common Frog (Rana temporaria)	09/03/2020	Amphibians and reptiles of Ireland	EU Habitats Directive Annex V || Protected Species: Wildlife Acts
Smooth Newt (Lissotriton vulgaris)	26/03/2020	Amphibians and reptiles of Ireland	Protected Species: Wildlife Acts
Birds			
Barn Owl (Tyto alba)	17/03/2019	Birds of Ireland	Wildlife Acts, Birds of Conservation Concern - Red List
Barn Swallow (Hirundo rustica)	31/03/2019	Birds of Ireland	Wildlife Acts, Birds of Conservation Concern - Amber List
Black-headed Gull (Larus ridibundus)	04/01/2018	Birds of Ireland	Wildlife Acts, Birds of Conservation Concern - Amber List
Common Coot (Fulica atra)	22/04/2019	Birds of Ireland	Wildlife Acts, EU Birds Directive Annex II, Section I & Annex III, Section II Bird Species, Birds of Conservation Concern - Amber List
Common Kestrel (Falco tinnunculus)	12/05/2019	Birds of Ireland	Wildlife Acts, Birds of Conservation Concern - Red List
Common Kingfisher (Alcedo atthis)	23/09/2018	Birds of Ireland	Wildlife Acts, EU Birds Directive Annex I Bird Species, Birds of Conservation Concern - Amber List
Common Linnet (Carduelis cannabina)	12/05/2019	Birds of Ireland	Wildlife Acts, Birds of Conservation Concern - Amber List
Common Snipe (Gallinago gallinago)	18/01/2017	Birds of Ireland	Wildlife Acts, EU Birds Directive Annex II, Section I & Annex III, Section III Bird Species, Birds of Conservation Concern - Red List
Common Starling (Sturnus vulgaris)	07/12/2017	Birds of Ireland	Wildlife Acts, Birds of Conservation Concern - Amber List
Common Wood Pigeon (Columba palumbus)	30/12/2017	Birds of Ireland	Wildlife Acts, EU Birds Directive Annex II, Section I & Annex III, Section I Bird Species
Eurasian Curlew (Numenius arquata)	09/05/2021	Birds of Ireland	Wildlife Acts, EU Birds Directive Annex II, Section II Bird Species, Birds of Conservation Concern - Red List
European Golden Plover (Pluvialis apricaria)	01/03/2018	Birds of Ireland	Wildlife Acts, EU Birds Directive Annex I Bird Species, EU Birds Directive Annex II, Section II & Annex III, Section III Bird Species, Birds of Conservation Concern - Red List
Goldcrest (Regulus regulus)	24/01/2018	Birds of Ireland	Birds of Conservation Concern - Amber List
Great Cormorant (Phalacrocorax carbo)	30/12/2017	Birds of Ireland	Wildlife Acts, Birds of Conservation Concern - Amber List
Grey Wagtail (Motacilla cinerea)	23/04/2014	Birds of Ireland	Birds of Conservation Concern - Red List
Greylag Goose (Anser anser)	23/04/2014	Birds of Ireland	Invasive Species Regulation S.I. 477 (Ireland), Wildlife Acts, EU Birds Directive Annex II, Section I & Annex III, Section II Bird Species,

			Birds of Conservation Concern - Amber List
Hen Harrier (Circus cyaneus)	10/06/2021	Birds of Ireland	Wildlife Acts, EU Birds Directive Annex I Bird Species, Birds of Conservation Concern - Amber List
House Sparrow (Passer domesticus)	07/12/2017	Birds of Ireland	Wildlife Acts, Birds of Conservation Concern - Amber List
Mallard (Anas platyrhynchos)	30/08/2022	Birds of Ireland	Wildlife Acts, EU Birds Directive Annex II, Section I & Annex III, Section I Bird Species, Birds of Conservation Concern - Amber List
Mute Swan (Cygnus olor)	04/01/2018	Birds of Ireland	Wildlife Acts, Birds of Conservation Concern - Amber List
Northern Lapwing (Vanellus vanellus)	01/03/2018	Birds of Ireland	Wildlife Acts, EU Birds Directive Annex II, Section II Bird Species, Birds of Conservation Concern - Red List
Sand Martin (Riparia riparia)	23/04/2014	Birds of Ireland	Wildlife Acts, Birds of Conservation Concern - Amber List
Sky Lark (Alauda arvensis)	12/05/2019	Birds of Ireland	Wildlife Acts, Birds of Conservation Concern - Amber List
Whooper Swan (Cygnus cygnus)	02/03/2020	Birds of Ireland	Wildlife Acts, EU Birds Directive Annex I Bird Species, Birds of Conservation Concern - Amber List
Willow Warbler (Phylloscopus trochilus)	22/04/2019	Birds of Ireland	Birds of Conservation Concern - Amber List
Flora			
Yellow Archangel (Lamiastrum galeobdolon)	12/04/2021	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	Threatened Species: Least concern
Invertebrates			
Large Heath (Coenonympha tullia)	03/06/2021	Atlas of Butterflies in Ireland 2021	Threatened Species: Vulnerable
Marsh Fritillary (Euphydryas aurinia)	04/06/2018	Irish Butterfly Monitoring Scheme	EU Habitats Directive Annex II, Threatened Species: Vulnerable
Small Heath (Coenonympha pamphilus)	11/06/2020	Atlas of Butterflies in Ireland 2021	Threatened Species: Near threatened
Gooden's Nomad Bee (Nomada goodeniana)	30/04/2021	Bees of Ireland	Threatened Species: Endangered
Large Red Tailed Bumble Bee (Bombus (Melanobombus) lapidarius)	02/08/2020	Bees of Ireland	Threatened Species: Near threatened
Moss Carder-bee (Bombus (Thoracombus) muscorum)	30/05/2018	Bees of Ireland	Threatened Species: Near threatened
Mammals			
Daubenton's Bat (Myotis daubentonii)	27/08/2013	National Bat Database of Ireland	EU Habitats Directive Annex IV, Wildlife Acts
Eurasian Badger (Meles meles)	31/12/2015	Badger Setts of Ireland Database	Wildlife Acts
Eurasian Pygmy Shrew (Sorex minutus)	24/08/2017	Mammals of Ireland 2016-2025	Wildlife Acts
Eurasian Red Squirrel	03/01/2023	Mammals of Ireland 2016-	Wildlife Acts

(Sciurus vulgaris)		2025	
European Otter (Lutra lutra)	14/10/2012	Roadkill Survey	EU Habitats Directive Annex II & Annex IV, Wildlife Acts
Lesser Horseshoe Bat (Rhinolophus hipposideros)	27/01/2015	National Lesser Horseshoe Bat Database	EU Habitats Directive Annex II & Annex IV, Wildlife Acts
Pine Marten (Martes martes)	18/11/2020	Mammals of Ireland 2016-2025	EU Habitats Directive Annex V, Wildlife Acts
West European Hedgehog (Erinaceus europaeus)	26/06/2021	Hedgehogs of Ireland	Wildlife Acts

8.1.2 Invasive Species Recorded within a 5km Radius over the last 10 years (NBDC, 2023)

Species name	Date of last record	Dataset	Designation
Birds			
Greylag Goose (Anser anser)	23/04/2014	Birds of Ireland	Invasive Species Regulation S.I. 477 (Ireland), Wildlife Acts, EU Birds Directive Annex II, Section I & Annex III, Section II Bird Species, Birds of Conservation Concern - Amber List
Flora			
Butterfly-bush (Buddleja davidii)	27/06/2019	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	Medium Impact Invasive Species
Cherry Laurel (Prunus laurocerasus)	18/04/2022	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	High Impact Invasive Species
Giant Hogweed (Heracleum mantegazzianum)	10/05/2022	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	High Impact Invasive Species, Invasive Species Regulation S.I. 477 (Ireland)
Giant Knotweed (Fallopia sachalinensis)	24/08/2016	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	High Impact Invasive Species, Invasive Species Regulation S.I. 477 (Ireland)
Himalayan Honeysuckle (Leycesteria formosa)	16/07/2019	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	Medium Impact Invasive Species
Himalayan Knotweed (Persicaria wallichii)	04/10/2017	National Invasive Species Database	Medium Impact Invasive Species, Invasive Species Regulation S.I. 477 (Ireland)
Indian Balsam (Impatiens glandulifera)	18/04/2022	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	High Impact Invasive Species, Invasive Species Regulation S.I. 477 (Ireland)
Japanese Knotweed (Fallopia japonica)	10/05/2022	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	High Impact Invasive Species, Invasive Species Regulation S.I. 477 (Ireland)
Rhododendron ponticum	19/06/2021	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	High Impact Invasive Species, Invasive Species Regulation S.I. 477 (Ireland)
Sycamore (Acer pseudoplatanus)	01/07/2021	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	Medium Impact Invasive Species
Three-cornered Garlic (Allium triquetrum)	29/03/2021	Vascular plants: Online Atlas of Vascular Plants 2012 Onwards	Medium Impact Invasive Species, Invasive Species Regulation S.I. 477 (Ireland)
Invertebrates			

Jenkins' Spire Snail (Potamopyrgus antipodarum)	09/08/2018	A national macroinvertebrate dataset collected for the biomonitoring of Ireland's river network, 2007–2018 (EPA)	Medium Impact Invasive Species
Zebra Mussel (Dreissena (Dreissena) polymorpha)	08/08/2018	A national macroinvertebrate dataset collected for the biomonitoring of Ireland's river network, 2007–2018 (EPA)	High Impact Invasive Species, Invasive Species Regulation S.I. 477 (Ireland)
Mammals			
American Mink (Mustela vison)	01/06/2015	Atlas of Mammals in Ireland 2010-2015	High Impact Invasive Species, Invasive Species Regulation S.I. 477 (Ireland)
Bank Vole (Myodes glareolus)	17/11/2010	Atlas of Mammals in Ireland 2010-2015	Medium Impact Invasive Species
Brown Rat (Rattus norvegicus)	09/11/2013	Atlas of Mammals in Ireland 2010-2015	High Impact Invasive Species, Invasive Species Regulation S.I. 477 (Ireland)
Eastern Grey Squirrel (Sciurus carolinensis)	03/07/2012	Atlas of Mammals in Ireland 2010-2015	High Impact Invasive Species, Invasive Species EU Regulation No. 1143/2014, Invasive Species Regulation S.I. 477 (Ireland)
European Rabbit (Oryctolagus cuniculus)	06/06/2018	Mammals of Ireland 2016-2025	Medium Impact Invasive Species
Greater White-toothed Shrew (Crocidura russula)	02/05/2020	Mammals of Ireland 2016-2025	Medium Impact Invasive Species

8.2 Annex I Habitats

This appendix includes three survey reports conducted by Dr Jo Denyer including:

- Assessment of Potential Annex 1 habitats (Denyer Ecology report – DE2179_M01a_Castleconnel_FRS_Annex_habitats)
- Alluvial Woodland survey report (Denyer Ecology report - DE2179 R01a Castleconnel_FRS_wet woodland)
- Tall Herb Swamp survey report (Denyer Ecology report DE2179 R02a Castleconnel_FRS_tall-herb swamp

Memo

To: Declan Egan, JBA Consulting
From: Dr Joanne Denyer (Denyer Ecology)
Cc:
Date: 24 May 2022
Subject: Castleconnel Flood Relief Scheme (FRS) Annex I habitats

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Dr Joanne Denyer was commissioned by JBA Consulting to undertake a survey and assessment of potential Annex I habitats in relation to the Castleconnel Flood Relief Scheme (FRS). Several areas of potential Annex I habitat had been identified within the floodzone of the Lower River Shannon near Castleconnel:

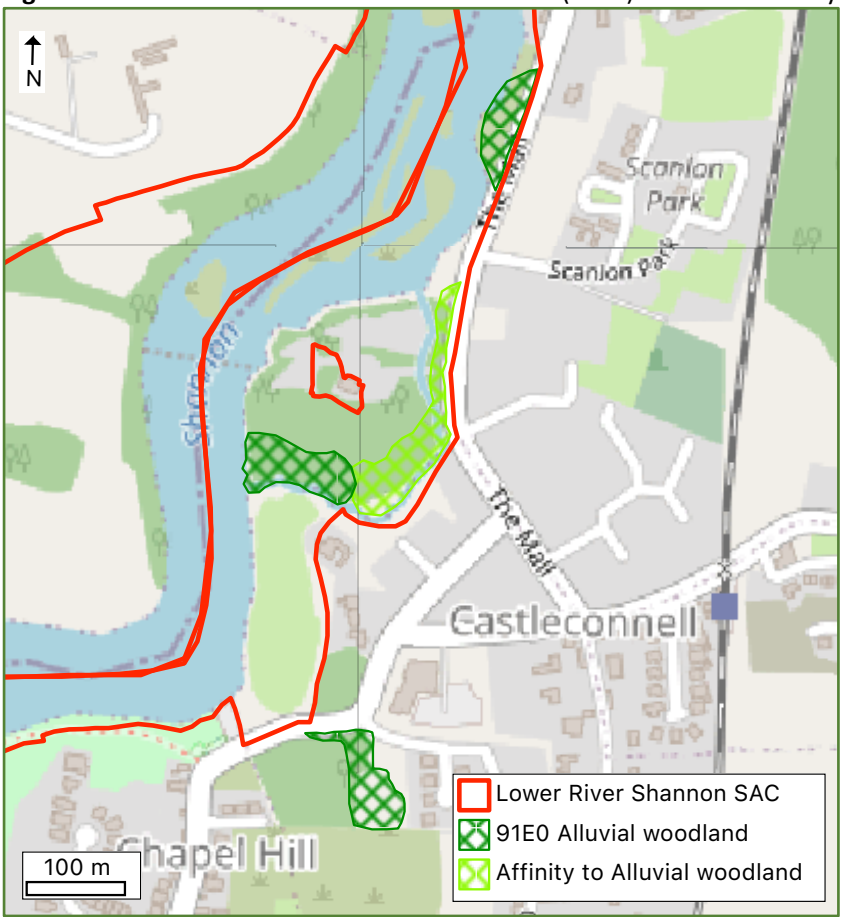
- Annex I habitat 'Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels' (Hydrophilous tall-herb fen) [6430]
- Annex I priority habitat 'Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)' (Alluvial woodland) [91E0]

The site was visited with JBA ecologist Hannah Mulcahy in mid-May 2022. Areas of potential Annex I (priority) habitat were surveyed by walk-over survey. Three areas of **Alluvial woodland (91E0)** were recorded. These are shown on Figure 1. These had a canopy and ground flora dominated by native species typical of alluvial woodland. A detailed 20m x 20m plot was recorded in the northern section (Photograph 1) and 16 positive indicator species for 91E0 were recorded (a minimum of 6 is required for this habitat to pass a condition assessment). In addition, one area of woodland was recorded that was considered to have 'affinity' to alluvial woodland (Figure 1, Photograph 2). This had a canopy dominated by non-native, non-alluvial woodland species (e.g. Sycamore *Acer pseudoplatanus* and Beech *Fagus sylvatica*), but the ground flora had a number of alluvial woodland positive indicator species. Although it is not considered to be an example of alluvial woodland, it is located within the SAC boundary and is sensitive wetland habitat.

Photograph 1. Annex I priority Alluvial woodland in the northern section of the survey area

Photograph 2. Woodland with affinity to 'Alluvial woodland' but with a canopy of non-native tree species

Figure 1.0. Location of Annex I alluvial woodland (91E0) within the survey area



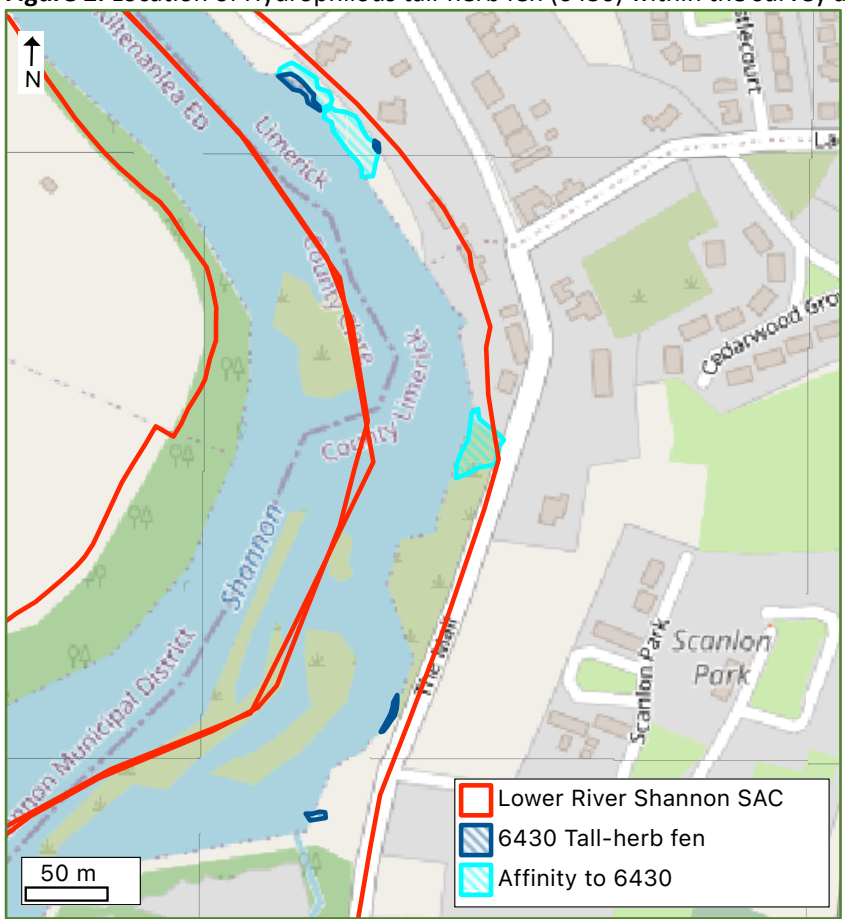
The River Shannon in the survey area frequently has areas of tall-herb swamp along the river margins. In some areas this is considered to be the Annex I habitat **Hydrophilous tall-herb fen (6430)** as it is dominated by positive indicator species for this habitat (Figure 2.0). These tend to be areas located directly adjacent to the river in low-lying areas with high water levels (e.g. Photograph 3). On slightly higher ground, where it is drier, Nettle *Urtica dioica* and Reed Canary-grass *Phalaris arundinacea* are dominant (e.g. Photograph 4). Positive indicator species for Hydrophilous tall-herb fen are present but not dominant. These areas, whilst having 'affinity' to 6430, are not considered to be examples of this Annex I habitat.

However, disturbance should be minimised as they are part of the overall riparian vegetation within the SAC and grade locally into Annex I Hydrophilous tall-herb fen and/ or Alluvial woodland.

Photograph 3. Annex I 'Hydrophilous tall-herb fen in the southern section of the survey area

Photograph 4. Tall-herb swamp with affinity to 'Hydrophilous tall-herb fen'

Figure 2. Location of Hydrophilous tall-herb fen (6430) within the survey area



Summary

- Three areas of Annex I priority Alluvial woodland (91E0) were recorded.
- One area of wet woodland with affinity to Alluvial woodland (91E0) were recorded.
- Four small areas of Hydrophilous tall-herb fen (6430) were recorded.
- Three areas of tall-herb swamp with affinity to Hydrophilous tall-herb fen (6430) were recorded. This habitat is more frequent than shown on Figure 2, as not all areas were mapped (e.g. if they were outside of the FRS direct zone of influence).
- GIS shapefiles of the areas of Annex I habitat (and areas with affinity to Annex I habitat) are included with this survey summary.
- A full survey report will be produced with the details of the survey and assessment for each Annex I/ Annex I priority habitat.

CASTLECONNELL FLOOD RELIEF SCHEME: ALLUVIAL WOODLAND HABITAT SURVEY

July 2022

Report produced by Denyer Ecology for:
JBA Consulting

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CONTENTS

1 INTRODUCTION

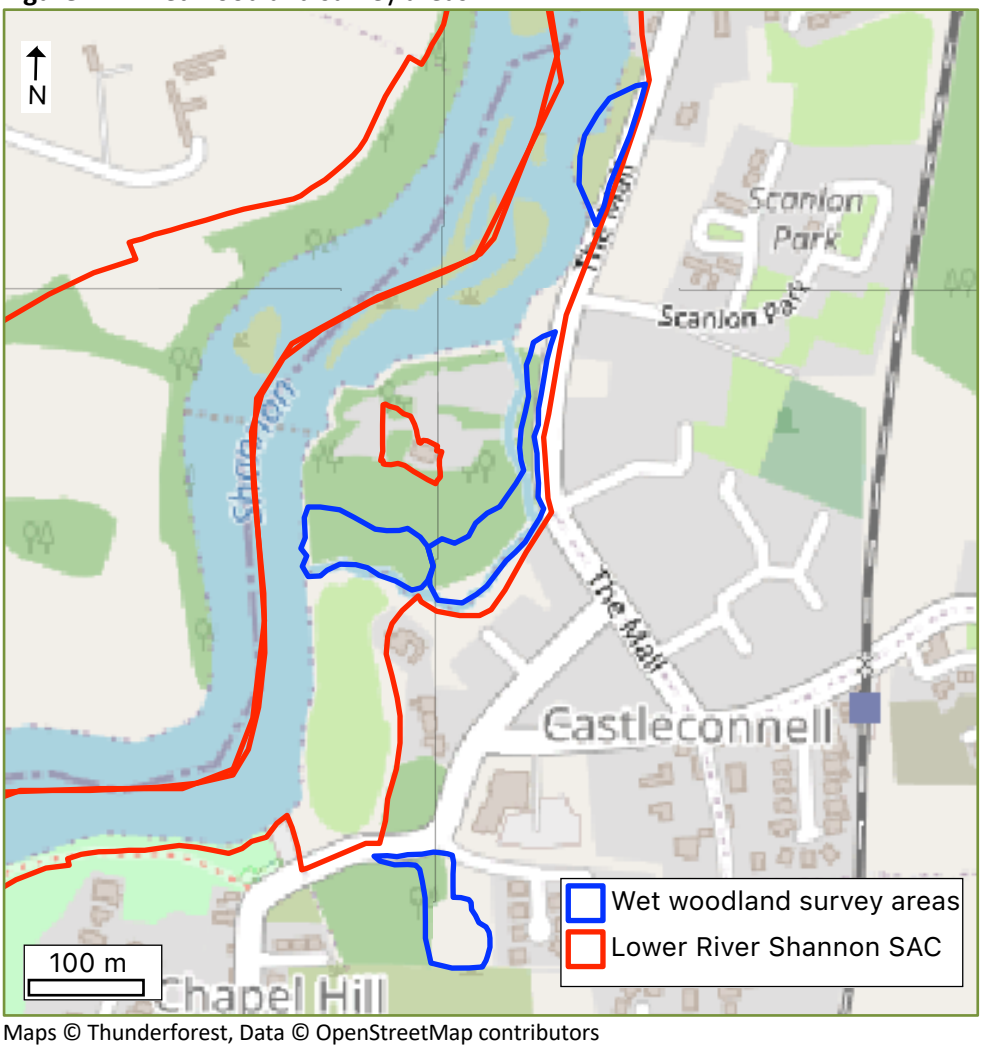
1.1 Background

Dr Joanne Denyer was commissioned by JBA Consulting to undertake a survey and assessment of potential Annex I wetland habitats in relation to the Castleconnel Flood Relief Scheme (FRS). Several areas of potential Annex I priority habitat 'Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)' (Alluvial woodland) [91E0] had been identified within the floodzone of the Lower River Shannon near Castleconnel. A number of these areas are located within the Lower River Shannon SAC boundary and Alluvial woodland is listed as a Qualifying Interest of this SAC. The aim of the survey was to assess these areas to determine if they are examples of this Annex I priority habitat and to map their extent.

1.2 Site

The survey area is shown in Figure 1.1. It comprises four small areas of wet woodland adjacent to the River Shannon. The site in the south (Figure 1.1) is located outside of the SAC boundary.

Figure 1.1. Wet woodland survey areas



Maps © Thunderforest, Data © OpenStreetMap contributors

2 METHODOLOGY

2.1 Desktop information

The following resources were consulted:

- GIS boundaries of designated site data (data accessed via NPWS website).
- *Conservation Objectives: Lower River Shannon SAC 002165*. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht (2012)
- Lower River Shannon SAC Site synopsis (Revision 13, 16.12.13)
- *Lower River Shannon SAC (site code 2165) Conservation objectives supporting document-woodland habitats* (Version 1, 2012)
- O'Neill, F.H. & Barron, S.J. (2013). Results of monitoring survey of old sessile oak woods and alluvial forests. *Irish Wildlife Manuals*, No. 71. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.
- Perrin, P. (2016*). Irish Vegetation Classification Technical Progress Report No. 2*. Unpublished report by BEC Consultants for the National Biodiversity Data Centre.
- Irish Vegetation Classification (accessed online https://biodiversityireland.ie/projects/ivc-classification-explorer/)
- Perrin, P., Martin, J., Barron, S., O'Neill, F., McNutt, K. & Delaney, A. (2008). *National Survey of Native Woodlands 2003-2008. Volume I – Main Report*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

2.2 Habitat survey

The areas of potential Annex I (priority) habitat were surveyed by walk-over survey by two experienced botanists (Dr Joanne Denyer and Hannah Mulcahy The woodland habitat types were classified using 'Guide to Habitats in Ireland' (Fossitt, 2000) and the Irish Vegetation Classification. Within each habitat dominant and abundant plant species, 91E0* indicator species and/or species of conservation interest were recorded.

2.3 Plant species nomenclature

Vascular plant nomenclature follows that of the *New Flora of the British Isles*. 4th Edition (Stace, 2019). The bryophyte nomenclature adopted by Blockeel et al. (2021) is used.

3 RESULTS

Three areas of Annex I priority **Alluvial woodland (91E0)** were recorded (Areas 2, 3 and 4; Figure 3.1). These had a canopy and ground flora dominated by native species typical of alluvial woodland. In addition, one area of woodland (Area 1; Figure 3.1) was considered to have 'affinity' to alluvial woodland, but had a canopy dominated by non-native, non-alluvial woodland species. The key features and Annex I assessment of the four woodland areas are shown in Tables 3.1 and 3.2.

Figure 3.1. Location of Annex I priority wet woodland areas

Table 3.1. Description of woodland areas and vegetation community

Woodland area	Photograph	Description	Fossitt Habitat level 3	IVC woodland type
1		An area of planted woodland in the grounds of a house. There is at least one stream channel within the woodland which discharges to the River Shannon. The canopy is dominated by non-native tree species Sycamore *Acer pseudoplatanus* and Beech *Fagus sylvatica,* which are not typical of 91E0. However, in some areas the ground flora has affinity to 91E0 alluvial woodland due to the proximity to the stream and probably winter flooding. Non-native species in ground flora include locally abundant Ground-elder *Aegopodium podagraria,* occasional Giant Hogweed Snowberry *Symphoricarpos albus* and Winter Heliotrope *Petasites fragrans.*	WD1 Mixed broadleaved woodland	Affinity to WL3c *Fraxinus excelsior – Iris pseudacorus* woodland, but with abundant *Fagus sylvatica* in canopy
2		This is a small area of woodland within the flood zone of the River Shannon. The canopy is dominated by Alder *Alnus glutinosa* and the non-native willow species White Willow *Salix alba*. Ash *Fraxinus excelsior* and Rusty willow *Salix cinerea* subsp. *oleifolia* are occasional and the hybrid *Salix* x *reichardtii* (Goat Willow *S. caprea* x Rusty Willow) was recorded. The ground flora is dominated by diverse wetland vegetation. In addition to the positive indicator species, the following are frequent: Hemlock Water-dropwort *Oenanthe crocata,* Great Willowherb *Epilobium hirsutum,* Water horsetail *Equisetum fluviatile*. Giant Hogweed *Heracleum mantegazzianum* is occasional.	WN5 Riparian woodland	WL3D *Salix cinerea – Urtica dioica* woodland, *Salix fragilis – Calystegia sepium* sub-community (WL3Di)

Woodland area	Photograph	Description	Fossitt Habitat level 3	IVC woodland type
3		A small area of woodland adjacent to a conifer plantation. This area is not adjacent to the river/ side channels (as for the other wet woodland areas) but has a typical wet woodland ground flora and is likely to be within the winter flood zone. The canopy is dominated by young Rusty Willow with Downy Birch *Betula pubescens.* The ground flora is dominated by 91E0 positive indicator species in most areas, but Pendulous sedge *Carex pendula* is also locally frequent.	WN6 Wet willow-alder-ash woodland	WL3E *Salix cinerea – Galium palustre* woodland
4		This area is located to the west of area 1. It is adjacent to the River Shannon and there is a river channel to the south which discharges into the River Shannon. This area was viewed from the south of this channel and partially accessed from the northern side. It was not possible to access the whole area due to the deep river channel and scrub. Whist non-native tree species are present (e.g. Sycamore and conifers), Alder and Ash are also locally frequent and the ground flora dominated by wet woodland species. The woodland grades into area 1 (WD1 Mixed broadleaved woodland) to the east and contains some areas of non-alluvial woodland.	WN6 Wet willow-alder-ash woodland/	WL3c *Fraxinus excelsior – Iris pseudacorus*

Table 3.2. Assessment of Annex I priority habitat features within woodland areas

Woodland area	91E0* positive indicator species	Number of 91E0 positive indicator species in 20m x 20m plot(s)[1]	Proportion of 91E0* target species in canopy[2]	Negative indicator species	Cover of negative species [3]	Annex I priority woodland 91E0*
1	**Target species:** *Alnus glutinosa, Fraxinus excelsior* **Other woody:** *Crataegus monogyna* **Herbs & ferns:** *Agrostis stolonifera, Carex remota, Filipendula ulmaria, Iris pseudacorus, Mentha aquatica, Ranunculus repens, Urtica dioica* **Mosses & liverworts:** n/a	5	<5%	**Non-native trees:** *Acer pseudoplatanus, Fagus sylvatica,* **Non-native shrubs:** *Symphoricarpos albus*	>60%	No
2	**Target species:** *Alnus glutinosa, Fraxinus excelsior, Salix cinerea, Salix alba, Salix* x *reichardtii, Salix viminalis* **Other woody:** n/a **Herbs & ferns:** *Agrostis stolonifera, Angelica sylvestris, Carex remota, Filipendula ulmaria, Galium palustre, Iris pseudacorus, Lycopus europaeus, Mentha aquatica, Phalaris arundinacea, Ranunculus repens, Rumex sanguineus, Urtica dioica* **Mosses & liverworts:** n/a	16	80%	**Non-native trees:** *Acer pseudoplatanus* **Non-native shrubs:** n/a	<1%	Yes
3	**Target species:** *Salix cinerea* **Other woody:** *Betula pubescens* **Herbs & ferns:** *Agrostis stolonifera, Angelica sylvestris, Carex remota, Filipendula ulmaria, Iris pseudacorus, Ranunculus repens, Rumex sanguineus, Urtica dioica* **Mosses & liverworts:** n/a	6	100%	**Non-native trees:** n/a **Non-native shrubs:** n/a	0%	Yes
4	**Target species:** *Alnus glutinosa, Fraxinus excelsior* **Other woody:** *Crataegus monogyna* **Herbs & ferns:** *Agrostis stolonifera, Angelica sylvestris, Carex remota, Filipendula ulmaria, Iris pseudacorus, Ranunculus repens, Rumex sanguineus, Urtica dioica* **Mosses & liverworts:** n/a	6	90% (where 91E0)	**Non-native trees:** *Acer pseudoplatanus,* conifers **Non-native shrubs:** n/a	5% (where 91E0)	Yes, but contains some areas of WD1 which is non-91E0

[1]Target for 91E0 is 6 species per 20m x 20m plot, including at least one target (canopy) species
[2]Target for 91E0 is ≥50% proportion of target species in the canopy
[3]Target for 91E0 is ≤10%

4 DISCUSSION AND SUMMARY

Three areas of Annex I priority alluvial woodland [91E0*] were recorded (Figure 3.1, Tables 3.1 and 3.2).

- Area 2: Riparian woodland, WL3D *Salix cinerea – Urtica dioica* woodland, *Salix fragilis – Calystegia sepium* sub-community (WL3Di)
- Area 3: WN6 Wet willow-alder-ash woodland; WL3E *Salix cinerea – Galium palustre* woodland
- Area 4: WN6 Wet willow-alder-ash woodland; WL3c *Fraxinus excelsior – Iris pseudacorus* woodland

Information on wet woodland within the SAC (SAC site synopsis and *Conservation objectives supporting document- woodland habitats* (see Section 2.1) state that the two main types of wet woodland within the SAC are:

- Gallery woodland (*Salicion albae*) dominated by White Willow and Alder and occurring in small narrow stands on riverbanks (e.g., area 2); and,
- Wet willow-alder-ash woodland dominated by Alder and Rusty Willow with Ash and occurring in valley bottoms and slopes (e.g., areas 3 and 4).

It is noted that Sycamore is the principal invasive alien tree species present, and that Giant Hogweed is frequent.

This is consistent with the three areas of wet woodland recorded and mapped during this survey, within and adjacent to the Lower River Shannon SAC.

REFERENCES

Blockeel, T.L., Bell, N.E., Hill, M.O., Hodgetts, N.G., Long, D.G., Pilkington, S.L. and Rothero, S.L. (2021). A new checklist of the bryophytes of Britain and Ireland, 2020, Journal of Bryology, Journal of Bryology, 43:1, 1-51.

Fossitt, J.A. (2000). *A guide to habitats in Ireland.* Heritage Council.

Hill, M.O., Blackstock, T. H., Long, D.G, Rothero G.P. (2008) *A checklist and census catalogue of British and Irish Bryophytes*. British Bryological Society.

NPWS (2013). *Lower River Shannon SAC Site synopsis* (Revision 13, 16.12.13)

NPWS (2012). *Lower River Shannon SAC (site code 2165) Conservation objectives supporting document- woodland habitats* (Version 1, 2012)

O'Neill, F.H. & Barron, S.J. (2013). Results of monitoring survey of old sessile oak woods and alluvial forests. Irish Wildlife Manuals, No. 71. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Perrin, P. (2016). Irish Vegetation Classification Technical Progress Report No. 2. Unpublished report by BEC Consultants for the National Biodiversity Data Centre.

Perrin, P., Martin, J., Barron, S., O'Neill, F., McNutt, K. & Delaney, A. (2008). National Survey of Native Woodlands 2003-2008. Volume I – Main Report. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Stace, C.A. (2019). *New Flora of the British Isles.* 4th Edition. C&M Floristics, Stowmarket, UK.

CASTLECONNELL FLOOD RELIEF SCHEME:
TALL-HERB SWAMP HABITAT SURVEY

July 2022

Report produced by Denyer Ecology for:
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CONTENTS

1 INTRODUCTION

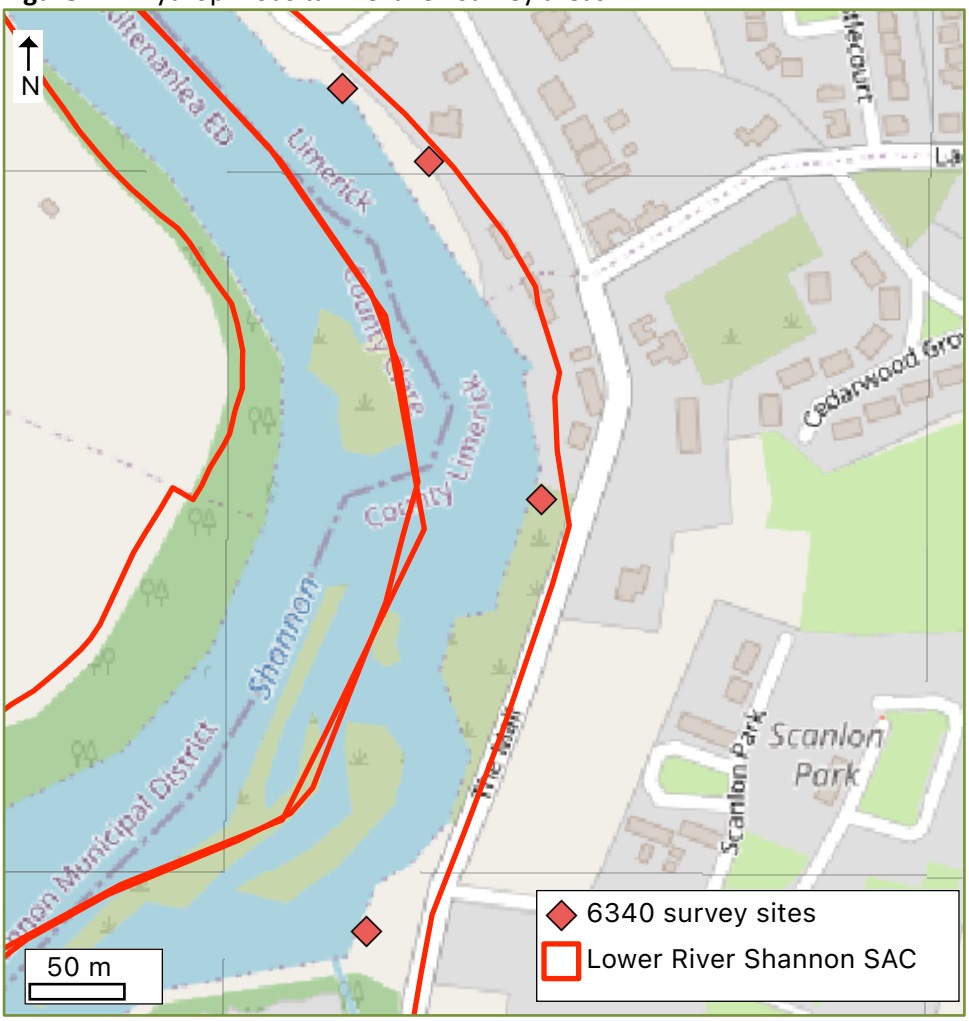
1.1 Background

Dr Joanne Denyer was commissioned by JBA Consulting to undertake a survey and assessment of potential Annex I wetland habitats in relation to the Castleconnel Flood Relief Scheme (FRS). Several areas of potential Annex I habitat 'Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels)' (Hydrophilous tall-herb fen) [6430] had been identified adjacent to the Lower River Shannon near Castleconnel. These areas are located within the Lower River Shannon SAC boundary. This Annex I habitat is not (currently) listed as a Qualifying Interest of this SAC. The aim of the survey was to assess these areas to determine if they are examples of this Annex I habitat and to map their extent.

1.2 Site

The survey area is shown in Figure 1.1. It comprises four sections of riparian vegetation adjacent to the River Shannon within the SAC boundary.

Figure 1.1. Hydrophilous tall-herb fen survey areas



Maps © Thunderforest, Data © OpenStreetMap contributors

2 METHODOLOGY

2.1 Desktop information

The following resources were consulted:

- GIS boundaries of designated site data (data accessed via NPWS website).
- *Conservation Objectives: Lower River Shannon SAC 002165*. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht (2012)
- Lower River Shannon SAC Site synopsis (Revision 13, 16.12.13)
- Lower River Shannon SAC (site code 2165) *Conservation objectives supporting document-woodland habitats* (Version 1, 2012)
- O'Neill, F.H., Martin, J.R., Devaney, F.M. & Perrin, P.M. (2013) The Irish semi-natural grasslands survey 2007-2012. *Irish Wildlife Manuals*, No. 78. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.
- Perrin, P. (2016*). Irish Vegetation Classification Technical Progress Reports No.1-7*. Unpublished report by BEC Consultants for the National Biodiversity Data Centre.
- Irish Vegetation Classification (accessed online https://biodiversityireland.ie/projects/ivc-classification-explorer/)

2.2 Consultation

The NPWS grassland specialist was consulted in relation to the latest definition of Hydrophilous tall-herb fen in Ireland. A national survey is currently being undertaken of this habitat and it is likely that the definition and positive indicator species list will be updated in the future.

2.3 Habitat survey

The areas of potential Annex I (priority) wetland habitat were surveyed by walk-over survey by two experienced botanists (Dr Joanne Denyer and Hannah Mulcahy The vegetation and habitat types were classified using 'Guide to Habitats in Ireland' (Fossitt, 2000) and the Irish Vegetation Classification. Within each habitat dominant and abundant plant species, 6430 indicator species and/or species of conservation interest were recorded.

2.4 Plant species nomenclature

Vascular plant nomenclature follows that of the *New Flora of the British Isles*. 4th Edition (Stace, 2019). The bryophyte nomenclature adopted by Blockeel et al. (2021) is used.

3 RESULTS

Four areas of Annex I Hydrophilous tall-herb fen (Figure 3.1) were identified. In addition there were three areas that had some affinity to Annex I Hydrophilous tall-herb fen, but did not have sufficient cover or number of positive indicator species. The key features and Annex I assessment of the seven wetland areas are shown in Tables 3.1 and 3.2.

Figure 3.1a. Location of areas of Hydrophilous tall-herb fen and similar habitat (southern area)

Figure 3.1b. Location of areas of Hydrophilous tall-herb fen and similar habitat (northern area)

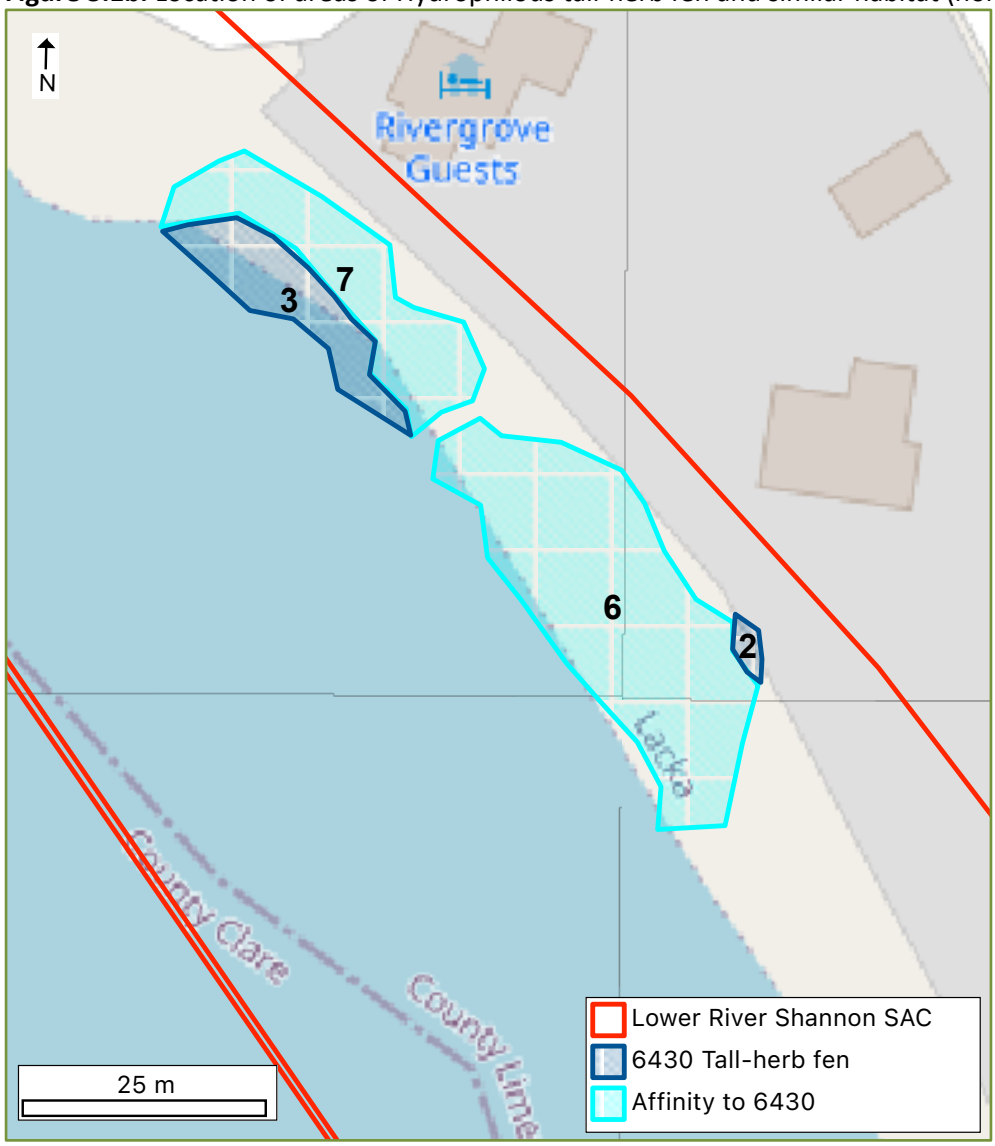


Table 3.1. Description of woodland areas and vegetation community

Wetland area	Photograph	Description	Fossitt Habitat level 3	IVC
1		A small strip of vegetation where a side channel meets the main river. There is a wall to the south and east. A small area is forb dominated. To the east it is drier and Nettle *Urtica dioica* becomes dominant. The main species present are Great Willowherb *Epilobium hirsutum,* Hemlock Water-dropwort *Oenanthe crocata,* Angelica *Angelica sylvestris,* Water Mint *Mentha aquatica,* Marsh Marigold *Caltha palustris,* Hemp-agrimony *Eupatorium cannabinum,* Meadowsweet *Filipendula ulmaria,* Yellow Flag *Iris pseudacorus* and Nettle.	FS2 Tall-herb swamps	FW3F *Filipendula ulmaria – Valeriana officinalis* tall-herb swamp (although *Phragmites australis* rare)
2		A small area of vegetation adjacent to the wall of a property to the east (indicated by red arrow). There is a ditch in this location and this small section of vegetation is wetter than adjacent areas, which are Nettle and Reed Canary-grass *Phalaris arundinacea* dominated. The small area of 6430 is forb dominated with Water Mint, Angelica, Marsh Marigold, Great Willowherb, Meadowsweet, Water Horsetail, Hemlock Water-dropwort, Water Figwort *Scrophularia auriculata,* Tufted Vetch *Vicia cracca* and Reed Canary-grass.	FS2 Tall-herb swamps	FW3F *Filipendula ulmaria – Valeriana officinalis* tall-herb swamp (although *Phragmites australis* rare)

Wetland area	Photograph	Description	Fossitt Habitat level 3	IVC
3		An area of wetland vegetation at the edge of the River Shannon and partially submerged. To the east the ground rises (right of the photo) and Nettle becomes dominant. In the wetland area Water Horsetail is abundant with Bur-reed *Sparganium* sp. (not flowering). Where these are dominant it could be classified as Reed and large sedge swamp. However forbs are locally abundant with Water Mint, Hemlock Water-dropwort, Great Willowherb and other wetland species.	FS1 Reed and large sedge swamps/ FS2 Tall-herb swamps	Affinity with both FW3G *Equisetum fluviatile – Eleocharis palustris* swamp and FW3F *Filipendula ulmaria – Valeriana officinalis* tall-herb swamp
4		Strip of wetland vegetation between the River Shannon to the west, a wall to the east and area of wet woodland to the north. This area is forb dominated and the vegetation is similar to that found in the ground flora of the wet woodland area. Species present include Great Willowherb, Hedge Bindweed *Calystegia sepium,* Tufted Vetch *Vicia cracca,* Water Horsetail *Equisetum fluviatile,* Hemlock Water-dropwort, Water Mint, Reed Canary-grass and Nettle.	FS2 Tall-herb swamps	FW3F *Filipendula ulmaria – Valeriana officinalis* tall-herb swamp (although *Phragmites australis* rare)

Wetland area	Photograph	Description	Fossitt Habitat level 3	IVC
5		An area of riparian vegetation to the north of a wet woodland area (which divides this section from area 4). The River Shannon lies to the west and a wall to the east and north. The vegetation has species typical of 6430, but Nettle and Reed Canary-grass are dominant and it is species-poor overall. Additional species include Hedge Bindweed, Yellow Flag, Water Horsetail and Hemlock Water-dropwort.	FS2 Tall-herb swamps	FW3F *Filipendula ulmaria – Valeriana officinalis* tall-herb swamp (although *Phragmites australis* rare)
6		A large area of Nettle dominated vegetation between property walls to the east and the River Shannon to the west. This area occupies slightly higher ground and is above the summer level of the river. Nettle is dominant over most of the area, with Reed Canary-grass, except where it grades into the wet ditch (area 2) closer to the wall to the SE. Other wetland species such as Great Willowherb, Water Mint, Hemlock Water-dropwort and Water Figwort are present but of low frequency and cover.	FS2 Tall-herb swamps	FW3F *Filipendula ulmaria – Valeriana officinalis* tall-herb swamp (although *Phragmites australis* rare)

Wetland area	Photograph	Description	Fossitt Habitat level 3	IVC
7		A large area of Nettle dominated vegetation between property walls to the east and the River Shannon to the west (similar to area 6). Giant Hogweed *Heracleum mantegazzianum* is present occasionally. This area occupies slightly higher ground and is above the summer level of the river. Nettle is dominant over most of the area, with Reed Canary-grass, except where it grades into wetter areas at the river edge (area 3). Other wetland species such as Great Willowherb, Water Mint, Hemlock Water-dropwort, Tufted Vetch, Hedge Bindweed are present but of low frequency and cover. In the northern area, to the east (nearest the wall) the vegetation becomes drier with Bramble *Rubus fruticosus* agg. and dumped hedge cuttings.	FS2 Tall-herb swamps	FW3F *Filipendula ulmaria – Valeriana officinalis* tall-herb swamp (although *Phragmites australis* rare)

Table 3.2. Assessment of Annex I habitat features within wetland areas

Woodland area	6430 positive indicator species	Number of 91E0 positive indicator species in 2m x 2m plot[1]	Proportion of 6430 target species in sward[2]	Negative indicator species	Cover of negative species[3]	Annex I priority tall-herb fen 6430
1	*Angelica sylvestris, Epilobium hirsutum, Eupatorium cannabinum, Filipendula ulmaria, Iris pseudacorus Mentha aquatica*	4-5	40%	*Phalaris arundinacea*	<10%	Yes
2	*Angelica sylvestris, Epilobium hirsutum, Equisetum fluviatile, Eupatorium cannabinum, Filipendula ulmaria, Iris pseudacorus Mentha aquatica, Vicia cracca*	4-5	50%	*Phalaris arundinacea*	<10%	Yes
3	*Epilobium hirsutum, Equisetum fluviatile, Mentha aquatica*	3-4	60%	*Phalaris arundinacea*	<5%	Yes
4	*Calystegia sepium, Epilobium hirsutum, Equisetum fluviatile, Mentha aquatica, Vicia cracca*	3-4	40%	*Phalaris arundinacea*	<20%	Yes
5	*Calystegia sepium, Equisetum fluviatile, Iris pseudacorus*	2	5%	*Phalaris arundinacea*	>60%	No
6	*Epilobium hirsutum, Mentha aquatica*	1-2	5-10%	*Phalaris arundinacea*	5-10%	No

Woodland area	6430 positive indicator species	Number of 91E0 positive indicator species in 2m x 2m plot[1]	Proportion of 6430 target species in sward[2]	Negative indicator species	Cover of negative species[3]	Annex I priority tall-herb fen 6430
7	*Calystegia sepium, Epilobium hirsutum, Mentha aquatica, Vicia cracca*	1-2	5%	*Phalaris arundinacea*	5-50%	No

[1]Target for 6430is ≥3 species per 2m x 2m plot. Tufted Vetch has been added to the indicator list (NPWS, pers. comm.)

[2]Target for 6430 is ≥40% proportion of positive indicator species in the sward

[3]Target for 6430 is ≤33% collective cover. Nettle is not currently a negative indicator species (but does reduce the proportion of positive indicator species).

4 DISCUSSION AND SUMMARY

Four areas of Annex I Hydrophilous tall-herb fen [6430] were recorded (Figure 3.1, Tables 3.1 and 3.2).

- Area 1: FS2 Tall-herb swamps; most affinity with FW3F *Filipendula ulmaria – Valeriana officinalis* tall-herb swamp (although *Phragmites australis* rare)
- Area 2: FS2 Tall-herb swamps, most affinity with FW3F *Filipendula ulmaria – Valeriana officinalis* tall-herb swamp (although *Phragmites australis* rare)
- Area 3: FS1 Reed and large sedge swamps/ FS2 Tall-herb swamps; affinity with both FW3G *Equisetum fluviatile – Eleocharis palustris* swamp and FW3F *Filipendula ulmaria – Valeriana officinalis* tall-herb swamp
- Area 4: FS2 Tall-herb swamps, most affinity with FW3F *Filipendula ulmaria – Valeriana officinalis* tall-herb swamp (although *Phragmites australis* rare)

Three additional areas had similar vegetation but Nettle and/ or Reed Canary-grass were dominant. These are not examples of Annex I Hydrophilous tall-herb fen [6430] as they do not have 3 positive indicator species per 2m x 2m area and positive indicator species are not 40% cover or over. These tend to occupy area that are slightly elevated above the river level and therefore drier. All areas (Annex and non-Annex) are located within the Lower River Shannon SAC.

REFERENCES

Blockeel, T.L., Bell, N.E., Hill, M.O., Hodgetts, N.G., Long, D.G., Pilkington, S.L. and Rothero, S.L. (2021). A new checklist of the bryophytes of Britain and Ireland, 2020, Journal of Bryology, Journal of Bryology, 43:1, 1-51.

Fossitt, J.A. (2000). *A guide to habitats in Ireland.* Heritage Council.

Hill, M.O., Blackstock, T. H., Long, D.G, Rothero G.P. (2008) *A checklist and census catalogue of British and Irish Bryophytes*. British Bryological Society.

NPWS (2013). *Lower River Shannon SAC Site synopsis* (Revision 13, 16.12.13)

NPWS (2012). *Lower River Shannon SAC (site code 2165) Conservation objectives supporting document- woodland habitats* (Version 1, 2012)

O'Neill, F.H. & Barron, S.J. (2013). Results of monitoring survey of old sessile oak woods and alluvial forests. Irish Wildlife Manuals, No. 71. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Perrin, P. (2016). Irish Vegetation Classification Technical Progress Report No. 2. Unpublished report by BEC Consultants for the National Biodiversity Data Centre.

Perrin, P., Martin, J., Barron, S., O'Neill, F., McNutt, K. & Delaney, A. (2008). National Survey of Native Woodlands 2003-2008. Volume I – Main Report. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Stace, C.A. (2019). *New Flora of the British Isles.* 4th Edition. C&M Floristics, Stowmarket, UK.

8.3 Bird Survey results

This appendix contains data collected during the bird surveys carried out within the footprint of the scheme. Records of bird data are collected and collated from specific wintering bird surveys, breeding bird surveys, records collected during nonspecific site visits, bird recorded on camera traps, as well as data collected by local residents from sound and observation surveys, and other casual records.

8.3.1 Wintering bird surveys

The wintering bird surveys recorded 30 species, with a mix of common woodland and garden bird species, as well as designated species (Table 2 1). Two species listed as Qualifying Interests of the River Shannon and River Fergus Estuaries SPA, Cormorant *Phalacrocorax carbo*, Black-headed Gull *Chroicocephalus ridibundus* and five species listed in the Annexes of the Birds Directives, Cormorant *Phalacrocorax carbo*, Mallard *Anas platyrhynchos*, Greylag Goose *Anser anser*, Kingfisher *Alcedo atthis* and Black-headed Gull *Chroicocephalus ridibundus* were also recorded.

Figure 8-1 Vantage points for wintering bird survey in 2019-2020 and 2024

Wintering bird Survey 1 – Island House VP

Date of Survey 14/11/2019

Surveyor Hannah Mulcahy

Survey start 8.30am Survey end 10am

Weather Clear, cold, bright Temp 3-4 degrees wind 4-5 beaumont

Species	No.	Time	behaviour	location/direction
Cormorant	1	before survey began	fly over	down river
Mallard (male)	1	before survey began	foraging	down river
Greylag Goose	2	8.34	foraging, resting, swimming	down river
Mute Swan	1	8.34	swim	down river
Mallard (male)	1	8.4	fly over	up river
Magpie	1	8.45	fly over	to field to east
Collared Dove	1	8.49	fly over	down river
Mallard	2	8.55	resting	down river
Jackdaw	2	8.55	fly over	to field to east
Mute Swan	2	9	foraging, swimming	up river
Cormorant	1	9.01	fly over	down river
Wood Pigeon	1	9.01	fly over	up river
Hooded Crow	1	9.12	fly over	down river
Kingfisher	1	9.16	fly over, close to water	down river
Chaffinch (female)	1	9.2	moving from tree to tree	up river, stayed by left bank
Grey Wagtail	1	9.23	fly over	down island house stream
Rook	1	9.4	fly over	up river

Wintering bird Survey 1 -Ferry Playground VP

Date of Survey 14/11/2019

Surveyor Colm O'Leary

Survey start 8.30am Survey end 10am

Weather Clear, cold, bright Temp 3-4 degrees wind 4-5 beaumont

Species	No.	Time	behaviour	location/direction
Mute Swan	2	8.35	feeding	centre of river
Cormorant	1	8.36	basking	up river
Mallard	5		fly over	down river
Black-headed Gull	3		fly over	
Mallard	3	8.47	swimming	right bank
Grey Heron	1		foraging	right bank
Grey Heron	2		foraging	right bank
Grey Heron	1		foraging	down river
Black-headed Gull	8	9.01	resting	right bank
Black-headed Gull	1		fly over	down river
Mallard	2		fly over	down river
Small black-head diver no ID	1	9.2	fly over	down river

Mallard	3		swimming	across river
Cormorant	1		foraging	centre of river
Black-headed Gull	1	9.32	fly over	down river
Black-headed Gull	5		fly over	down river
Mute Swan	1		fly over	down river
Black-headed Gull	7		fly over	up river
Cormorant	1		fly over	down river
Mallard	2	10	foraging	down river

Wintering bird Survey 2 -Ferry Playground VP

Date of Survey 17/12/2019

Surveyor Hannah Mulcahy

Survey start 8.30am Survey end 10am

Weather Clear, cold, bright, Temp 1-2 degrees, no wind

Species	No.	Time	behaviour
Black-headed Gull	15	8.40am	flying
Grey Heron	1		hunting
Mute Swan	2		foraging
Mallard	2		swimming
Wren	1		foraging
Robin	1		foraging
Blackbird	4		foraging
Greylag Goose	2		swimming/flying
Mallard	2		swimming
Rook	4		roosting
Wood Pigeon	2		roosting
Greylag Goose	4	9am	swimming/flying
Mallard	5	9.15am	swimming
Grey Heron	1	9.30am	hunting/flying
Goldfinch	2		foraging
Blue Tit	2		foraging
Great Tit	2		foraging
Cormorant	2	9.40am	flying
Moorhen	1		swimming
Song Thrush	1		forgaing
Wagtail	1		forgaing
Grey Wagtail	1		forgaing
Cormorant	1	9.58am	flying
Grey Heron	1		hunting/flying
Treecreeper	2	10am	foraging

Wintering bird Survey 2 -Island House entrance VP

Date of Survey 17/12/2019

Surveyor Colm O'Leary

Survey start 8.30am Survey end 10am

Weather Clear, cold, bright Temp 1-2 degrees wind no wind

Species	No.	Time	behaviour	location/direction
Mallard	3	8.54		
Grey Heron	1	8.54	flying	downstream
Greylag Goose	2	8.54	swimming	north of IH
Mallard	1	9.04	swimming	
Mallard	3	9.26	swimming	
Black-headed Gull	1	9.26	flying	north of IH
Black-headed Gull	1	9.29	flying	
Cormorant	1	9.31	flying	downstream
Grey Heron	1	9.33	flying	upstream
Grey Heron	1	9.34	flying	downstream
Cormorant	1	9.34	flying	downstream
Mute Swan	1	9.43	foraging	
Mallard	1	9.53	swimming	downstream

Wintering bird Survey 3 -Ferry Playground VP

Date of Survey 15.01.2020

Surveyor Colm O'Leary

Survey start 8.30am Survey end 10am

Weather Clear, cold, bright Temp 4 degrees wind small breeze

Species	No.	Time	behaviour	location/direction
Mute Swan	2	8.35	feeding	
Greylag Goose	2		feeding	
Mallard	4		feeding	
Black-headed Gull	17		feeding	
Grey Heron	1	8.37	feeding	opp. Bank
Mallard	2		swimming	
Kingfisher	1	8.38	perched by car park	
Grey Heron	1	8.43	feeding	near bank
Mallard	12	8.47	swimming	upstream
Moorhen	1		flying	downstream
Greylag Goose	5	8.52	flying	upstream
Cormorant	1		flying	downstream
Greylag Goose	56	8.57	flying, landing on water	
Mallard	2		flying	upstream
Greylag Goose	3	9am	flying	downstream
Mute Swan	1		flying	downstream
Mallard	2	9.05	swimming	upstream
Mallard	3		swimming	downstream
Black-headed Gull	1	9.14	swimming	

Black-headed Gull	4		swimming	
Black-headed Gull	2	9.22	swimming	
Greylag Goose	2	9.26	swimming	
Mallard	2	9.29	swimming	
Cormorant	1		flying	downstream
Greylag Goose	1		flying	
Greylag Goose	3	9.31	flying	upstream
Cormorant	1		flying	upstream
Cormorant	1		flying	downstream
Greylag Goose	8	9.37	flying	
Mallard	1		flying	downstream
Greylag Goose	2	9.45	flying	upstream
Cormorant	1	9.45	flying	downstream
Cormorant	1	9.55	flying	upstream

Wintering bird Survey 3 -Island House entrance VP

Date of Survey 15.01.2020

Surveyor Hannah Mulcahy

Survey start 8.30am Survey end 10am

Weather Clear, cold, bright Temp 4 degrees wind no wind

Species	No.	Time	behaviour	location/direction
Mallard	7	8.4	took flight from water, flushed by surveyor	downriver
Grey Heron	2		circling above river, calling	downriver
Greylag Goose	3	8.55	foraging	near eelery houses
Moorhen	1		foraging	near eelery houses
Greylag Goose	10	8.57	flying in a flock	upriver
Mute Swan	4	9am	foraging	upriver
Greylag Goose	1		flying	downriver
Mallard	3		swimming	downriver
Black-headed Gull	1	9.05	flying	downriver
Mallard	4	9.07	flying/ landing	downriver, behind island
Grey Wagtail	1	9.15	foraging edge of water	
Grey Heron	1	9.2	flying	upriver
Cormorant	1	9.28	flying	downriver
Greylag Goose	2	9.31	flying	upriver
Cormorant	1	9.35	flying	downriver

Wintering bird Survey 4 -Island House entrance VP

Date of Survey 13.02.2020

Surveyor Colm O'Leary

Survey start 07:55 Survey end 09:20

Weather Cold, Clear sky, River in flood, Temp 5, wind low

Species	No.	Time	behaviour	location/direction
Grey Heron	1	08:02		In Island house garden
Moorhen	1	08:04	Flying	Downstream
Otter	1	08:08	Swimming	Downstream
Black-headed Gull	2	08:10	Flying	Downstream
Black-headed Gull	16	08:11	Flying	Downstream
Mallard	2	08:19	Feeding	In reed bed just north of Islandhouse
Grey Heron	1	08:27	Flying	Upstream
Mallard	4	08:30	Flying	Downstream
Grey Heron	1	08:32	Flying	Carrying nest material. Possible nest somewhere near Island House
Grey Wagtail	1	08:35		
Grey Heron	1	08:38	Flying	Carrying nest material.
Little Egret	1	08:54	Flying	Downstream
Grey Heron	1	08:55	Flying	Downstream
Grey Heron	1	08:56	Flying	Upstream
Grey Heron	1	09:00	Flying	Downstream
Mallard	2	09:03	Feeding	
Mallard	1	09:10	Feeding	
Greylag Geese	3	09:11	Flying	Downstream
Mallard	2	09:13	Feeding	In alluvial woodland along road

Wintering bird Survey 4 -Ferry Playground VP

Date of Survey 13.02.2020

Surveyor Joe Freijser

Survey start 07:45 Survey end 09:19

Weather Clear, Sunny Temp 5 wind none

Species	No.	Time	behaviour	location/direction
Mute Swan	2	07:45	Feeding	NW parking
Black-headed Gull	1	07:48	Flying	NW parking
Mallard	2	07:59	Swimming	NW parking
Grey Heron	1	08:07	Flying	west
Mallard	1	08:08	Swimming	NE parking
Dipper	1	08:19	Perching	Under bridge
Dipper	1	08:25	Feeding	Middle of river under bridge
Dipper	2	08:30	Flying	100m ahead of bridge, flying west
Greylag Goose	2	08:36	Foraging	on r-bank opposite playground
Moorhen	1	08:37	Swimming	on r-bank opposite playground
Black-headed Gull	1	08:45	Swimming	on r-bank opposite playground
Tree Sparrow	~50	08:46	Feeding	On floating debris next to park
Long-tailed Tit	1	08:50		

Grey Heron	1	08:54	Flying	East, North of park
Black-headed Gull	2	09:06	Sitting	on bank playground
Mallard	2	09:08	Flying	
Greylag Goose		09:08		on water
Mute Swan		09:08		on water

Wintering bird Survey 5

Date of Survey 11.03.2020

Surveyor Colm O'Leary & Hannah Mulcahy

Location Island House, Tom Maher's Pub carpark, and Ferry playground

Survey start 07:10 Survey end 08:30

Weather Drizzle, some wind, River in flood but receding and flowing fast. Temp 7 wind 03-Jan

NOTE: The river and survey areas were in flood conditions, and as such this survey was not carried out in the usual VPs

VP Survey from island house to Mall house.

Species	No.	Time	behaviour	location/direction
Heron	1	07:19	flying with twig	to island house
Treecreeper	1	07:19	foraging on tree	
Greylag goose	2	07:24	swimming	in flooding alder woodland (current is strong)
Greylag goose	2	07:26	resting on bank by flood water next to	mall house

VP Survey at Ferry Playground and downriver to bridge

Species	No.	Time	behaviour	location/direction
Greylag goose	2	07:37	grazing on bank by flood water next to	playground carpark
Greylag goose	2	07:37	grazing on bank by flood water next to	opposite bank from carpark
Greylag goose	2	07:37	flying downriver	
Greylag goose	2	07:40	flying upriver	
Heron	1	07:40	flying to trees behind castle	
Black headed gull	1	07:44	resting at ferry playground	
Cormorant	1	07:45	flying low upriver	
Black headed gull	25	07:46	flying high downriver	
Greylag goose	4	07:46	flying upriver and landing to avoid rapids	
Black headed gull	39	07:47	flying high downriver	
Cormorant	1	07:47	flying low upriver	
Greylag goose	2	07:50	flying upriver and landing to avoid rapids	

Survey of heronry on island house trees from Tom Mahers pub carpark from 8.10-8.30am

Species	No.	Time	Comment
Heron	3	08:10	three active nests observed being built in two conifers and a beech R 66087 62687
sparrowhawk	1	08:20	flying through trees in same area, maybe hunting or possibly nesting.

Wintering bird Survey 6 – VP Ferry playground to footbridge

Updated surveys in 2024 to supplement data

Date of Survey 16.01.2024

Surveyor Hannah Mulcahy

Survey start 8.40am Survey end 10.30am

Weather calm, no wind, clear, Temp minus 3c

Species	No.	Time	behaviour
Ferry Playground			
Blackheaded Gull	6	08:40	Flying and resting
Jackdaw	1	08:41	Next to stradbaly stream
Redwing	1	08:42	Flying north
Bluetit	1	08:43	In trees
Heron	2	08:44	Flying towards Island House
Song Thrush	1	08:45	In trees
Chaffinch	1	08:46	In trees
Mallard	3	08:47	By Stradbally stream
Great tit	1	08:48	in trees
Mute Swan	3	08:49	Upstream foraging by islands
Rook	1	08:50	in trees
Mute swan	2	09:11	swans swam over to left bank
Heron	2	09:12	1 heron landed on right bank and then both took off to island house
Greenfinch	1	09:13	in trees
Chaffinch	1	09:14	in trees
Song thrush	1	09:15	in trees
Mallard	3	09:16	flying upstream
Blackheaded gull	11	09:17	gathering around ferry playground
Goldfinch	10	09:18	large flock on right bank in trees
Wren	1	09:19	
Mallard	3	09:20	
Kingfisher	1	09:30	Flying up Stradbally stream, possibly roosting under or near road bridge
Cormorant	2	10:30	resting on weirs
Footbridge additional species			
Mallard	8	08:51	feeding around weirs
Greylag goose	35	08:52	resting on weirs, confluence of small stream on right bank

Dipper	2	08:53	at bridge, on weirs
Grey wagtail	1	08:54	at bridge, on weirs
Chaffinch	1	08:55	In trees
Starling	1	08:56	In trees
Goldfinch	1	08:57	In trees
Mute Swan	2	08:58	feeding on right bank

Wintering bird Survey 6 – Island House and Mall Road VP

Updated surveys in 2024 to supplement data

Date of Survey 16.01.2024

Surveyor Dominic Tilley

Survey start 8.40am Survey end 10.30am

Weather calm, no wind, clear, Temp minus 3c

Species	No.	Time	behaviour
Island House entrance – Mall Road			
Moorhen	1	08:40	foraging
Greylag	4		roosting
Lotti	6		foraging
Mallard	4		foraging
Chaffinch	6		foraging
Grey wagtail	1		on weir
Fieldfare	5		island house trees
Chaffinch	3		on island
Pied wagtail	1	08:50	flying west
Mallard	3		foraging
Greylag	3		flew in from south, circled and flew back south
Mute swan	2	09:17	flying north
Greylag	2	09:30	flying south
Tom Maher Pub			
Redwing	50	09:40	in tree tops
Heron			in heron tree
Heron			in beech
Rivergrove B&B			
Mallard	2	10:20	
Swan	3		1 juvenile foraging

Wintering bird Survey 7– Updated surveys in 2024 to supplement data

Date of Survey 23.02.2024

Surveyor Hannah Mulcahy

Survey start 7.40am Survey end 9.30am

Weather calm, slight wind, drizzle. River was in flood condition- Temp 3 degrees

NOTE: River in flood conditions, fast moving, flooded islands and alluvial woodland. Instream islands flooded and birds not able to roost. Some birds such as Greylags and Mallards are resting and foraging in Stormont House wet meadows.

Species	No.	Time	Behaviour / location
Island House / Mall Road			
Blackbird	1	07:40	
Jackdaw	1	07:40	flying over
Herons	1	07:44	
Wood pigeon	1	07:45	calling in heron tree
Mute swan	1	07:46	
Moorhen	1	07:46	in alluvial woodland and amongst island in centre of the channel
Wren	1	07:47	
Chaffinch	1	07:50	
Ferry Playground			
Mallards	3	08:20	are flying around a lot, makes chasing females
mallard	3	08:20	on top of castle wall
Mallard	2	08:20	resting at mouth of stradbally stream
greylag	3	08:30	resting at mouth of stradbally stream
2 greylag geese	2	08:30	flying upriver 8.10
2 greylag geese	2	08:30	flying upriver 8.15
Mute swan	2	08:30	resting at stormont house - meadow flooded
5 greylag geese r	5	08:30	resting at stormont house - meadow flooded
Mallard	3	08:30	resting at stormont house - meadow flooded
Chaffinch, Wren, starling, great tit, robin, dunnock, goldfinch, wood pigeon, song thrush, Bullfinch, blackbird	1	09:00	
goldcrest	3	09:00	
Greylag	1	09:00	flying in to area next to ferry p,ayground
Greylag	1	09:00	also roost and feeding in grass/lawn of ferry playground
Grey heron	1	9.30	flushed from trees by park bank

Summary table of the protected, red listed or amber listed birds recorded during the Wintering Bird Surveys from 2019 to 2020, as well as notable species.

Latin name	Common name	14/11 /19	17/12 /19	15/01 /20	13/02 /20	11/03 /20	16/01/2 4	23/02/2 3
Accipiter nisus	Sparrowh awk	0	0	0	0	1	0	0
Anas platyrhyn chos *	Mallard	17	17	42	16	0	18	13
Anser anser	Greylag Goose	2	6	40	6	18	43	11
Cygnus olor *	Mute swan	6	3	3	3	0	7	3

Chroicocephalus ridibundus *	Black-headed Gull	13	17	0	22	65	17	0
Alcedo atthis *	Kingfisher	1	0	1	0	0	1	0
Gallinula chloropus	Eurasian moorhen	0	1	2	2	0	0	1
Cinclus cinclus	Dipper	0	0	0	4	0	1	0
Motacilla cinera **	Grey Wagtail	1	1	1	1	0	0	0
Passer montanus *	Eurasian Tree sparrow	0	0	0	50	0	0	0
Ardea cinerea	Grey heron	5	6	5	9	2	0	2
Egretta garzetta	Little Egret	0	0	0	1	0	0	0
Phalacrocorax carbo *	Great Cormorant	5	5	8	0	2	0	0
Turdus iliacus **	Redwing	0	0	0	0	0	51	0
Turdus pilaris	Fieldfare	0	0	0	0	0	5	0
Symbol * = Amber listed bird under BoCCI, ** = Red listed								

8.3.2 Breeding bird survey

Breeding bird surveys recorded the presence of 39 species, mainly common woodland and garden birds as well as migrant species. Evidence of breeding activity was recorded either by the presence of singing males, visible nests (in use, under construction, or recently fledged), evidence of feeding chicks or the presence of fledglings. This resulted in 26 species being confirmed as breeding in the area (Table 3-2).

The trees to the back of Mahers Pub, and adjacent to Island House, hold a significant rookery, as well as a heronry.

Latin name	Common name	Breeding?	29/07/2022	04/05/2023	01/06/2023
*Anas platyrhynchos**	Mallard	Yes	2	3	3
Anser anser	Greylag Goose	Yes	6	5	4
*Cygnus olor**	Mute Swan	Yes	2	3	0
*Alcedo atthis**	Kingfisher	No	1		
Cuculus canorus	Cuckoo	No	1	0	0
Falco peregrinus	Peregrine Falcon	No	0	1	0
*Falco tinnunculus***	Eurasian Kestrel	No	0	2	0
Gallinula chloropus	Eurasian Moorhen	Yes	0	2	1
Aegithalos caudatus	Long-tailed tit	Yes	0	1	1
Carduelis carduelis	European Goldfinch	No	0	1	0
Cinclus cinclus	Dipper	No	1	0	0

Columba palumbus	Common Wood-pigeon	No	0	5	3
Corvus frugilegus	Rook	Yes	0	8	4
Corvus monedula	Eurasian Jackdaw	Yes	0	2	2
Cyanistes caeruleus	Eurasian Blue Tit	Yes	0	6	11
Erithacus rubecula	European Robin	Yes	6	4	3
Fringilla coelebs	Common Chaffinch	Yes	0	8	6
Garrulus glandarius	Eurasian Jay	No	0	1	0
*Hirundo rustica**	Barn Swallow	Yes	0	4	3
Motacilla alba	Pied Wagtail	Yes	0	1	2
*Motacilla cinera***	Grey Wagtail	Yes	2	0	1
Parus major	Great tit	Yes	1	5	4
*Passer domesticus**	House sparrow	Yes	0	2	1
Periparus ater	Coal tit	Yes	0	1	0
Phylloscopus collybita	Common Chiffchaff	Yes	0	2	2
*Phylloscopus trochilus**	Willow warbler	Yes	2	2	3
Pica pica	Eurasian Magpie	Yes	0	3	3
Prunella modularis	Dunnock	No	0	0	1
Pyrrhula pyrrhula	Bullfinch	Yes	0	4	4
*Regulus regulus**	Goldcrest	Yes	1	2	1
Streptopelia decaocto	Eurasian Collared-Dove	No	0	2	1
Sturnus vulgaris	European Starling	Yes	0	4	4
Sylvia atricapilla	Eurasian Blackcap	Yes	0	3	5
Troglodytes troglodytes	Eurasian Wren	Yes	1	11	10
Turdus merula	Eurasian Blackbird	Yes	0	17	6
Turdus philomelos	Song thrush	Yes	0	2	5
Turdus viscivorus	Mistle thrush	No	0	2	0
Ardea cinerea	Grey heron	Yes	1	3	2
*Phalacrocorax carbo**	Great Cormorant	No	1	2	2
Symbol * = Amber listed bird under BoCCI, ** = Red listed					

8.3.3 Additional bird records

Bird recorded from Trail cameras

Camera traps deployed in the wooded area around Island house, to record mammals also detected bird species. The species recorded were all common woodland and garden birds.

- Eurasian Treecreeper Certhia familiaris
- Eurasian Blue Tit Cyanistes caeruleus
- Common Chaffinch Fringilla coelebs
- Great titParus major
- Eurasian Wren Troglodytes troglodytes
- Eurasian Blackbird Turdus merula
- Song thrush Turdus philomelos

Sound records

Casual sound recording carried out in the grasslands and woodland areas of Island House recorded the presence of common woodland and garden bird species;

- Mallard Anas platyrhynchos*
- Greylag Goose Anser anser
- Sedge Warbler Acrocephalus schoenobaenus
- Long-tailed Tit Aegithalos caudatus
- Eurasian Treecreeper Certhia familiaris
- Common Wood-pigeon Columba palumbus
- Hooded crow Corvus cornix
- European Robin Erithacus rubecula
- Common Chaffinch Fringilla coelebs
- Grey Wagtail Motacilla cinera **
- Great titParus major
- Coal tit Periparus ater
- Common Chiffchaff Phylloscopus collybita
- Goldcrest Regulus regulus *
- Eurasian Siskin Spinus spinus
- Eurasian Blackcap Sylvia atricapilla
- Eurasian Wren Troglodytes troglodytes
- Eurasian Blackbird Turdus merula
- Song Thrush Turdus philomelos

8.4 Mammal / Otter Surveys

In 2019 & 2020, an Otter spraint was recorded on the Island House causeway over the Cloon stream. As the proposed FRS will be located close to the Cloon Stream, further work to determine use of the stream by otters was carried out. This involved trail cameras set up along the stream in 6 locations in winter and spring 2023.

In January 2023, signs of otter were also searched for while the vegetation was low in the winter, such as prints, slides, couches, dens, and spraints. No signs of otter such as spraints or tracks have been observed around the Cloon Stream downstream of the Island House causeway.

Casual observations have been undertaken over the course of all other surveys in this area since 2019 for otter. Otter has been observed in main River Shannon near the islands during the wintering bird surveys. No other signs of otter has been observed in Cloon Stream.

Camera	Date range	Results
Location 1	26 January 2023 – 6 February 2023	Species recorded were Fox *Vulpes vulpes* and Grey Heron *Ardea cinerea* and House cats
Location 2	26 January 2023 – 6 February 2023	No Data – camera faulty
Location 3	19th May 2023 – 30th May 2023	No Data – no species recorded
Location 4	19th May 2023 – 30th May 2023	Species recorded were Mallard, Magpie *Pica pica* and Bullfinch *Pyrrhula pyrrhula*
Location 5	1st June 2023 – 20th June 2023	Species recorded were Blackbird *Turdus merula*, Blue Tit *Cyanistes caeruleus*, Fox, Chaffinch *Fringilla coelebs*, Great Tit *Parus major*, Brown Rat *Rattus rattus*, Song Thrush *Turdus philomelos*, Treecreeper *Certhia familiaris* and Wren *Troglodytes troglodytes*
Location 6	1st June 2023 – 20th June 2023	Species recorded were Wood Pigeon *Columba palumbus*

Otter was not recorded from any of the 6 cameras, the trail cameras picked up other species such as Heron and Foxes *Vulpes vulpes* many times.

This does not rule out the presence of otter on the Cloon Stream, however it is unlikely that otters are regularly using the Cloon Stream, and do not appear to be using this area as a resting site, despite the dense vegetation.

Detailed results of 6 trail cameras included below.

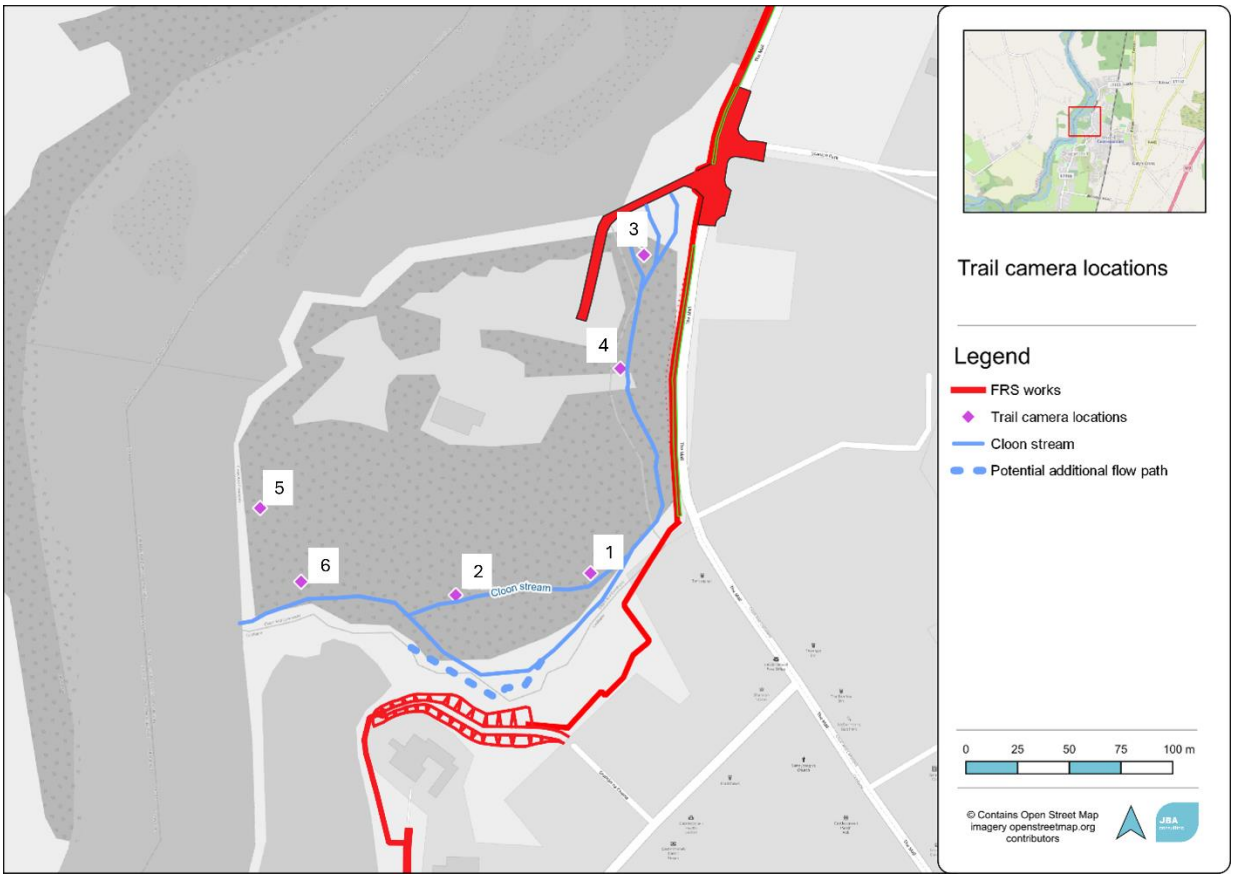


Figure 8-2: Camera traps location

Table 8-1 Trail cam Location 1 and 2 (Camera trap behind Mahers along Cloon Stream) in January 2023

Date	Location 1 Results	Location 2 Results
23/01/23	Fox	No data – camera fault
24/01/23	Fox	No data – camera fault
25/01/23	Fox and House cat	No data – camera fault
26/01/23	Fox	No data – camera fault
29/01/23	Fox	No data – camera fault
30/01/23	Fox	No data – camera fault
01/02/23	Fox	No data – camera fault
02/02/23	Fox	No data – camera fault
04/02/23	Grey Heron and Fox	No data – camera fault
05/02/23	Grey Heron and Fox	No data – camera fault
06/02/23	Fox	No data – camera fault

Table 8-2 Location 3 and 4 along Cloon stream next to Island House causeway in May 2023

Date	Location 3 Results	Location 4 Results
19/05/2023	No data – no species	No data – no species
20/05/2023	No data – no species	No data – no species
21/05/2023	No data – no species	No data – no species
22/05/2023	No data – no species	Magpie
23/05/2023	No data – no species	No data – no species
24/05/2023	No data – no species	No data – no species
25/05/2023	No data – no species	Bullfinch

26/05/2023	No data – no species	No data – no species
27/05/2023	No data – no species	No data – no species
28/05/2023	No data – no species	No data – no species
29/05/2023	No data – no species	No data – no species

Table 8-3 Trail cam results along Cloon Stream (in Alluvial woodland) and in woodland along trail in June 2023

Date	Location 5 results	Location 6 Results
01/06/23	Blackbird and Fox	No data – no species
02/06/23	Blackbird	No data – no species
03/06/23	Blackbird	No data – no species
04/06/23	Blackbird and Fox	No data – no species
05/06/23	Great Tit, Fox, Chaffinch	No data – no species
06/06/23	Great Tit, Blue Tit, Blackbird, Song Thrush and Fox	No data – no species
07/06/23	Fox and Great Tit	No data – no species
08/06/23	Fox and Blackbird	No data – no species
09/06/23	Great Tit and Wren	No data – no species
10/06/23	Fox and Song Thrush	No data – no species
11/06/23	Fox, juvenile Blue Tit and Song Thrush	No data – no species
12/06/23	Blackbird, Great Tit and Brown Rat	No data – no species
13/06/23	Blackbird	No data – no species
14/06/23	Treecreeper	Wood pigeon
15/06/23	Wren	No data – no species
18/06/23	Juvenile fox	No data – no species
20/06/23	Blackbird, juvenile Blue Tit and Great Tit	No data – no species

8.5 Bat Surveys

Survey	Date	Location of survey
Preliminary Bat Roost and Habitat Suitability Surveys	19 September 2019 20 May 2020 & 20 July 2020 (and during other	Entire scheme (except Grange House and Rivergrove)
Bat activity	19 September 2019	Island House and Mall Road, and area outside of current Scheme to the south.
Bat activity	20 May 2020 & 20 July 2020	Entire Scheme (except Grange house and Rivergrove)
Bat static detectors	19th September – 29th September 2019 20th May – 25th May 2020 19th July – 27th July 2020 12th August- 19th August 2020	Static set up at Island House, Mahers Pub & Coolbane woods
Bat activity and emergence – Beech trees at Grange House	8 September 2022	Additional area added to FRS option – Flood cell A Rivergrove and Grange house

8.5.1 Bat Survey Transect Island House to Castleconnell Castle 20th May 2020

Bat Survey Transect Island House to Castleconnell Castle 20th May 2020								
Name	Hannah Mulcahy and Colm O'Leary		Temp	Start:	17 oC	Finish:	15	oC
Date	20.05.2020		Start time	21.30				
Site	Castleconnell FRS		End time	23.30				
Survey point	Island house to Castle Transect Survey		Weather	Mild, clear, low cloud cover, but wind and cloud increased towards end of survey				
Type of survey	Transect							
Static detector placed behind Maher's Pub and Static detector placed in scrub behind Coolbane Wood								
Location	Species	Comments						
Island House to Mahers Pub	Soprano Pipistrelle, Common Pipistrelle	Island house by River Shannon very busy with bats – continuous feeding.						
Mahers pub to Post Office	Soprano Pipistrelle, Common Pipistrelle Leislers Bat	Static set up on Ash tree in Mahers pub car park.						
Post Office to Castle	Soprano Pipistrelle, Common Pipistrelle Leislers Bat	Castle lit up brightly						
Castle to Stormont House	Soprano Pipistrelle, Common Pipistrelle Leislers Bat	Limited bat activity						
Coolbane Woods	Soprano Pipistrelle, Common Pipistrelle Leislers Bat	Cpip in clearing in scrub. Static bat detector set up in this scrub. Lots of activity at entrance to Coolbane Woods						

Table 8-4 Bats recorded by Anabat Walkabout Detector during 20th May 2020 transect

Bats	Call Count
Brown Long-eared (Plecotus auratus)	1
Common Pipistrelle (Pipistrellus pipistrellus)	49
Leisler's Bat (Nyctalus leisleri)	8
Myotis sp.	1
Soprano Pipistrelle (Pipistrellus pygmaeus)	151
Island House to Castleconnell Castle Total	210

Table 8-5 Data from Static Detector placed along Cloon Stream behind Mahers Pub 20-24th May 2020

Static - Mahers Pub	Date				
Bat Species	20/05	21/05	22/05	23/05	24/05
Common Pipistrelle	49	8	174	165	139
Leisler's Bat	139	17	86	230	124
Soprano Pipistrelle	159	29	564	497	315
Myotis sp.	6	0	8	9	32
Total	353	54	832	901	610

8.5.2 Bat Survey Transect Island House to Castleconnell Castle 20th July 2020

Bat Survey Transect Island House to Castleconnell Castle 20th July 2020			
Name	Colm O'Leary, Hannah Mulcahy	Temp	Start: 15 oC Finish: 15 oC
Date	20.07.2020	Start time	21.45
Site	Castleconnell	End time	23.40
Survey point	Island House to Castleconnell Castle	Weather	80% cloud, very light breeze, warm
Type of survey	Transect		
Static detector placed behind Maher's Pub and Static placed detector in scrub behind Coolbane Wood			

Location	Species	Comments
Island House to Mahers Pub	Soprano Pipistrelle, Common Pipistrelle Daubentons Bat	Island house by River Shannon very busy with bats – continuous feeding.
Mahers pub to Post Office	Soprano Pipistrelle, Common Pipistrelle Leislers Bat	Static set up on in car park.
Post Office to Castle	Soprano Pipistrelle, Common Pipistrelle Leislers Bat	
Castle to Stormont House	Soprano Pipistrelle, Common Pipistrelle Leislers Bat	
Coolbane Woods	Soprano Pipistrelle, Common Pipistrelle Leislers Bat	Spip and Cpip Roost located at (52.712135, -8.503112), approximately 20 - 40 Spip and Cpip emerging from roof fascia of building near Coolbane Meadows

Figure 8-3 Roost of 20-40 Pipistrelles emerging from building in Coolbane Meadows

Table 8-6 Bats recorded by Anabat Walkabout Detector during 20th July 2020 transect

Bats	Call Count
Brown Long-eared (Plecotus auratus)	1
Common Pipistrelle (Pipistrellus pipistrellus)	4
Leisler's Bat (Nyctalus leisleri)	57
Soprano Pipistrelle (Pipistrellus pygmaeus)	31
Island House to Castleconnell Castle Total	93

Table 8-7 Data from Static Detector placed along Cloon Stream behind Mahers Pub 20-28 July 2020

Static- Mahers Pub	Date							
Bat Species	20/07	21/07	22/07	23/07	24/07	25/07	26/08	27/07
Common Pipistrelle	236	164	69	156	96	176	4	159
Leisler's Bat	265	401	366	381	465	335	222	351
Soprano Pipistrelle	494	436	301	414	267	291	159	419
Myotis sp.	6	4	5	7	3	0	0	2
Brown Long-eared Bat	1	0	2	0	0	0	0	0
Total	1002	1005	743	958	831	802	385	931

Table 8-8 Data from Static Detector placed along Cloon Stream behind Coolbane Woods in Scrub Area 20-28 July 2020

Static- Coolbane Woods Willow Scrub	Date							
Bat Species	20/07	21/07	22/07	23/07	24/07	25/07	26/07	27/07
Common Pipistrelle	2	2	0	1	3	3	0	3
Leisler's Bat	42	44	39	42	35	28	10	25
Soprano Pipistrelle	39	112	82	85	161	132	73	73
Myotis sp.	2	4	2	3	4	3	1	0
Lesser Horseshoe Bat	0	0	0	1	0	0	0	0
Total	85	162	123	135	203	166	84	101

Static Bat detector data August 2020

A transect was not carried out for August 2020 however static detectors were placed in Coolbane Woods and Mahers pub for a week in August.

Table 8-9 Data from Static Detector placed along Cloon Stream behind Mahers Pub 12-18th August 2020

	Date						
Bat Species	12/08	13/08	14/08	15/08	16/08	17/08	18/08
Common Pipistrelle	58	15	19	12	15	0	54
Leisler's Bat	750	535	493	624	606	7	621
Soprano Pipistrelle	466	376	396	343	472	0	657
Myotis sp.	13	38	30	10	25	0	14
Total	1241	964	938	989	1118	7	1346

Table 8-10 Data from Static Detector placed along Coolbane Woods 12-18th August 2020

	Date				
Bat Species	12/08	13/08	14/08	15/08	16/08
Common Pipistrelle	3	6	2	6	5
Leisler's Bat	134	193	139	66	160
Myotis sp.	1	1	1	0	1
Soprano Pipistrelle	29	86	49	58	69
Total	167	286	191	130	235

8.5.3 Bat Survey Grange House 8th September 2022

An additional survey was carried out at Grange House in 2022 as this area was added to the scheme after the original bat surveys were carried out. This included an emergence survey of two mature Beech trees in Grange House, which will be removed as part of the Scheme.

Bat Survey Grange House 8th Sept 2020			
Name	Johanna Healy	Temp	Start: 17 oC Finish: 15 oC
Date	8.09.2022	Start time	20.10
Site	Grange House	End time	22.15
Survey point	Hollow beech by river wall	Weather	Clear, warm, no rain
Type of survey	Activity & emergence		

Location	Species	Comments
Grange house – Beech trees emergence surveys	Leislers Bat	Possible emergence from beech tree at 20.35
Grange House activity over River Shannon	Soprano Pipistrelle, Common Pipistrelle Leislers Bat	High foraging activity over river

Table 8-11 Bats recorded by Anabat Walkabout Detector during 8th September 2022 transect

Bats	**Call Count**
Common Pipistrelle (Pipistrellus pipistrellus)	306
Leisler's Bat (Nyctalus leisleri)	187
Myotis sp.	55
Soprano Pipistrelle (Pipistrellus pygmaeus)	219
Grange House Total	767

8.5.4 Bat survey conducted 27th September 2019 for development of Options for Castleconnell FRS

Transect Surveys were conducted at Island House and along the Mall Road, and another survey conducted at Stradbally (this area was later removed from the scope).

Island House transect survey

Bats were recorded along Island House from 20:03 to 21:39, a total of 44 recordings were made by surveyors. In section A, many bats were recorded and seen flying through the wooded area, the main species here were Soprano and Common Pipistrelles 25+, Leisler's and at least two species which could not be identified in the field. In section B along the water 10+ Daubenton's were seen and recorded over water and 2+ Leisler's bats were recorded overhead. In section C, 1+ Daubenton's and Leisler's were recorded, this section was within a beech treeline. In Section D and E smaller numbers of Common and Soprano Pipistrelle, Daubenton's, Leisler's and unidentified species were recorded. Many flying insects were observed during the evening. Foraging behaviour was the most frequently recorded behaviour during the survey period. Some commuting behaviour was also observed.

Overall, approximately 40-50 occurrences of Pipistrelles, and 15 Leisler's bat, Pipistrelle occurrences were recorded. The fact that Leisler's bats were observed early in the evening means that they are roosting nearby to the site, and as there was such a high number of Leisler's bats recorded, we can conclude this nearby population may be part of a maternity roost.

657 bats were recorded by the static bat detector during the transect survey. Table 8-12 (below) shows the species of bat and the number of bat calls recorded during the Island House transect survey.

Table 8-12: Species and number of bat calls recorded during the transect survey

Bat species	Call Count
Common pipistrelle (Pipistrellus pipistrellus)	198
Daubenton's Bat (Myotis daubentonii)	23
Leisler's Bat (Nyctalus Leisleri)	353
Soprano pipistrelle (Pipistrellus pygmaeus)	83
Island House Total	657

Stradbally survey

In Stradbally bats were recorded between 08:01 and 09:30. A total of 17 recordings were made by surveyors. Species recorded were Soprano and Common Pipistrelles, Leisler's and unidentified Myotis sp. Overall there were 123 bats recorded during the transect by Anabat walkabout bat detector. Table 8-13 (below) shows the species of bat and number of bat calls recorded during the Stradbally transect survey.

Table 8-13: Species and number of bat calls recorded during the Stradbally transect survey

Bats	Call Count
Common pipistrelle (Pipistrellus pipistrellus)	5
Leisler's Bat (Nyctalus Leisleri)	92
Myotis sp.	4
Soprano pipistrelle (Pipistrellus pygmaeus)	22
Stradbally Total	123

Static detector survey results

An Anabat static bat detector was deployed for 7 nights close to the River Shannon within the Island House woodland. The detector was placed in a secluded area away from the road to reduce the amount of background noise picked up by the detector.

Over the 7 nights the weather was fair with a few showers. Temperatures ranged from highs of 20 to lows of 10 degrees. This represents ideal conditions for bat activity.

Table 8-14 shows the bat species and the number of bat calls recorded from the 19th to the 26th of September.

Table 8-14: Species of bat and number of bat calls recorded during the seven days the static detector was deployed

Bat species	19/09	20/09	21/09	22/09	23/09	24/09	25/09	26/09	Total
Common pipistrelle (Pipistrellus pipistrellus)	157	1	0	348	0	25	0	0	531
Leisler's Bat (Nyctalus Leisleri)	109	21	17	57	10	14	4	10	242
Lesser Horseshoe Bat (Rhinolophus hipposideros)	0	1	0	0	0	0	0	0	1
Myotis sp.	15	15	15	47	18	7	14	9	140
Soprano pipistrelle (Pipistrellus pygmaeus)	607	440	62	1840	1190	646	609	968	6362
Total	888	478	94	2292	1218	692	627	987	7276

The exceptionally high bat activity at both sites, particularly at Island House, indicates that these sites are important foraging sites for the bat species recorded using the site. It also suggests that there may be several bat roosts in the vicinity of the site, particularly due to the high bat activity noted very early in the night, indicating that a large number of bats are emerging from roosts close by.

8.6 Fishery survey

A Survey report carried out by Ecofact “Castleconnell Aquatic Ecology (23-11-21)

Proposed Flood Relief Scheme, Castleconnell, Co. Limerick

Baseline Aquatic Ecology Survey

Version (23-11-21) DRAFT

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TABLE OF CONTENTS

1. INTRODUCTION

Ecofact Environmental Consultants Ltd. were commissioned by JBA Consultants Ltd. and Limerick City and County Council to undertake a baseline aquatic ecology survey of the River Shannon in Castleconnell, Co. Limerick. This document describes the existing baseline in the study area for aquatic habitats, aquatic ecological communities and individual aquatic species.

There is a proposal to carry out flood relief works on selected areas in Castleconnell, on a section of the Old River Shannon, as can be seen in Figure 1. The proposal includes for flood walls, embankments, road raising, culverts, flood gates and low level plinth walls. Flood walls are proposed along the eastern bank of the River Shannon, on the boundary of Castelconnell town, along Coolbawn meadows road and main street. Embankments are also proposed along the eastern bank of the shannon, as well as along an existing drain near Chapel Hill road. Road raising works are proposed near the junction of Chapel hill road, Coolbawn meadows road and Coolbane wood road, adjacent to Castleconnell castle. A flood gate is also proposed at this junction. Culverting works are proposed in the north of the town near Rivergrove House BnB, along with a low level plinth wall. Road raising, flood gates and an embankment are also proposed along the junction between Scanlon road and The Elvers road on the eastern bank of the River Shannon.

The aims of the current report are to carry out a desktop study and a baseline aquatic ecological survey of the study area, in order to provide a detailed description and evaluation of the receiving environment proposed flood relief scheme. Field survey work, to inform the current assessment, included habitat surveys, kick/sweep sampling for aquatic macroinvertebrates as well as a general fish stock assessment and juvenile lamprey survey. The surveys were completed during August 2021.

Castleconnell village and the proposed flood scheme is located the “old” River Shannon channel. This was the former main channel of the Shannon before the Shannon hydroelectric scheme. This section of river is now affected by extreme water abstraction and regulation – with up to 97% of the flow in the Lower River Shannon SAC abstracted at Parteen Regulating Weir. Parteen Regulation Weir is located approximately 4km upstream of Castleconnell village, within the Lower River Shannon SAC. Here the river is diverted via a 12.6km headrace to the 86MW hydroelectric generating station at Ardnacrusha. Downstream of Ardnacrusha hydroelectric station water is discharge via a 2.1km long the tailrace canal and joins with the River Shannon just upstream of Limerick City. A statutory minimum “compensation flow” for the “old” River Shannon was set in 1935 and has not been reviewed since. The compensation flow is 10 cubic meters per second (cumecs) - which is less than the n99%ile flow prior to the Shannon scheme. This minimum flow is only exceeded when the flows in the river are in excess of the turbine capacity at Ardnacrusha (400 cumecs). Therefore for the majority of the time the “old” river channel only has the absolute minimum compensation flow. This extreme abstraction and regulation has had a profound effect on the ecology and hydromorphology of the river. A map of the Lower River Shannon showing the location of the hydroelectric scheme and the proposed flood scheme area is provided in Figure 1.

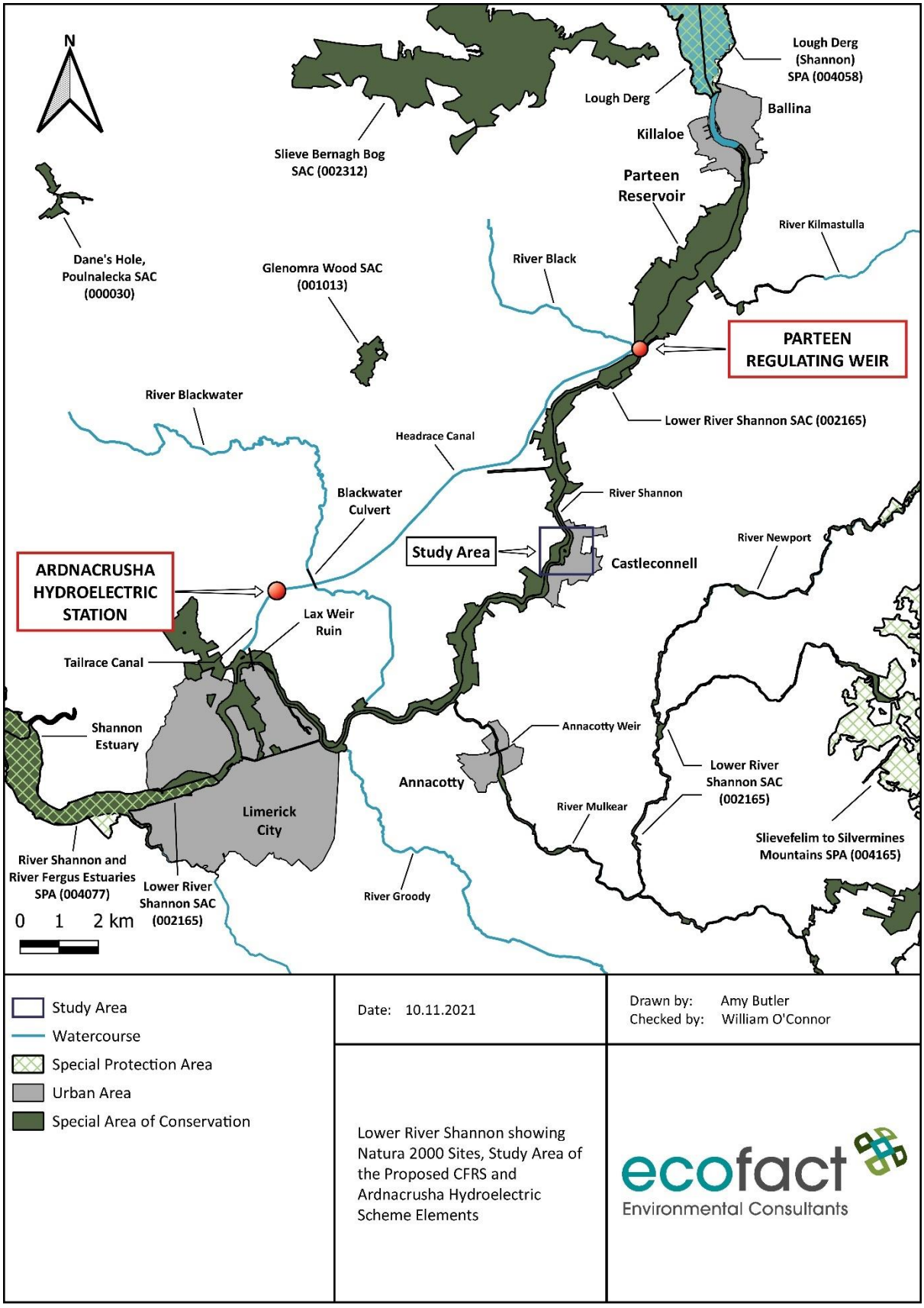


Figure 1 Lower River Shannon showing Natura 2000 Sites, Study Area of Proposed CFRS and Ardnacrusha Hydroelectric Scheme Elements.

2. METHODOLOGY

2.1 Desk Study

A desktop study was undertaken to describe the aquatic ecology of the River Shannon at Castleconnell to identify the previous records of aquatic species and designated areas of protection. This involved accessing the National Biodiversity Data Centre (NBDC) (www.biodiversityireland.ie) and the databases available here. The National Vegetation Database, Online Atlas of Vascular Plants 2021 Onwards, River Biologists' Database, National Survey of Native Woodlands, Amphibians and Reptiles of Ireland, Aquatic Oligochaeta of Ireland, Clare Biological Records Centre Database 2004-2007, Freshwater Fish in Irish Lakes, Water Beetles of Ireland, Caddisflies (Trichoptera) of Ireland, Dragonfly Ireland 2019 to 2024, Mayflies (Ephemeroptera) of Ireland, True Bugs (Heteroptera) of Ireland, All Ireland Non-marine Molluscan Database and Invasive Species Ireland databases were all accessed and reviewed.

The National Parks and Wildlife Service (www.npws.ie) website and online maps were accessed in relation to designated areas, qualifying interests and site synopses on relevant Special Areas of Conservation with regard to aquatic ecology.

The Environmental Protection Agency (www.gis.epa.ie/EPAMaps/) websites including Catchments.ie (www.catchments.ie) and publications relating to the Water Framework Directive (WFD) were accessed in relation to water quality status and water quality pressures in the study area.

Previous reports prepared by the Electricity Supply Board (ESB), Environmental Protection Agency, Inland Fisheries Ireland and various other studies on the Lower River Shannon were reviewed in relation to aquatic fauna in the study area. This also included the National Otter Survey of Ireland database and reports prepared by the Standing Scientific Committee on Salmon (SSCS).

Aerial imagery was accessed online in order to gain a better understanding of the study area and its surrounding habitats. All documents reviewed are included in the bibliography section of the current report.

2.2 Field Survey

2.2.1 Habitat Surveys

Habitat Surveys were carried out on the entire study area on the River Shannon, with detailed investigations at a total of 6 survey sites. Survey Site locations are illustrated in Figure 2. The survey was completed with reference to the Environment Agency's "*River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003*" (EA, 2003) and "*A Guide to Habitats in Ireland*" (Fossitt, 2000). River habitat types as well as flora and vegetation were characterised at each survey site. All sites were assessed in terms of:

- Stream width and depth and other physical characteristics
- Substrate type, listing substrate fractions in order of dominance, i.e., large rocks, cobble, gravel, sand, mud etc.
- Flow type, listing percentage of riffle, glide and pool in the sampling area

- Instream vegetation, and percentage coverage of the stream bottom at the sampling site (as applicable) and on the bankside
- Estimated cover by bankside vegetation, giving percentage shade of the sampling site.

2.2.2 Aquatic Macroinvertebrate Surveys

Qualitative sampling of benthic (or bottom dwelling) macroinvertebrates was undertaken at the survey sites using kick-sampling (Toner et al., 2005). Survey Site locations are illustrated in Figure 2. This procedure involved the use of a 'D' shaped hand net (mesh size 0.5 mm; 350 mm diameter) which was submerged on the riverbed with its mouth directed upstream. The substrate upstream of the net was then kicked for one minute in order to dislodge invertebrates, which were subsequently caught in the net. This procedure was undertaken at three points along/across the watercourse. Vegetation sweeps were also undertaken over a further 1-minute period to ensure a representative sample of the fauna present at the site was collected. Specific sweep netting assessments were completed to determine presence / absence of White-clawed crayfish and juvenile lamprey species.

Macroinvertebrates provide an estimation of the current health of the waterbody and the type of substrate. They are divided into 5 categories (A, B, C, D, E – "A" being the most sensitive and "E" being the most tolerant). A desk study was completed and used resources such as the NBDC species maps to identify if any rare/protected species have been recorded in the area. All samples of invertebrates were combined for each site and live sorted on the riverbank and fixed in ethanol for subsequent laboratory identification. The relative abundance of macroinvertebrates was recorded on-site at each site. Further identification was undertaken in the laboratory using a stereoscope.

Table 1 Relationship between Q-value and Ecological Status for macroinvertebrates.

Q Value*	WFD Status	Pollution	Condition**
Q5, Q4-5	High	Unpolluted	Satisfactory
Q4	Good	Unpolluted	Satisfactory
Q3-4	Moderate	Slightly polluted	Unsatisfactory
Q3, Q2-3	Poor	Moderately polluted	Unsatisfactory
Q2, Q1-2, Q1	Bad	Seriously polluted	Unsatisfactory

** These values are based primarily on the relative proportions of pollution sensitive to tolerant macroinvertebrates (the young stages of insects primarily but also snails, worms, shrimps etc.) resident at a river site.*
*** "Condition" refers to the likelihood of interference with beneficial or potential beneficial uses*

2.2.3 Fish Surveys

2.2.3.1 General Fish Surveys

Each survey site was assessed for potential Lamprey and Salmon habitat. Survey Site locations are illustrated in Figure 2. An electrical fishing survey was undertaken at the 6 sites during August 2021. This was completed under authorisation from the Department of Environment, Climate and Communications under Section 14 of the Fisheries (Consolidation) Act (1959). Sites were surveyed following the methodology outlined in the CFB (2008) guidance "*Methods for the Water Framework Directive - Electric fishing in wadable reaches*". A portable electrical fishing unit (Smith Root-LR 24 backpack) was used during the assessments. Fishing was carried out continuously for 5 minutes at each of the sites. Captured fish were collected into a container of river water using dip nets. On completion of the survey fish were then anaesthetised using a solution of 2-phenoxyethanol, identified,

and measured to the nearest mm using a measuring board. Subsequent to this the fish were allowed to recover in a container of river water and were the released alive and spread evenly over the sampling area. No mortalities were recorded. Strict biosecurity measures were followed during all fieldwork (IFI, 2010).

2.2.3.2 Juvenile Lamprey Surveys

Juvenile Lamprey surveys generally followed the methodology for ammocoete surveys given in the manual *'Monitoring the River, Brook and Sea Lamprey, Lampetra fluviatilis, L. planeri and Petromyzon marinus'* by Harvey & Cowx (2003). Electrical fishing for juvenile lampreys was carried out at three 1m^2 habitat patches where available. A total of 3 x 1 m^2 enclosures were fished at each site where suitable habitat was present and where conditions allowed. Lamprey identification followed '*Identifying Lamprey. A Field Key for Sea, River and Brook Lamprey'* by Gardiner R (2003).

Table 2 Locations of the survey sites and the fish surveys carried out at each site.

Site	NOS Grid Reference	Habitat surveys	Electrical fishing survey (salmonids)	Electrical fishing survey (lampreys)	General fish stock assessment	Kick/Sweep sampling
1	R 65517 62318	✓	✓	✓	✓	✓
2	R 65903 62691	✓	✓	✓	✓	✓
3	R 66107 62764	✓	✓	✓	✓	✓
4	R 66080 62875	✓	✓	✓	✓	✓
5	R 66089 63261	✓	✓	✓	✓	✓
6	R 65864 63574	✓	✓	✓	✓	✓

3. DESCRIPTION OF THE WORKS

Limerick City and County Council plan to carry out flood relief works on selected areas in Castleconnell, Co. Limerick. This proposal includes for flood walls, embankments, road raising, culverts, flood gates and low level plinth walls. Flood walls are proposed along the eastern bank of the River Shannon. The walls are proposed to be located on the boundary of Castelconnell town, along the Coolbawn meadows road and main street. Embankments are also proposed along the eastern bank of the shannon, as well as along an existing drain near Chapel Hill road. Road raising works are also proposed near the junction of Chapel hill road, Coolbawn meadows road and Coolbane wood road, adjacent to Castleconnell castle. A flood gate is also proposed at this junction. Culverting works are proposed in the north of the town near Rivergrove House BnB, along with a low level plinth wall. Road raising, flood gates and an embankment are also proposed along the junction between Scanlon road and The Elvers road on the eastern bank of the River Shannon.

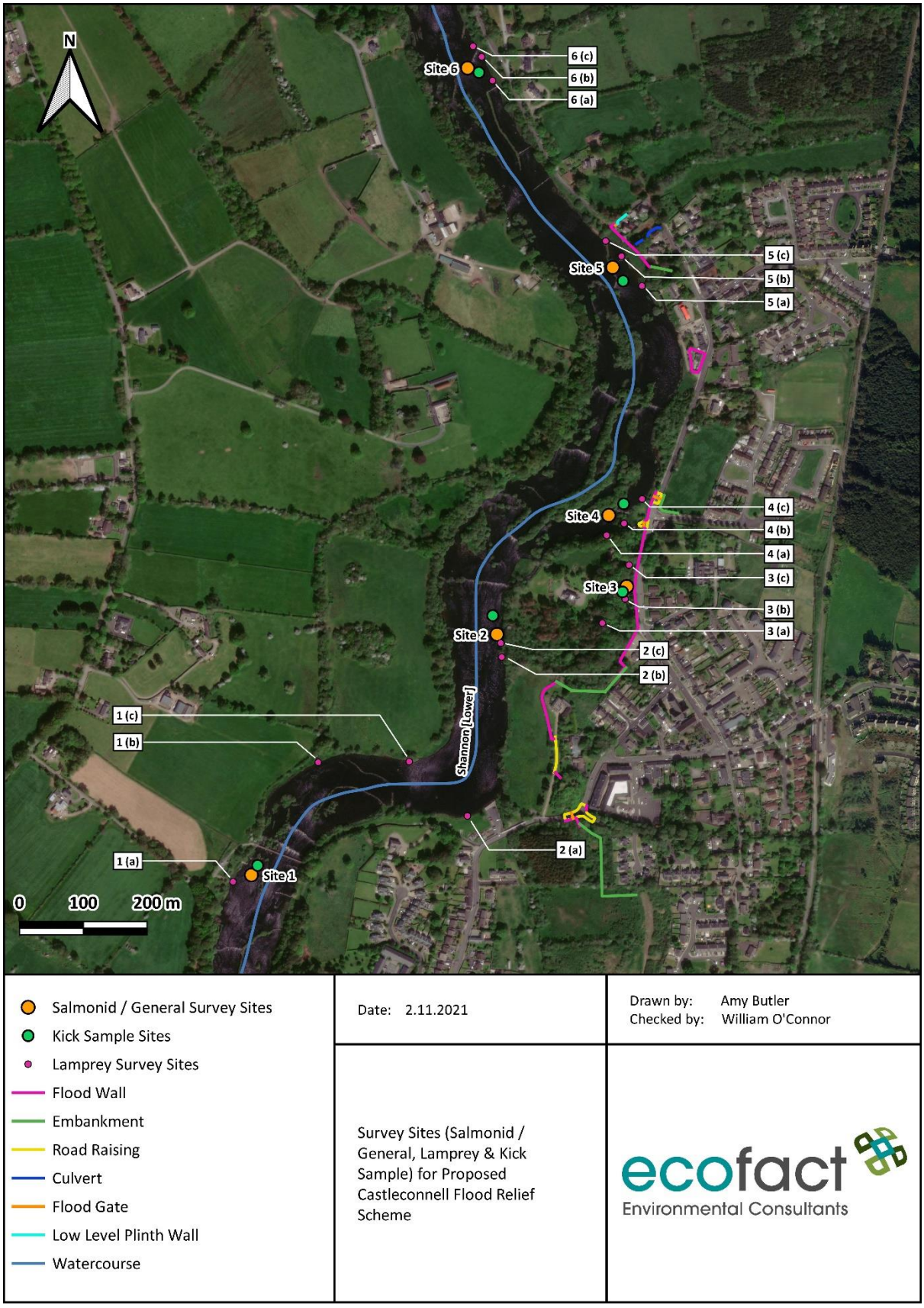
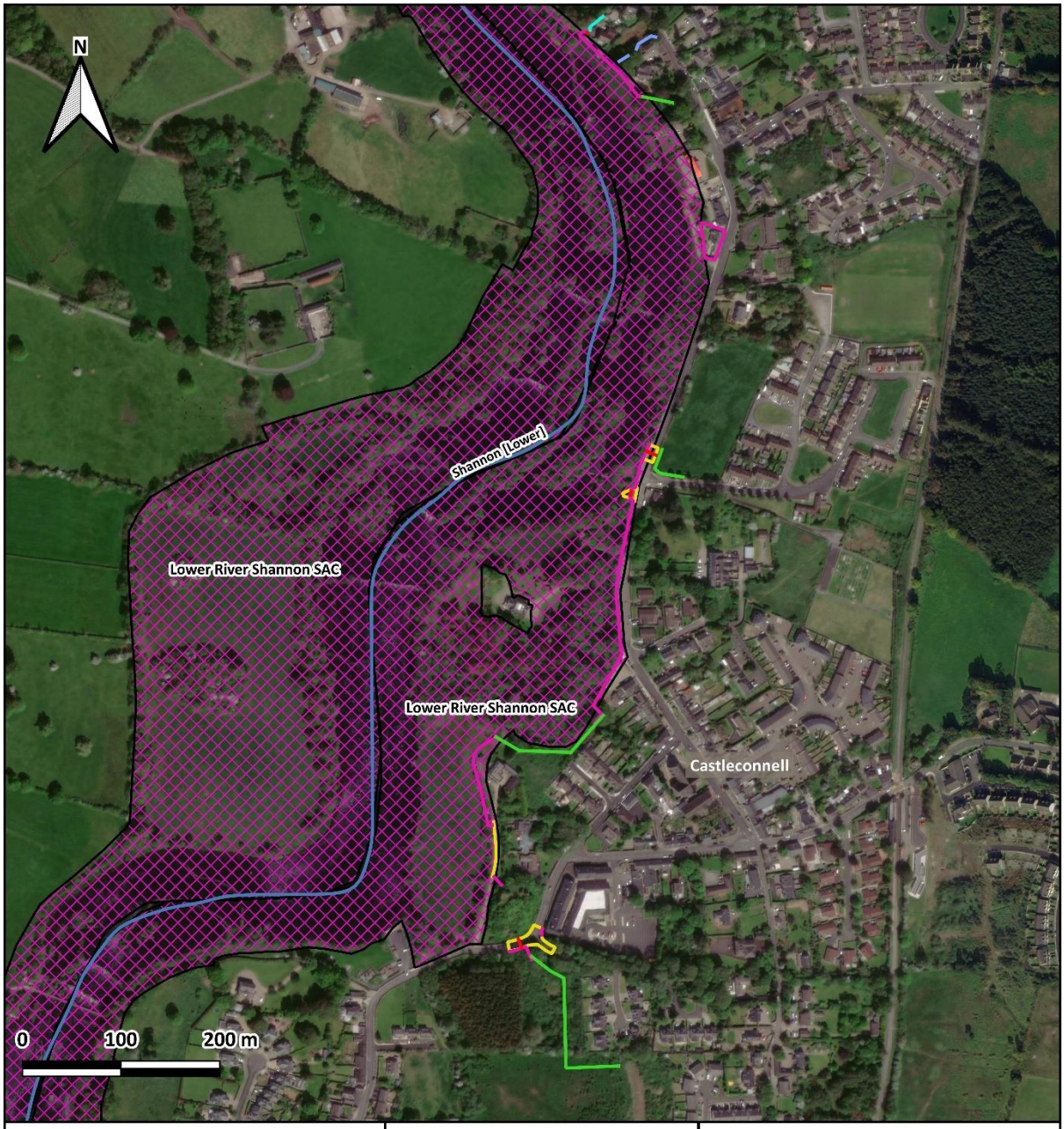


Figure 2 Survey Sites (Salmonid / General, Lamprey & Kick Sample) for Proposed Castleconnell Flood Relief Scheme.



Flood Wall
Embankment
Road Raising
Culvert
Flood Gate
Low Level Plinth Wall
Watercourse
Special Area of Conservation

Date: 10.11.2021

Drawn by: Amy Butler
Checked by: William O'Connor

Location of Proposed Flood Scheme. Lower River Shannon SAC also shown.

ecofact
Environmental Consultants

Figure 3 Location of Proposed Flood Scheme. Lower River Shannon SAC also shown.

4. RECEIVING ENVIRONMENT

4.1 Desk Study

4.1.1 Designated Areas

The proposed Flood Relief Scheme is located within the Lower River Shannon Special Area of Conservation (Site Code: 002165). This SAC is designated for Annex I habitats and Annex II species under the E.U. Habitats Directive. This site is selected for the presence of a large number of varied estuarine, aquatic and terrestrial habitats.

The Lower River Shannon SAC is designated for the following Habitats listed as Q.I.s of the site: Sandbanks which are slightly covered by sea water all the time, Estuaries, Mudflats and sandflats not covered by sea water at low tide, Coastal lagoons, Large shallow Inlets and Bays, Reefs, Perennial Vegetation of Stony Banks, Vegetated Sea Cliffs of the Atlantic and Baltic coasts, Salicornia and other annuals colonising mud and sand, Atlantic salt meadows, Mediterranean Salt meadows, Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation, Molinia meadows on calcareous, peaty or clayey-silt-laden solids and Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-padion, Alnion incanae, Salicion albae*). The species designated as qualifying interests of the Lower River Shannon SAC are: Freshwater Pearl Mussel *Margaritifera margaritifera*, Sea lamprey *Petromyzon marinus*, Brook lamprey *Lampetra fluviatilis*, River lamprey *Lampetra planeri*, Salmon *Salmo salar*, Common Bottlenose Dolphin *Tursiops truncatus* and Otter *Lutra lutra*. Table 3 below details these qualifying interests (NPWS, 2012a). There are no other downstream aquatic Natura 2000 sites.

Table 3 Qualifying interests of the Lower River Shannon SAC.

Natura Code	Qualifying Interest
1110	Sandbanks which are slightly covered by sea water all the time
1130	Estuaries
1140	Mudflats and sandflats not covered by seawater at low tide
1150	Coastal lagoons
1160	Large shallow inlets and bays
1170	Reefs
1220	Perennial vegetation of stony banks
1230	Vegetated sea cliffs of the Atlantic and Baltic coasts
1310	Salicornia and other annuals colonising mud and sand
1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
1410	Mediterranean salt meadows (*Juncetalia maritimi*)
3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
91E0	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)
1029	*Margaritifera margaritifera* (Freshwater Pearl Mussel)
1095	*Petromyzon marinus* (Sea Lamprey)
1096	*Lampetra planeri* (Brook Lamprey)
1099	*Lampetra fluviatilis* (River Lamprey)
1106	*Salmo salar* (Salmon)
1349	*Tursiops truncatus* (Common Bottlenose Dolphin)
1355	*Lutra lutra* (Otter)

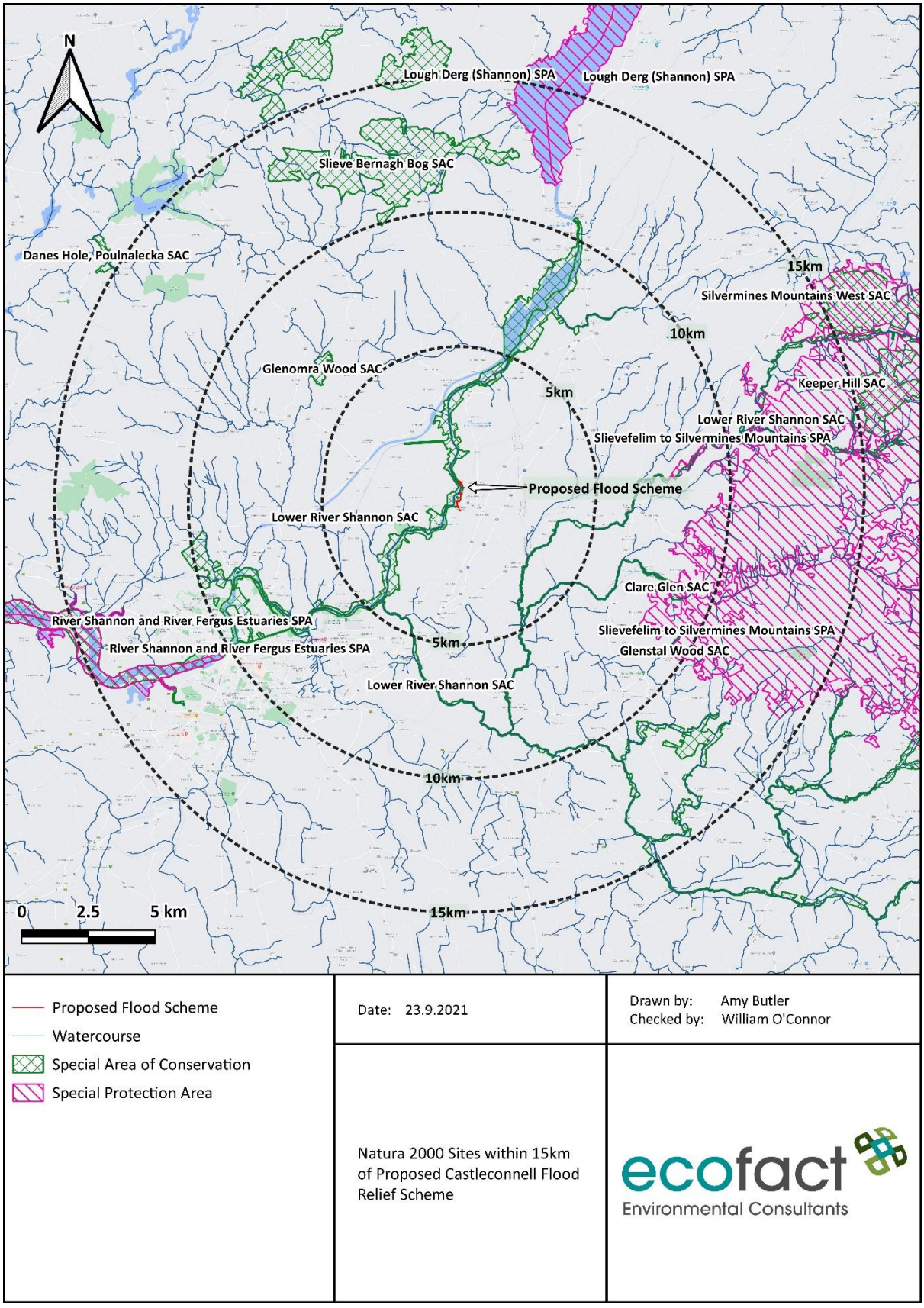


Figure 4 Natura 2000 Sites within 15km of Proposed Castleconnell Flood Relief Scheme.

The River Shannon at the site is also designated as a drinking water protected area (DWPA) as defined under Article 7 of the Water Framework Directive (WFD). This stretch is designated under the European Communities (Drinking Water) (No. 2) Regulations 2007 (S.I. No. 278/2007). This represents a snapshot of river waterbodies with qualifying abstractions taken at the end of 2018 for the purpose of the WFD River Basin Management Plans, with data from the EPA register of abstractions.

There are no aquatic Proposed Natural Heritage Areas or Natural Heritage Areas in the study area.

4.1.2 Shannon Catchment Overview

The River Shannon is the largest river in Ireland spanning some 360.5km in length down the Island, with a catchment area of 11,700km^2. The catchment area of the river, including that of the estuary, covers approximately 1/6 of the area of the Republic of Ireland.

The River Shannon rises in a pool in the Cuilcagh Mountain Range in Co. Cavan, known as the Shannon pot, and falls 104m in the first 14m of its journey, before it enters Lough Allen. After this point the Shannon continues its journey across Ireland's central plain. Between Battlebridge at the confluence of the Lough Allen canal, and Killaloe at the lower end of Lough Derg, which is a distance of some 185km, the river falls only 12m. The River Shannon therefore has the gentlest gradient of any of the large rivers in Europe (Heery, 1993).

The Shannon has a total surface water area of 41,000ha of surface waters upstream of Limerick city, which drains a total catchment area of approximately 11,800km^2. The catchment area from the source to the Lough Allen outlet is 425km^2. The catchment area from the Lough Allen outlet to the Lough Ree outlet is 415km^2. This section contains major tributaries such as the Inny River, Boyle River and the River Camlin. The catchment area for the river between the Lough Ree outlet and the Lough Derg outlet is 5,833km^2. The Rivers Suck, Brosna, Little Brosna, Cappagh/Kilcrow, Nenagh and Graney are major tributaries confluencing along this middle section of the river. The catchment area from the Lough Derg outlet to Limerick City is 1,431km^2. The Mulkear River joins the Shannon along this section. There are a number of large lakes located within the upper Shannon catchment area, including Loughs Allen, Key, Gara, Boderg, Bofin, Forbes, Sheelin, Ree, Ennel and Owel. The largest of the Shannon lakes, L. Derg, with a surface area of 117km^2, and mean depth of 7.55m. The five largest lakes in the system, Loughs Derg, Ree, Allen, Sheelin and Ennel comprise almost 70% of the catchments 41,000ha of surface water (O'Connor, 2003). Due to the large size of the Shannon, it is usually split into the upper and lower Shannon catchments.

There are numerous weirs and sluices along the River Shannon, making it a regulated river system for the purposes of both navigation and flood control. The most significant of these structures are located at or downstream of the outflows of Loughs Allen and Ree and at Meelick, Tarmonbarry and Rooskey. In addition to these structures, a hydroelectricity generating station is located at Ardnacrusha, immediately upstream of Limerick city.

4.1.2.1 Lower Shannon

The Lower Shannon catchment covers an area of 1,820km^2 and comprises Lough Derg as well as the Mulkear catchment. The catchment is characterised by flat limestone plains, a small proportion of which are karstified to the east of Lough Derg (EPA, 2021). The River Shannon flows into Lough Derg at Portumna and travels c. 39rkm through Lough Derg. The Shannon flows out of Lough Derg through the

steep-sided gap between the Slieve Bernagh and Arra Mountains where the towns of Ballina and Killaloe are located on the east and the west bank of the river respectively (EPA, 2021).

Downstream of Killaloe, the Lower River Shannon flows into Parteen Reservoir. Parteen Weir is located c. 6rkm downstream. At Parteen Regulating Weir, the river is diverted via a 12.6km headrace which travels to the 86MW hydroelectric generating station at Ardnacrusha. Downstream of Ardnacrusha hydroelectric station, the tailrace canal is c. 2.1km in length, and joins with the River Shannon c. 660m downstream of Parteen bridge. Downstream of Parteen Regulating Weir, the old River Shannon main channel flows south-west, through Castleconnell, Castletroy and then continues towards Limerick City where it is joined by the tailrace canal immediately downstream of the Lax weir ruin.

Parteen regulating weir controls the flow of water that travels through the old River Shannon main channel in order to run the Ardnacrusha Hydroloelectric station. The average annual river flow is 180m^3/sec (ESB, 2017). This discharge drops to an average of 99m^3/sec during summer and rises to an average of 274m^3/sec during winter (O'Connor, 2003). The turbine capacity at Ardnacrusha hydroelectric station is 400m3/s, with a minimum compensation flow of 10 m3/s. When the flow of water is greater than 410 m3/s, such as during flood events and 'high water' (i.e. when Lough Derg levels exceed 33.56m O.D.), the gates at Parteen Regulating Weir are opened to 'spill' the excess volume of water needed to regulate the river down to the original course of the river (O'Connor, 2003).

The main affected watercourse in the subject area is the Lower "old" River Shannon. Within the study area, there are some small channels, drains and streams that are not registered as watercourses by the Environmental Protection Agency due to their small size. It is noted that many of these are not of any fisheries importance but are present and therefore provide a context of the hydrology present here. These channels are mostly present in the vicinity of Castleconnell town on the eastern side of the river so may be associated with past developments in the area.

4.1.3 Aquatic Flora

The study area of the survey sites falls within the 10km grid square R66. The National Biodiversity Data Centre holds records for flowering plants within this 10km grid square from the National Vegetation Database, the Online Atlas of Vascular Plants, 2012 onwards, the EPA River biologists database and the National Invasive Species Database. Some of these flowering plants are aquatic or semi-aquatic or emergent and therefore these species would be likely to come from the River Shannon or smaller tributaries within this 10 grid square, and therefore have potential to be found at the site. Table 4 below details the flowering plant species that have potential to be within the study area.

The protected habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion vegetation'* habitat is designated within the Lower River Shannon SAC. It is noted that the full distribution of this habitat and sub-types are currently unknown (NPWS, 2012b). However, map 13 of the conservation objectives does show the known occurrences within the site boundary, which are located in Limerick City, downstream of Limerick City and in the River Bilboa in the Mulkear catchment (NPWS, 2012a). There is no mapped habitat for Castleconnell (NPWS, 2012a). NPWS note that the three main plant species listed as characteristic of this habitat are *Ranunculus, Potamogeton* spp. and *Fontinalis antipyretica* (NPWS, 2012a). There are three main sub types with this protected habitat, two of which are associated with tidal reaches of rivers: *Groenlandia densa* (L.) Four., Opposite-leaved Pondweed and *Schoenoplectus triqueter* (L.) Palla, Triangular Club-rush (NPWS, 2012b). The last sub-type is associated with fast-flowing stretches of unmodified streams and rivers and is not noted to occur at Castleconnell.

The site synopsis for the Lower River Shannon SAC also notes that the *Molinia* meadows Annex I habitat type can be found on the eastern bank of the River Shannon just north of Castleconnel, called Worldsend. It also further notes that areas of wet meadow here are dominated by Rushes *Juncus* spp. and Sedges *Carex* spp. and support a rich and diverse species-rich vegetation, including such uncommon species at Blue-eyed Grass *Sisyrinchium bermudiana* and Pale sedge *Carex pallescens*.

Alluvial woodlands occur along the River Shannon and are a protected habitat type in the Lower River Shannon SAC. These are woodland that periodically flood and are associated with rivers, in riparian areas and on islands (NPWS, 2012c). This woodland type is known to occur upstream of Limerick City and map 14 of the conservation objectives for the SAC show this habitat type to be present within the study area close to survey sites included in the current field surveys (NPWS, 2012a). These sites have been included in the National Survey of Native Woodlands in Ireland and are given the following sites codes: 1577 and 1857 (NPWS, 2012a). Perrin *et al* (2008) sets out the main report for the National Survey of Native Woodlands 2003-2008 and notes Doonass Demesne (NSNW Code 1577), just downstream of Doonass survey site, as having a threat score of 33.3% and an overall conservation score of 45.5% (Perrin *et al*., 2008). Invasive species are noted at the site, as well as other threats such as grazing, non-native regeneration and damaging activities. The other site just upstream of doonass footbridge, is called Newgarden North (NSNW Code 1857) and is rated as having a threat score of 33.3% and a conservation score of 69.7% (Perrin *et al*., 2008). Issues at this site as similar to Doonass Demesne, with invasive species, grazing and non-native regeneration (Perrin *et al*., 2008).

ESB (2020) noted that habitat improvement and angling access works were completed throughout Castleconnell, including the spraying of Giant Hogweed which was undertaken by the Castleconnell Fishery Association (CFA) (ESB, 2020a). ESB also note that volunteers sprayed Himalayan Balsam later in the year, which was mainly done at the bottom of the fishery near beats 5 and 6 (ESB, 2020a). In 2019, a planning application was put forward by the ESB to Clare County Council for a development near Conway's Canal, on the opposite side of the river to Castleconnell (Planning Ref No.: 19603). This development included a new pedestrian gate to the existing pedestrian bridge over the River Shannon, a new steel footbridge over Conway's Canal, 50m upstream of where it flows into the River Shannon, removing instream rubble in Conway's Canal and a new gate to the rear of Summerhill House. AECOM prepared an 'Appropriate Assessment Screening Report and Natura Impact Statement' for the proposed development as well as an 'Ecological Appraisal Report' (AECOM, 2019a & 2019b). Each of these reports note the presence of the Annex I Habitat *Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation* in Conway's Canal at the site (AECOM, 2019a & 2019b).

Table 4 Flowering Plant Species that have potential to be within the study area, based on National Biodiversity Data Centre online records for the 10km grid square R66.

Common Name	Scientific Name	Date of Last Record	Database	Invasive Species
Alternate Water-milfoil	*Myriophyllum alterniflorum*	17/06/1991	National Vegetation Database	No
Branched Bur-reed	*Sparganium erectum*	15/08/2020	Online Atlas of Vascular Plants 2012 Onwards	No
Brooklime	*Veronica beccabunga*	23/08/2020	Online Atlas of Vascular Plants 2012 Onwards	No
Bulbous Rush	*Juncus bulbosus*	14/07/2011	National Vegetation Database	No
Bulrush	*Typha latifolia*	19/06/1991	National Vegetation Database	No
Canadian Waterweed	*Elodea canadensis*	01/10/2008	River Biologists' Database (EPA)	Yes
Common club-rush	*Schoenoplectus lacustris*	15/08/2020	Online Atlas of Vascular Plants 2012 Onwards	No
Common Reed	*Phragmites australis*	15/08/2020	Online Atlas of Vascular Plants 2012 Onwards	No
Compact Rush	*Juncus conglomeratus*	15/08/2020	Online Atlas of Vascular Plants 2012 Onwards	No
Floating Sweet-grass	*Glyceria fluitans*	14/07/2011	National Vegetation Database	No
Flowering-rush	*Butomus umbellatus*	23/08/2020	Online Atlas of Vascular Plants 2012 Onwards	No
Fool's water-cress	*Apium nodiflorum*	06/03/2021	Online Atlas of Vascular Plants 2012 Onwards	No
Giant Hogweed	*Heracleum mantegazzianum*	05/05/2020	Online Atlas of Vascular Plants 2012 Onwards	Yes
Hemlock water-dropwort	*Oenanthe crocata*	03/05/2020	Online Atlas of Vascular Plants 2012 Onwards	No
Lesser water plantain	*Baldellia ranunculoides*	15/08/2020	Online Atlas of Vascular Plants 2012 Onwards	No
Nuttall's Waterweed	*Elodea nuttallii*	31/12/2006	National Invasive Species Database	Yes
River water-dropwort	*Oenanthe fluviatilis*	01/10/2008	River Biologists' Database (EPA)	No
Soft rush	*Juncus effusus*	15/08/2020	Online Atlas of Vascular Plants 2012 Onwards	No
Unbranched Bur-reed	*Sparganium emersum*	01/10/2008	River Biologists' Database (EPA)	No
Water forget-me-not	*Myosotis scorpioides*	15/08/2020	Online Atlas of Vascular Plants 2012 Onwards	No
Water Mint	*Mentha aquatica*	10/05/2021	Online Atlas of Vascular Plants 2012 Onwards	No
Water-cress	*Rorippa nasturtium-aquaticum*	25/05/2007	National Vegetation Database	No
Water-pepper	*Persicaria hydropiper*	14/07/2011	National Vegetation Database	No
Yellow Iris	*Iris pseudacorus*	15/08/2020	Online Atlas of Vascular Plants 2012 Onwards	No
Yellow water-lily	*Nuphar lutea*	08/06/2018	Online Atlas of Vascular Plants 2012 Onwards	No

4.1.3.1 Invasive Species

The Invasive Species Ireland database was accessed on the National Biodiversity Data Centre online maps for records in the study area. There are numerous records of high-impact invasive species in the area of Castleconnell. Upstream near the survey sites extent, there are records of Winter Heliotrope *Petasites fragrans* from 2016 and 2017. Downstream near the middle of Castleconnell town, there are further records of Winter Heliotrope as well as Giant Hogweed *Heracleum mantegazzianum* from 1987. Downstream of here, there are further records of Giant Hogweed again from 1987, as well as records of Himalayan balsam *Impatiens glandulifera* from downstream of Doonass footbridge from 2017.

Furthermore, there are records on the National Biodiversity Data Centre online maps of other invasive species which have been recorded from Lough Derg upstream. Due to the hydrological connection here there is some potential that these species could be spread within the wider study area. These records, and the date of their most recent record, are as follows: Least Duckweed *Lemna minuta* (2007), Water Fern *Azolla filiculoides* (2012), Water violet *Hottonia palustris* (2009), Canadian pondweed *Elodea canadensis* (1988), Curly waterweed *Lagarosiphon major* (2009) and Nuttall's Waterweed *Elodea nuttali* (2006).

4.1.4 Aquatic Fauna

4.1.4.1 Fish populations

McCarthy (1997) reported a total of 23 freshwater fish species in the catchment area above Limerick and noted that the fish community in the shannon includes a large proportion of introduced species. The fish community includes the European Eel *Anguilla Anguilla*, Flounder *Platichthys flesus*, Sea lamprey *Petromyzon marinus*, River lamprey *Lampetra fluviatilis*, Brook lamprey *Lampetra planeri,* Atlantic salmon *Salmo salar*, and Smelt *Osmerous eperlanus* (O'Connor, 2003). The Shannon also contains a variety of resident, or largely within catchment migratory species including Pollan *Coregonus autumnalis*, Brown trout *Salmo trutta*, Northern Pike *Esox Lucius*, Perch *Perca fluviatilis*, Bronze Bream *Abramis brama*, Roach *Rutilus rutilus*, Tench *Tinca tinca*, Minnow *Phoxinus phoxinus*, Gudgeon *Gobio gobio* and Rudd *Scardinius erythrophthalmus* (O'Connor, 2003).

The Lower River Shannon SAC at the site is designated for the presence of Atlantic Salmon, Sea lamprey, Brook lamprey, River lamprey and Otter, as outlined in Section 3.1.1. The site synopsis for the SAC notes that all three species of Lamprey and Salmon have been observed spawning in the lower Shannon or its tributaries. Kurz & Costello (1999) note that Castleconnell is one of the main spawning areas for Sea lamprey and Brook / river lamprey, based on observations from O'Connor, W. The report from Kurz & Costello further notes that the silt beds downstream of these areas in Castleconnell are utilised by ammocoetes of both species (Kurz & Costello, 1999).

Cullen, P & McCarthy, T. K. (2007) conducted a study of European Eel in the Lower River Shannon and with study site was located in Castleconnell. This survey included electrofishing on ten occasions between 1996 and 1997. A total of 1467 eels were captured over the study period (Cullen & McCarthy, 2007). This study also notes that large fish were absent from the diets of most of the Lower River Shannon Eel population, with larger eels requiring larger prey. Cullen & McCarthy describe the Eel population in the lower Shannon as dense in the lower reaches of a large river system (2007).

The National Biodiversity Data Centre also has records of bony fish from the 10km grid square R66. From the Freshwater Fish in Irish Lakes dataset there are records of Common Bream x Rudd *Abramis*

brama x Scardinius erythrophthalmus, European Eel and Pike, all with most recent records from 1995. From the Clare Biological Records Centre Dataset from 2004-2007 there are records of Common Bream, Common Carp *Cyprinus carpio* (invasive Species), Perch, Rudd and Tench, all with most recent records from 2005.

In 1959, a salmon hatchery unit was constructed at Parteen Regulating Weir by the ESB. This hatchery involved annual releases of juvenile salmon produced at the hatchery with the aim of recovery of wild salmon in the catchment area. A new fish-lock system was also installed at Ardnacrusha hydroelectric station, as part of a proposal by the ESB to investigate fish passage issues. These measures were introduced to attempt to conserve the salmon population in the River Shannon (ESB, 2020a). The River Shannon Salmon Management Programme was also set up in 1990 (ESB, 2020a). All hatchery reared smolt have been adipose fin-clipped since 1991, with selected breeding lines micro-tagged, as well as the retention of unfed fry for smolt production in the coming year (ESB, 2020a).

In 2010, the ESB established the Shannon Fishery Partnership following discussions with the Shannon Fisheries Preservation and Development Co Ltd (SFPDC). The partnership comprises representatives from the ESB, the SFPDC, IFI and an independent chairperson (ESB, 2020b). The aim of the partnership is to develop a structure to identify the needs of the fishery, ensure conservation and sustainable yield in line with scientific advise, develop a 5-year plan for maintenance and enhancement, enhance recreational angling and stakeholder involvement (ESB, 2020b). Programmes of work as outlined in the 2020 report include silver and juvenile eel trap and transport, tree and shrub clearance, instream habitat works, electrical fishing, recreational fishing infrastructure, fish counters, smolt release and salmon hatchery activities (ESB, 2020b). The report notes that the fish counter at Ardnacrusha and Parteen weir malfunctioned in 2020 (ESB, 2020b). Overall, this report shows that the wild salmon population in the River Shannon continues to decline and healthy populations are not being restored.

The Standing Scientific Committee on Salmon presented a report to Inland Fisheries Ireland on the Status of Irish Salmon Stocks in 2016, which also outlines the objective of meeting 'Conservation Limits' in relation to the Fisheries (Amendment) Act 1999 (Standing Scientific Committee on Salmon, 2017). This Conservation Limit is applied by SSCS to establish the status of individual stocks as defined by the International Council for Exploration of the Sea (ICES) and the North Atlantic Salmon Conservation Organisation (NASCO) (SSCS, 2017). This report utilised the 'Upper Shannon' which is noted to be above Parteen weir and the impoundment here at the hydroelectric station, and data was collected using fish counter data from IFI. The report shows that the Upper Shannon area is not meeting it's conservation limit, with 0.05 of its CL achieved, meaning a deficit of 47,156. SSCO therefore advise that restoration programmes be introduced (SSCO, 2017). The updated version of this report in 2020 prepared by Gargan, *et al.,* (2020) gives the average salmon count for the Upper Shannon catchment (above Parteen) as 1,429, meeting 5% of its conservation limit. The recommendation is the same, that there should be no harvest fisheries and restoration programmes should be given precedence (Gargan, *et al,* 2020).

Inland Fisheries Ireland (2019) *Report on Salmon Monitoring Programmes* for 2017 to 2018 gives results of salmon monitoring at a site near Castleconnell in the Old Main Channel, with a mean catch of 5.5 salmon fry/5 mins of fishing. This is compared with a total of 18.2 salmon fry/ 5 mins in 2018 and a total of 35.68 salmon fry/5 mins for the 2019 results of the Salmon Monitoring Programme by IFI (IFI, 2021).

4.1.4.2 Macroinvertebrates

The National Crayfish Plague Surveillance Programme was set up in 2018 and is jointly funded by the National Parks and Wildlife Service (NPWS) and the Marine Institute and assesses the prevalence of crayfish plague on the Island. Crayfish plague is now present in 34 catchments across Ireland, and some are located within the wider Shannon catchment. This includes the Shannon Estuary South catchment (24), Lower Shannon (25C) which is from Killaloe upstream to Portumna, Upper Shannon (26D), Upper Shannon (25G), Lower Shannon (25A) including the Brosna, Upper Shannon (26A) near Lough Allen and Upper Shannon (26B).

Freshwater White-clawed Crayfish *Austropotamobius pallipes* were also recorded most recently in 1994 from the River Biologists Database (EPA). Crayfish plague was reported in 2018 from the River Al in Athlone which is a tributary of the River Shannon. There is some potential that crayfish plague has spread this far down the catchment as this species has not been recorded since 1994 according to online records. As noted above, Crayfish plague has been reported in the catchment upstream of Killaloe.

There are numerous aquatic macroinvertebrate records for the 10km grid square R66. These records span across the following databases: River Biologists' Database, Aquatic Oligochaeta of Ireland, Clare Biological Records Centre Database 2004-2007, Water Beetles of Ireland, Caddisflies (Trichoptera) of Ireland, Dragonfly Ireland 2019 to 2024, Mayflies (Ephemeroptera) of Ireland and True Bugs (Heteroptera) of Ireland.

The annelids *Glossiphonia complanate* and *Potamothrix moldaviensis* have been recorded in the 10km grid square R66 from the River Biologist's Database (EPA) and Aquatic Oligochaeta of Ireland databases respectively.

A total of 21 aquatic beetles have been recorded in this grid square, including the following 3 threatened species: *Hydrocyphon deflexicollis, Hydroporus obsoletus* and *Nebrioporus depressus.* A total of 57 different species of Caddisflies have been recorded in the 10km grid square. None of these caddisfly species are noted to be threatened and most records are from 2015. For Dragonflies, a total of 16 different species have been recorded in this grid square and none of these species are threatened. The most abundant of these are the Large red damselfly *Pyrrhosoma nymphula*, Four-spotted chaser *Libellula quadrimaculata*, Common blue damselfly *Enallagma cyathigerum* and Common hawker *Aeshna juncea*. A total of 9 different species of Mayfly have been recorded including the threatened species *Rhithrogena germanica* which was last recorded in 1996. The most abundant mayfly in the 10km grid square is *Baetis rhodani*. For the True Bugs, a total of 5 species have been recorded. For True Flies, a total of 12 species have been recorded and none of these are noted to be threatened species.

4.1.4.3 Molluscs

The vulnerable and threatened Duck Mussel *Anodonta anatine* was last recorded in the 10km grid square in 1982, according to the All-Ireland Non-marine Molluscan Database. There is no potential for the Annex II species Freshwater Pearl Mussel to be present here. This species range is confined to the River Cloon which flows into the Shannon Estuary, far downstream of the study area. There is therefore no known population upstream of downstream of Castleconnell.

4.1.4.4 Invasive Species

There are also a number of invasive species relating to aquatic fauna that have been recorded in the 10km grid square R66, and indeed in other areas within the wider study such as Lough Derg upstream. Due to the hydrological connection, there is potential that these species could be spread to areas downstream. These species include the Zebra Mussel *Dreissena polymorpha,* which arrived in Lough Derg in 1990 and has colonised much of the area here including the study area at Castleconnell. The freshwater invasive mussel improves water clarity and has resulted in a shifting of ecosystems here, resulting in increased light penetration in areas, meaning reduced green algae and therefore having consequences for naturally occurring wildlife, fish and aquatic species. Other invasive aquatic fauna recorded in the wider study area upstream include Freshwater Shrimp *Crangonyx pseudogracilis* (2004), Bloody-red Mysid *Hemimysis anomala* (2009) and the Asian Clam *Corbicula fluminea* (2011). As previously noted, the invasive Common Carp was last recorded in 2005 from the Freshwater Fish in Irish Lakes dataset.

4.1.4.5 Mammals

The National Biodiversity Data Centre online maps show records of Otters in the study area as part of the Otter Survey of Ireland 1982 by the Vincent Wildlife Trust, with the record being droppings in 1980. There are no more recent recordings of Otters from the study area in this database. However, Otter are known to be present along this stretch of the River Shannon in the study area. The Otter Survey of Ireland 2004/2005 shows that these surveys indicated that Otters were present in 70.53% of sites in the Shannon River Basin District (which included some sites in the vicinity of Castleconnell), compared to 100% from the surveys in 1980/81 (Bailey & Rochford, 2006). Otter spraints were also collected as part of this study, which were then analysed to obtain the percentage occurrence of prey categories for each river basin district. This showed that frogs accounted for the highest percentage in the Shannon River Basin District at 42.9%, followed by Stickleback at 35.7% and Salmonids at 21.4%. Cyprinids (10.7%), Eels (17.9%), Stoneloach (3.6%), Birds (7.1%), Mammals (17.9%), Unidentified Bones (3.6%) and Crayfish (10.7%) comprised the remainder of prey items found in Otter spraint in the Shannon RBD (Bailey & Rochford, 2006). This also gives an indication of what aquatic prey items are present at Castleconnell, in particular with Eels, Stoneloach, Stickleback and Crayfish.

4.1.5 Water Quality

4.1.5.1 Biological Monitoring

The Environmental Protection Agency (EPA) carry out biological monitoring on a number of sites on the Lower River Shannon in the Lower Shannon Hydrometric Area (25). There are a total of 9 monitoring sites on the lower Shannon, including one at Castleconnell. The overall assessment of the lower Shannon from the EPA is as follows: *'Moderate ecological conditions persist in the Shannon at World's End, Castleconnell in August 2018'*. The most recent monitoring data available is from 2018.

The closest monitoring site upstream of Castleconnell is actually at Portumna, upstream of Lough Derg, with no monitoring points located in between this stretch on the Lower Shannon. The site upstream was most recently rated as Q4 in 1984 (EPA Station Code: 25S01 2300), corresponding to Water Framework Directive (WFD) status 'Good'. The site at Castleconnell is located at World's End, immediately upstream of the study area for the current baseline study. This site was most recently rated as Q34 in 2018 (EPA Station Code: 25S01 2500), corresponding to WFD Status 'Moderate'. Looking at the monitoring trends for the lower Shannon, no site was rated above Q4 since 1984, where the two

furthest upstream stations were rated as Q4-5, with one upstream of Banagher, Co. Galway, and one downstream. At the same time in 1984, all other sites surveyed on the lower Shannon were evaluated as being Q4. Declines were noted first from 1993, with the two lower sites, one at Castleconnell and one at Athlunkard Bridge in Limerick, rated as Q3-4. Both of these sites continued to receive this rating over the years, with the exception of Q4 in 2002 for the Castleconnell site, which subsequently fell again to Q3-4 to following monitoring year in 2008.

4.1.5.2 Water Framework Directive

The WFD set out objectives to be met by river waterbodies in Ireland before 2021. Waterbodies are then assessed for their potential risk of not meeting these objectives set out by WFD, and therefore are assigned a Risk rating. Waterbodies that are At Risk can then be prioritised for implementation of measures. The Lower River Shannon, from the base of Parteen reservoir at Ardnacrusha hydroelectric station up until the World's End immediately upstream of the study area at Castleconnell, is assessed as being 'At Risk'. After this point, the Shannon main channel, from Castleconnell up until its tidal are at Limerick City, is assessed as being 'Not At Risk'. Similarly, the WFD River Waterbody status for the period 2013-2018, was given as 'Moderate' for the area of Ardnacrusha hydroelectric station downstream to Castleconnell, while areas downstream of this point were 'Unassigned'. The catchments online maps also show that that River Shannon above Castleconnell does suffer from hydromorphology pressures.

4.1.5.3 Discharges

There are multiple wastewater discharges along the lower Shannon main channel. The first downstream of Lough Derg is at Ballina / Killaloe (Reg. No.: D0189-01). The most recent Annual Environmental Report for the plant is from 2019 (Uploaded on 27-8-20; Checked 2-11-21), which states that the plant is compliant with Emission Limit Values (ELVs) (Irish Water, 2019). However, the ambient monitoring results show that the plant is not meeting its required Environmental Quality Standards (EQS), with deteriorations noted for Ammonia, BOD, Ortho-P concentrations downstream of the discharge (Irish Water, 2019). The AER also noted that the plant is constructed for a i.e. of 4500 but the collected load is 5243 p.e. with no capacity remaining, meaning that the plant is currently overloaded. However it is note that it is not expected that the plant will exceed its capacity in the next three years, which leads to some uncertainty (Irish Water, 2019). There were 9 complaints of a blocked sewer in 2019, as well as incidents relating to a uncontrolled release due to pump failure and network infrastructure, breach of ELVs due to a sludge issue, and equipment offline due to maintenance, which were all reported to the EPA (Irish Water, 2019).

Further downstream, there is another wastewater treatment plant at O'Brien's Bridge, which is known as the Brookhaven, Montpelier plant (Reg. No.: A0499-01). This plant discharges directly into the River Shannon on the Montpelier, Limerick side of the river via a 400mm diameter open ended sewer (EPA, 2011). The Inspectors report for the plant states that the agglomeration has a population equivalent (p.e.) of 49, and the WwTP consists of primary treatment only with a septic tank, with a design capacity of 50 p.e. (EPA, 2012). There is a designated bathing water located in the vicinity of the discharge. An NIS was completed as noted in the Inspector's report, which stated that mitigation measures proposed include maintaining the current management regime of the septic tank, which if followed would therefore not adversely affect the integrity of the European Site(s) (EPA, 2012). No Annual Environmental Report (AER) has been completed for the plant (Checked 2-11-21).

Moving further downstream after O'Brien's Bridge, the next discharge point is at Castleconnell, which consists of a storm water overflow, within the study area. The Castleconnell agglomeration is treated at Castletroy WwTP, which discharges into the River Shannon downstream. The Castletroy WwTP deals with effluent from the following three agglomerations: Castletroy, Castleconnell, Mountshannon (EPA, 2009). The storm water overflow at Castleconnell is noted to be an emergency overflow at the pumping station but standby pumps are in place (EPA, 2009). The most recent Annual Environmental Report for Castletroy WwTP was completed in 2020 (Uploaded 11-8-21; Checked 2-11-21). This AER states that the plant is compliant with ELVs set out in the license, and the ambient monitoring results do meet required EQS (Irish Water, 2020). The design capacity of the plant is noted to be 45,000 p.e., with a collected load of 40,200 p.e., and a remaining capacity of 4,800 p.e. (Irish Water, 2020). There was one complaint for sewage noted in the 2020 report, and 13 no. incidents reported to the EPA in 2020, ranging from spillages to uncontrolled releases caused by weather and blocked sewers (Irish Water, 2020). There are further discharge points on the Shannon main channel downstream however the rest are located in the tidal sections of the river, with the Limerick City WwTP at Bunlicky, as well as at Shannon town and various agglomerations along the coast in the estuary.

4.1.6 Angling and Fisheries

Reale, A (2011) describes the Castleconnell fishery of the past which was once famous for large spring salmon, and significant declines were recorded following the construction of the Shannon hydroelectric scheme. O'Reilly (2002) describes the Castleconnell fishery as having 8 beats, each about a half mile long. It is noted here that salmon caught during recent times are a much lower weight than previous records, and that fishing on the Shannon in general has declined greatly in recent years, with the construction of the hydroelectric dam greatly reducing the volume of water in the flow of the old river (O'Reilly, 2002).

Significant fisheries modifications have been completed on this stretch of the River Shannon over the years. These modifications were introduced on the river in order to enhance habitat due to the 10m^3/s compensation flows as part of the Ardnacrusha Hydroelectric Scheme, but many of the works were completed during the 1980s and 1990s. Therefore when water is 'spilled' through Parteen Regulating Weir gates during high water events, the modifications are not suitable for these water levels and therefore are unfishable during these periods. The modifications set out to create salmon pools and include intrusive structures such as the wall at Beat 5 but have significantly altered the natural hydro-geomorphological processes. These works are also expected to have increased the likelihood of flood events in the area of Castleconnell, as they increase vegetation encroachment onto the river and thus reduce the rivers ability to hold water during flood events.

The 'River Shannon Fishery' article in the Old Limerick Journal from 1998 shows a map of the salmon pools once found at Castleconnell in 1941, which was after the construction of the Ardnacrusha Hydroelectric scheme but prior to the fisheries modifications undertaken in the 1980s and 1990s. This article notes that the river was full of big fish in 1928 and 1929, with one fish weighing close to 60lbs (Old Limerick Journal, 1998).

5. FIELD SURVEY RESULTS

5.1 Overview

5.1.1 Study Area

The extent of the field survey comprised a stretch of the Lower River Shannon c. 1.7rkm in length adjacent to Castleconnell. The study area takes into account the main areas affected by the proposed Castleconnell Flood Relief Scheme as well as areas both upstream and downstream of this point. The extent of the study area stretches from the Doonass Footbridge downstream of Castleconnell Village to an area known locally as 'Pa's Gap' upstream of the village. This survey stretch comprises areas that used to be well known as a fishery historically, and has undergone fishery modifications in the past. There are numerous weirs, side channels, walls, artificially created pools, islands and riparian woodland present here. The river is affected by extreme water abstraction and regulation as part of the operation of the Shannon hydroelectric scheme.

The width of the old River Shannon in the study area ranges from between 80m and 160m in wetted width. Some of the sites are located on side channels and adjacent small streams. Due to the fisheries modifications, flows are very varied here, even at individual sites. This results in a range of different vegetation types for both high flow and slow flowing water, as well as varied fish habitat. Vegetation encroachment is common in the study area.

5.1.2 Aquatic Flora

The protected habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion vegetation'* habitat is designated within the Lower River Shannon SAC. This habitat was not recorded on the River Shannon at Castleconnell during the current survey – but it does exist within the study area, for example in Conway's Canal.

There were several species of submerged vegetation recorded. The non-native invasive species Canadian waterweed *Elodea canadensis* was common throughout the survey area. This species out competes native species for nutrients and space and can lead to an overall decrease in biodiversity. Large stands of the species can cause anoxic conditions by reduced the movement of water (NIEA, 2020). Also present in high abundances were *Potamogeton spp.* including Pondweed *Potamogeton natans* and Curled Pondweed *P. crispus* can be found in a variety of habitats and is capable of withstanding in highly eutrophic conditions (Preston & Croft, 2001/1997). The species was recorded at several sites along the river at depths of up to c. 1.5m. Where it was it occurred in small groups which were widespread in the river. *P. natans* was also recorded throughout. This species was also recorded throughout the survey stretch. This species is most common in still and slow flowing waters but can also occur in faster moving waters (Preston & Croft, 2001/1997). This species tended to be more common in areas of allow flowing water on the river edges where Yellow water-lily also occurs. Yellow-water lily *Nuphar lutea* also occurs throughout the survey area and was strictly confined to areas of slow flowing water. In addition to these species the green algae *Cladophora sp.* was common in the survey stretch. The high occurrence of this species is indicative of enrichment. Filamentous algae was common in several areas.

Other submerged species which are present include Water milfoil *Myriophyllum* sp. which occurred sporadically throughout the survey stretch. In addition, Great water-moss *Fontinalis antipyretica* was common throughout and Bistort *Persicaria amphibia* occurred in discrete areas of slow-moving water.

The species Water-crowfoot *Ranunculion sp.* was also recorded. However, the Annex I habitat which it can form is not believed to occur in this stretch. The protected habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion vegetation'* habitat is designated within the Lower River Shannon SAC. When designating this habitat in the SAC the basis for selection was the presence of plant species such as *Ranunculus*, *Potamogeton* spp. and *Fontinalis antipyretica* (European Commission, 2007). There are three main sub types with this protected habitat. Two of the sub-types are associated with the tidal rivers: *Groenlandia densa* (L.) Four., Opposite-leaved Pondweed and *Schoenoplectus triqueter* (L.) Palla, Triangular Club-rush (NPWS, 2012b). The last sub-type is associated with fast-flowing stretches of unmodified streams and rivers and is not noted to occur at Castleconnell. During the survey *Ranunculus*, *Potamogeton spp.* and *Fontinalis antipyretica* were identified. While the species which make up this habitat were noted separately throughout the survey, due to high levels of siltation, filamentous algae and these areas being very localized with high proportion of *Potamogeton spp.* these areas are not considered to represent this Annex I habitat.

This habitat occurs in nutrient poor fast flowing waters. It is stated in the Article 17 reports that "*High conservation value sub-types are associated with natural hydrological regimes, including functioning floodplains*." The river here is not under a natural hydrological regime with ESB abstracting a significant proportion of the River Shannon flow which maintains a flow rate of 10cm^3 for large periods of time. There are also several fisheries modifications to the River Shannon upstream and in the survey stretch such as weirs, rocks and groynes. These have changed the river levels in areas resulting in some deeper areas and an increasingly confined channel. This is typically unsuitable for this habitat (NPWS, 2019; Hatton-Ellis and Grieve, 2003). Eutrophication and water pollution are also an issue. As stated above in Section 4.1.5 there are water quality issues here such as the WwTP at O' Brien's bridge, Ballina / Killaloe in addition to hydromorphological changes to the river. Cumulatively these impacts have made this section of the River Shannon generally unsuitable for the Annex I habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion vegetation'*.

Several species of emergent plants were also recorded which were confined to the edges, fishing features and islands. The dominant species present were Water Mint *Mentha aquatica*, Branched bur-reed *Sparangium erectum*, Unbranched Bur-reed *Sparganium emersum* and Water-cress *Rorippa nasturtium-aquaticum.* Also present in high numbers mostly on the river edges were Common Reed *Phragmites australis* and Reed sweet-grass *Glyceria maxima*. Other species recorded include Water Mint *Mentha* aquatica, Yellow Iris *Iris pseudacorus*, Fool's watercress *Apium nodiflorum,* Bull rush *Typha latifolia*, Common club-rush *Schoenoplectus lacustris* and Water Hemlock *Oenanthe crocata*.

5.1.3 Fish populations

A total of 15 fish species were recorded during the current survey. Atlantic Salmon and Brown Trout were present throughout the study area. Juvenile salmon numbers were very variable but locally abundant in suitable habitats. Adult salmon are also present in the study stretch and were seen during the survey. Brown Trout numbers were very low and salmon is the dominate salmonid in this stretch of the river. Small numbers of eels were recorded along the study stretch. Brook lampreys, River Lampreys, and Sea Lampreys were all recorded. However, lamprey numbers were considered to be very low and were absent from a number of areas despite habitats appearing to be physically suitable. Three-spined stickleback was one of the most common fish species recorded. One Flounder was recorded during the survey. Stone loach, Minnow, Dace, Roach, Gudgeon, Pike and Perch were also recorded. Overall, the fish community recorded was dominated by non-native cyprinid species. The most common fish species recorded was the non-native minnow.

5.1.4 Aquatic Macroinvertebrates

Aquatic macroinvertebrates in the study area spanned across 12 orders and a total of 34 different families. Overall there were only two Group A families recorded, and Group A species were only recorded at 3 sites within the study area. These Group A families were Family Heptagenidae and Ephemeridae, with three species present. These species were *Ecdyonurus* sp., *Ecdyonurus venosus* and *Ephemera danica* and were very scarce.

Group B pollutant sensitive species in the study area spanned across two orders and 5 different families. One stonefly *Leuctra hippopus* was present in the study area in small numbers. The remaining Group B species comprised cased caddisflies, with 4 species recorded. Group B species were recorded at every site in the study area, with some having higher diversity of species and greater numbers. The abundances ranged from present to small numbers.

Group C pollutant tolerant was the most common group across the study area, with the highest diversity also across the groups. Group C species were recorded across 8 different orders and 22 families. There were a total of four Group C mayflies recorded across 3 families. The large dark olive *Baetis rhodani* was present at every site with abundances ranging from scarce/few to fair numbers. The blue winged olive *Serratella ignita* was present at almost every site, mostly recorded in fair numbers. The freshwater shrimp *Gammarus* sp. was recorded at every site in the study area. Abundance of this species ranged from small numbers to numerous. One Class C leech was present and this was *Piscicola geometra*. Three bugs in Group C were present from families Notonectidae, Corixidae and Gerridae. This consisted of Water Boatman *Sigara distincta*, Common Backswimmer *Notonecta glauca* and water striders *Gerris* sp. A total of 7 species of snails in Group C were recorded in the study area. Abundances of these snails ranged from present to fair numbers, with *Lymnaea stagnalis* and *Bithniya tentaculata* both being recorded at each site and with the highest abundances. Two Group C beetles were present in the study area and these were *Haliplus rufieollis* and *Gyrinus caspius* with abundances ranging from present to small numbers. True flies in Group C were represented by *Similium* sp. and green chironomid, which were present at most sites. A total of 10 species of caseless caddisflies were recorded in the study area, across the families Hydropsychidae, Rhyacophilidae, Polycentropodidae and Philopotamidae. The most common species throughout the study area were *Polycentropus kingi, Hydropsyche* sp. and *Plectrocnemia geniculata.* Abundances of Group C species ranged from present to fair numbers, with *Hydropsyche siltali* having the highest abundance at one of the sites.

Group D very pollutant tolerant species in the study area were represented by two species, the crustacean *Asellus aquaticus* and the leech *Glossiphonia* sp. Each of these species were present at most sites in the study area, with abundances ranging from present to small numbers. Only one Group E species was recorded at the site in the family Chironomidae, represented by *Chironomous* sp. which was only recorded as present at each site it was found.

Overall the study area was represented by a macroinvertebrate family richness of between 19 and 28. The Q ratings were stable across all sites at Q3-4, corresponding to WFD status ‘Moderate’. There was a paucity of group A pollutant sensitive species in the study area and Group B species were not well represented, when compared to Group C pollutant tolerant species which were the most abundant and diverse. Group D and E very pollutant tolerant species were also not well represented, which reflects this ‘Moderate’ water quality rating.

5.2 Results from the Individual Survey Sites

5.2.1 Site 1

5.2.1.1 Site Location

Site 1 was located at Doonass bridge, which connects Clonlara, Co. Clare to Castleconnell, Co. Limerick. The kick sampling survey site in this location was located upstream of Doonass Bridge on the right bank as this is where the most riffle habitat was recorded. Lamprey survey site 1 (a) was located downstream of the bridge on the right bank. Lamprey survey sites 1 (b) and 1 (c) were located c. 163m upstream and c. 300m upstream of the footbridge respectively. These sites were both located on the left bank of the river. Lamprey survey site 1 (b) was located just adjacent to the confluence of an unregistered drain / stream in an area of silt on the bank of the river. Lamprey survey site 1 (c) was located on the left bank of the river on a bend, adjacent to riparian trees.

5.2.1.2 Aquatic Habitats

The habitat at this site was a mixture of riffle and glide. Several fishery features on the river here in the form of small weirs have formed riffles in the area. Riffles are most common upstream of Doonass Bridge on the right bank. There are two weirs upstream of Doonass Bridge which span the channel – upstream of these there is glide habitat. Glide is also present downstream of the bridge. There are small areas of pool habitat particularly, particularly in a back water channel upstream of Doonass Bridge on the right bank and also in the lamprey survey areas.

Water depth varies throughout the site, with depth being approximately 1m within 10m of the river bank. Water depth increases towards the middle of the channel with these areas being largely inaccessible by wading. The substrate also varies in parts, with larger boulders in areas of stronger flows and cobble and sand noted in areas with slower flows. At the edges of the river where vegetation occurs there are silt deposits also. There are several small instream islands at the site, the largest of which are on the right hand side of the river upstream of Doonass bridge. There were also silt deposits around these islands and they created some pool habitat. This area also had a high density of instream vegetation. The back channel of these islands had little flow in areas, high levels of shading and some filamentous algae growth along with a moderate level of silt.

During the lamprey survey a farmer came to site and washed a slurry tank out. This was done over the grass but localised pollution was caused by this activity.

5.2.1.3 Fish populations

A total of 191 individual fish comprising of 12 species recorded at Site 1. Juvenile Atlantic Salmon were recorded at the site. There were 16 individuals recorded which resulted in a CPUE of 3.2 fish / min. Low numbers of Brown Trout were recorded (0.8 fish / min). The most abundant fish species recorded was Minnow with 100+ individuals present, followed by Roach (n=30), and Three-spined stickleback (n=20). Also recorded at this site in smaller numbers (>10), and decreasing abundance were Dace, Stone Loach, Gudgeon, Eel, Flounder, Perch, and Pike.

A total of 37 juvenile lampreys were recorded at Site 1 during the group specific survey. The majority of lamprey recorded (n=35) were River / Brook Lamprey. There were 2 Sea Lamprey recorded at Site

1. This corresponded to a River / Brook Lamprey density of 3.89 lamprey/m^2 and a density of 0.22 lamprey/m^2 overall.

5.2.1.4 Aquatic Macroinvertebrates

A total of 30 macroinvertebrates species were found at Site 1. These were spread across 24 families. There were no pollutant sensitive Class A macroinvertebrates recorded at the site. There were several species Class B, pollutant sensitive macroinvertebrates recorded. These consisted of Caddisflies (Tricoptera), Damselflies (Zygoptera) and one True Bug (Hemiptera). These were all recorded in fair numbers. The cased caddisfly larvae of *Lepidostoma hirtum*, *Phryganea grandis* and *Potamophylax latipennis* were all recorded in small numbers. There were two species of damselfly recorded from the same family. These were *Calopteryx splendens* and *Calopteryx virgo*. These were both recorded in fair numbers. They were recorded most often during vegetation sweeps and were also observed as adults in flight. Lastly, the pollutant tolerant true bug *Aphelocheirus aestivalis* was recorded in fair numbers. Class C pollutant tolerant macroinvertebrates were the most common group recorded.

There was a total of 22 Class C species recorded consisting of Mayflies (Ephemoptera), Caseless Caddisflies (Trichoptera), True Flies (Diptera), Snails (Gastropoda), Crustaceans (Crustacea) and True Bugs. The most abundant were the mayfly larvae *Seratella ignita*, the caseless caddis fly larvae *Rhyacophila dorsalis,* the snail *Bithynia tentaculata*, the freshwater shrimp *Gammarus deubeni*, and the three true bugs *Notonecta glauca* and *Gerris* sp. Were all recorded in fair numbers. Class C species recorded in small numbers include the mayfly *Baetis rhodani*, black fly larvae *Similium* sp. and the snails *Lymnaea stagnalis.* There were six Class 6 species recorded as scarce/few. These included the caseless caddis flies *Hydropsyche augustipennis*, *H. pellucidulata*, *Rhyacophila dorsalis* and *Polycentropus kingi*. In addition, the true fly larvae green chironimid and the leech *Pisciola geometra* are Class C and were also recorded in scarce/few numbers. There were five Class C species recorded as present only. These were the caseless caddisfly larvae *Plectrocnemia conspersa* and *Polycentropus flavomaculatus.* Also recorded as present were the were three snail species including *Succinea putris*, *Theodoxus fluviatilis* and *Valvata cristata*.

There was on Class D and one Class E representative recorded at the site. These were the crustacean *Asellus aquaticus* and the *bloodworm Cironomous* sp. These were recorded in small numbers and as present respectively. The non-native invasive species the Zebra mussel *Dreissena polymorpha* was also recorded at the site.

Overall, Class C were the dominant macroinvertebrate group recorded at the site. However, Class B species were present in relatively high numbers and there was a general lack of Class D and E species. Due to this the site is rated Q3-4 equivalent to “Moderate” WFD status and indicative of slightly polluted conditions.

5.2.2 Site 2

5.2.2.1 Site Location

Site 2 was located on the main channel of the river (right bank) within the Castleconnell village area, on the stretch known as Castlelough and near Island House. The kick sample survey site was located within ruffle habitat just upstream of the main pool at Castlelough. Lamprey survey Site 2 (a) was located within Castlelough at the Ferry Playground carpark area. Lamprey survey Sites 2 (b) and 2 (c) were located upstream near at the confluence of the Island House distributary.

5.2.2.2 Aquatic Habitats

Compared to Site 1 the complexity of habitats at Site 2 is somewhat lower and is dominated by Castlelough. The kick sampling site was located at a weir spanning the river length at the site which has resulted in some riffle habitat being present. The water at this site varied greatly and access was very difficult. The middle sections of the river are very deep and it was not possible to wade here; while the edges range in depth from c. 1-2m. There are several established islands and also areas of instream emergent vegetation. The substrate throughout the site varies considerably. It compromised boulder at rock in the vicinity of the weirs. Upstream of the weird the substrate consists of sand / cobble. At the edges of the river there are deposits of silt. The average wetted width at Site 2 is c. 90m.

The weir at the kick sampling site compromised of old boulders. The wetted width at this weir is c. 80m. There is a further weir just upstream of the first one, with a length of c. 110m. This weir has some small islands near the left bank side. On the right bank there is a significant island with several trees upstream of this weir and not included in the site. Extensive filamentous algae was noted on the boulders at these weirs.

There are silt deposits in the area particularly at the lamprey survey sites. At lamprey survey Site 2 (a), there was no overhanging vegetation at this site and therefore no shading is present. There is also no emergent vegetation. At lamprey survey Site 2 (b) there is a small back channel. Due to the adjacent woodland and riparian vegetation, there is some shading on this site. There is also some emergent vegetation close by. The main flow is blocked here due to the back channel, so flows are slower, resulting in the build-up of algae in this glide/pool habitat. At lamprey survey Site 2 (c) there is some shading present due to the riparian trees as well as some emergent vegetation. The main flow is diverted into the middle of the channel due to the presence of the back channel downstream as well as a small section of trees separating the back channel from the main channel.

5.2.2.3 Fish populations

There was a total of 26 individual fish recorded at Site 2, comprising 4 species. There were no salmonids recorded at this site. The most common species was Three-spined stickleback with 10 individuals present followed by Stone Loach, Minnow, and Eel.

A total of 11 juvenile lampreys were recorded at Site 2. At Site 2 (a) there was 1, at 2(b) there were 3 and 2(c) there were 7. These were all identified as River / Brook Lamprey. The density of lamprey at the site was 1.22 lamprey pe m^2 which is considered to be very low.

5.2.2.4 Aquatic Macroinvertebrates

A total of 21 macroinvertebrate species spread across 19 different families were recorded at Site 2. The Class A pollutant sensitive Mayfly *Ephemera danica* was recorded at this site as scarce / few. A number of Class B pollutant sensitive species were also recorded at this site, with the highest abundances being 'Fair numbers' of both the True bug *Aphelocheirus aestivalis* and the Damselfly *Calopteryx splendens*. Other Class B species recorded included the cased caddis flies *Lepidostoma hirtum* and *Phryganea grandis* and the damselfly *Calopteryx virgo* at Present, Scarce/few and Scarce/few respectively in relation to abundances at this site.

Overall, the majority of macroinvertebrate species recorded at Site 2 were Class C pollutant tolerant macroinvertebrates. These species spanned across Mayflies (Ephemeroptera), Caseless caddis flies

(Tricoptera), True Flies (Diptera), Snails (Mollusca, Gastropoda), Crustaceans (Crustacea), Leeches (Hirunidae) and Bugs (Hemiptera). The most abundant were the freshwater shrimp *Gammarus deubeni,* common backswimmer *Notonecta glauca* and water striders *Gerris* sp. with numerous numbers. True flies were represented by *Similium* sp. with fair numbers at this site. The snails *Lymnaea stagnalis* and *Bithnynia tentaculata* were recorded in fair numbers and small numbers respectively. The Class C Mayfly *Baetis rhodani* was recorded as scarce/few at Site 2. Green chironomid were also recorded in small numbers. Class C species recorded as present at Site 2 include the caseless caddis flies *Polydentropus kingi, Plectrocnemia geniculata* and the snail *Theodoxus fluviatilis*.

There were two Class D Very pollutant tolerant species recorded at this site represented by leeches and crustaceans. The leech *Glossiphonia* sp. was recorded as present and the crustacean *Asellus aquaticus* was recorded in fair numbers. There was one Group E Most pollutant tolerant species recorded at Site 2 and this was *Chironomous* sp. The invasive zebra mussel *Dreissena polymorpha* was also recorded during the macroinvertebrate surveys, with the abundance of scarce/few.

Overall, Class C were the dominant macroinvertebrate group recorded at the site. However, one Group A species was recorded as well as some Group B species with some recorded as fair numbers. There was a general lack of Class D and E species and therefore this site is rated as Q3-4 equivalent to 'Moderate' WFD status and indicative of slightly polluted conditions.

5.2.3 Site 3

5.2.3.1 Site Location

Site 3 is located on a small stream adjacent to a residential dwelling called Island House. This stream is not registered by the EPA. The stream at Site 3 flows through an area of broadleaved woodland, which is located east of the main old River Shannon channel. Downstream of Site 3, the stream flows for c. 260rm before flowing into the River Shannon just downstream of Site 2. This site is adjacent to the Main Street in Castleconnell. The kick sample site is located just c. 22m downstream of The Elvers road bridge.

Lamprey survey site 3 (a) is located c. 35m downstream of the bridge site on the right bank of the stream. Lamprey survey site 3 (b). is located c. 65m upstream of site 3 (a) and c. 24m downstream of The Elvers road. Lamprey survey site 3 (c) is located on an adjacent drain / stream which is again not registered by the EPA. This site is located on the northern side of the entrance road to the residential dwelling here known as 'Island House'.

5.2.3.2 Aquatic Habitats

The stream at Site 3 is a relatively small waterbody consisting of mostly glide and pool habitat. This is a backchannel of the River Shannon and is immediately downstream of a bridge, which is to a private entrance of a house. This stream here has a wetted width of approximately 4m. The wetted width is uniform throughout most of this stretch however it does reduce to 2.5m in areas downstream of the bridge. The substrate at the site comprises a mixed substrate of cobble and stones. This area is heavily shaded as it flows through a woodland and there are several overhanging trees. This has resulted in a high level of canopy cover for most of the survey section of c. 70%. There is no large vegetation on the banks however they are covered in ivy. There were low levels of instream vegetation present. In this area is increased siltation when disturbed. There is no instream vegetation at this site and emergent vegetation is not common.

There are some silt deposits here such as approximately 35rm downstream of the bridge site at the edge of the bank. This was lamprey survey site 3 (a). The substrate here at this site however was mostly cobble making it sub-optimal for lamprey. The wetted width at this site is c. 3m. Again, this area is heavily shaded here by riparian trees as the stream flows through woodland. There is no instream vegetation and emergent vegetation is sparse. Moving upstream, at lamprey survey site 3 (b) substrate here is mostly cobble again and lamprey habitat is suboptimal. The area is heavily shaded by overhanging riparian trees. Some siltation is noted here. At lamprey survey site 3 (c) the wetted width is c. 2m. The main substrate present here is cobble and juvenile lamprey habitat is therefore again suboptimal. This site is heavily shaded by the woodland and overhanging riparian trees here. There is no instream vegetation.

At the Site 3 bank channel there was evidence of pollution. Due to the low flow there were significant siltation in areas. There was also filamentous algae growths on the siltation.

5.2.3.3 Fish populations

At Site 3 there were 33 individual fish recorded across 6 species. There were no Salmon recorded at this site but there was one Brown Trout. The most common species recorded were Minnow and Roach with 10 individuals of each. There were 7 Three-spined stickleback recorded, 3 Eel and 2 Stone Loach.

At Site 3 there were 5 juvenile lampreys recorded. Of these 4 were identified as River / Brook Lamprey and 1 as Sea Lamprey. All lampreys were caught at Site 3 (c). The density of River / Brook Lamprey was 0.44 lamprey/m^2 and of Sea Lamprey was 0.11 lamprey/m^2

5.2.3.4 Aquatic Macroinvertebrates

A total of 25 macroinvertebrate species were recorded at Site 3. This spanned across 24 different macroinvertebrate families. The Class A pollutant sensitive Mayfly *Ecdyonurus* sp. was recorded as present at this site and was the only Class A species recorded during the survey. Class B pollutant sensitive species were spread across 4 different families. The caseless caddisflies *Lepidostoma hirtum* and *Potamophylax latipennis,* in the Lepidostomatidae family and Limnephilidae family respectively were both recorded in small numbers. The Class B damselfly *Calopteryx splendens* was also recorded as scarce/few. The true bug *Aphelocheirus aestivalis* was also recorded in small numbers.

Overall, the majority of macroinvertebrate species recorded at Site 3 were Class C pollutant tolerant macroinvertebrates. These species spanned across Mayflies (Ephemeroptera), Caseless caddis flies (Trichoptera), True flies (Diptera), Beetles (Coleoptera), Snails Mollusca, Gastropoda), Crustaceans (Crustacea), Leeches (Hirudinae) and Bugs (Hemiptera). The most abundant were the freshwater shrimp *Gammarus deubeni* in common numbers. Recorded with the abundance of Fair numbers, were the Group C Mayflies *Serratella ignita* and *Baetis rhodani.* The following Group C species were recorded at Site 3 with an abundance of Small numbers: the snail *Lymnaea stagnalis* and the bugs common backswimmer *Notonecta glauca* and water striders *Gerris* sp. Class C mayfly *Caenis luctuosa* was recorded as present at Site 3, while the caseless caddisflies *Rhyacophila dorsalis* and *Polycentropus kingi* were recorded as scarce/few. Group C true flies were represented by *Similium* sp. and Green chironomid, both recorded as scarce/few. The water beetle *Haliplus ruficollis* was also recorded as scarce/few, while the larger coleopteran *Gyrinus caspius* was recorded as present. The Group C Snail *Bithniya tentaculate* was also recorded as present at Site 3. Finally for Group C, the leech *Piscicola geometra* was recorded as scarce/few.

Two Group D very pollutant tolerant species were recorded at this site represented by leeches and crustaceans. The leech *Glossiphonia* sp. was recorded as present and the crustacean *Asellus aquaticus* was recorded as scarce/few. There were no Group E species recorded at Site 3.

Overall, Class C were the dominant macroinvertebrate group recorded at the site. However, one Group A species was recorded and some Group B species were recorded in small numbers. There were only two Group D species and no Group E species at this site. Site 3 is rated as Q3-4 equivalent to 'Moderate' WFD status and indicative of slightly polluted conditions.

5.2.4 Site 4

5.2.4.1 Site Location

Site 4 was located on the main old River Shannon channel west of The Elvers road area. This survey site is located adjacent to an Island on side channel. The kick sample site is located c. 12m upstream of the weir across this side channel on the left bank. The kick sample site is located just downstream of riparian trees on an island in the main channel of the River Shannon. This island splits the main channel and results in two side channels here, and site 4 is located on the eastern side channel. The kick sample site is located in a riffle area where the flow is increased just downstream of the island. Vegetation sweeps were also carried out in emergent vegetation here.

Lamprey surveys site 4 (a) is located c. 43m downstream of the weir on the right bank. As this site is located on a bend in the river there are some accumulations of silt resulting in suitable juvenile lamprey site. Lamprey survey site 4 (b) is located c. 17m downstream of the weir, c. 12m in from the right bank of the side channel. Lamprey survey site 4 (c) is located c. 28m upstream of the weir at this side channel, on the right bank.

5.2.4.2 Aquatic Habitats

Survey Site 4 also shows high habitat complexity with several different substrates present, riffle, glide and pool habitat as well as a small weir and several different instream islands. There is a large instream Island c. 300m long here which splits the river channel. This island is heavily vegetated and has woodland habitat. There is another island to the east of this larger island and also included in the site. The survey at this site only concerned the left (east) side of the channel. On the right side the channel is much less vegetated and there are several weirs going from the largest instream island to the bank. On the subject side the channel width is c. 30m, but the width of the main river channel including the islands and side channels is c. 160m. The side channel has a slower flow than the main river channel here.

This survey site has been modified for fisheries in the past. There is a small weir at this site comprising rock and boulders and this crosses circa half the channel here. There is also a large stone platform jutting into the river here. The substrate here is predominantly rock / cobble. There are boulders around the fishery modifications. At the river edges and also in areas of low flow around the instream islands there are silt deposits.

At the kick sampling site there is a riffle area where the flow is increased just downstream of the island. The wetted width at this site is c. 28m. There are some algal growths on the substrates here which comprise mainly of cobble with some sand also present. There is no emergent vegetation at the kick sample site, which is more common downstream of the weir.

At lamprey survey site 4 (a) there is some riparian woodland with mature trees resulting in some shading of the survey site. As this site is located on a bend in the river which causes different flow rates across the channel, there are some accumulations of silt resulting in suitable juvenile lamprey site. There is some emergent vegetation in the shaded areas as well as some algal growths where flows are slower. Upstream from here in the vicinity of lamprey survey site 4 (b) there is minimal shading. There are some small islands downstream of the weir here and emergent vegetation is abundant. In between the vegetation there are some accumulations of silt where flows are slower and downstream of the islands, which provides suitable juvenile lamprey habitat. The wetted width here is c. 44m. Further upstream at lamprey survey site 4 (c) there is some emergent vegetation at this site but shading again is minimal. The wetted width at this site is c. 31m. There is suitable juvenile lamprey habitat at this site in the form of silt accumulations on the banks of the side channel. The islands at this site are located downstream of this point and none are present at lamprey survey site 4 (c).

Overall, this site has high levels of emergent and instream vegetation. *Ranunculus* sp were abundant in some areas particularly in the vicinity of the weir and the river channel and bank both had significant emergent vegetation such as Branched Bur-reed *Sparganium erectum*

5.2.4.3 Fish populations

At Site 4 there were 169 individual fish recorded, comprising of 11 species. This was the most productive site for juvenile salmon with 35 individuals recorded which resulted in a CPUE of 7 fish / min. For Brown Trout, there were 3 individuals recorded which is 0.6 fish / min. The most abundant fish species recorded was Minnow *Phoxinus phoxinus* with 55 individuals present, followed by Salmon and Three-spined stickleback *Gasterosteous aculeatus* (n=30). Also recorded at this site in relatively high numbers were Roach with 15 individuals, Dace with 12 and Stone Loach with 10. Other species recorded in smaller numbers (>10), and decreasing abundance were eel (n=4), Perch (n=2), River Lamprey (n=2) and Pike (n=1).

There were 16 juvenile lampreys recorded in the group specific surveys. They were all identified as River / Brook Lamprey, and none were recorded at Site 4 (b). The total density of River / Brook Lamprey at the site was 1.44 lamprey/m^2, which was again considered low.

5.2.4.4 Aquatic Macroinvertebrates

A total of 19 macroinvertebrate species were recorded at Site 4, each in different families. No Class A Pollutant sensitive macroinvertebrates were recorded at this site. A total of two species in Class B pollutant sensitive species were recorded and these were the cased caddisfly *Potamophylax latipennis* in the Limnephilidae family which was recorded as scarce/few, and the Damselfly *Calopteryx splendens* in fair numbers.

The majority of macroinvertebrate species recorded at Site 4 were Class C pollutant tolerant macroinvertebrates. Class C mayflies at this site were represented by *Baetis rhodani* and *Serratella ignita* which were recorded in as scarce/few and fair numbers respectively. Two species of caseless caddisflies were recorded at this site with *Hydropsyche* sp. in small numbers and *Polycentropus kingi* in scarce/few numbers. True flies were recorded at Site 4 with *Similium* sp. in fair numbers and Green chironomid recorded as present. One beetle in the Haliplidae family was recorded and this was *Haliplus rufieollis* in small numbers. Three species of snails were also recorded at Site 4. These were the Greater Pond Snail *Lymnaea stagnalis* as scarce/few, *Bithniya tentaculate* as present and the river nerite *Theodoxus fluviatilis* in scarce/few numbers. The most abundant Class C species at this site was the

freshwater shrimp *Gammarus* sp. in fair numbers. Finally for the Class C pollutant tolerant species were the bugs common backswimmer *Notonecta glauca* and water striders *Gerris* sp. both in small numbers.

Two Group D very pollutant tolerant species were recorded at this site represented by leeches and crustaceans. The leech *Glossiphonia* sp. was recorded as scarce/few and the crustacean *Asellus aquaticus* was recorded in small numbers. There were no Group E species recorded at Site 4.

Overall, Class C were the dominant macroinvertebrate group recorded at the site. No Class A species were recorded and only two Class B species were present. Two Group D species were recorded and no Class E species were present in the sample at this site. Site 4 is rated as Q3-4 equivalent to 'Moderate' WFD status and indicative of slightly polluted conditions.

5.2.4.5 Summary and Evaluation

Site 4 is rated as Q3-4 equivalent to 'Moderate' WFD status and indicative of slightly polluted conditions.

5.2.5 Site 5

5.2.5.1 Site Location

Site 5 is located on the main old River Shannon adjacent to The Elvers road. The site is located beside Rivergrove House. The kick sample site is located directly downstream of the small weir to the east. This site is c. 30m from the right (eastern) bank. Vegetation sweeps were also carried out in emergent vegetation here. Lamprey survey site 5 (a) was located c. 40m downstream of the small weir on the right bank. Lamprey survey site 5 (b) was located c. 56 upstream of lamprey survey site 5 (a) and is in an area of slower flow behind the wall that leads to the small weir. This site is c. 9m in from the right bank. Lamprey survey site 5 (c) is located c. 34m upstream of lamprey survey site 5 (b), and is also behind the wall that leads to the small weir. This site is on the right bank of the river where the wall starts and is immediately downstream of the wall.

5.2.5.2 Aquatic Habitats

Site 5 is characterised by several significant intrusive modifications. These consist of walls and weirs. These results in a variety of aquatic habitat. Again, there is a mixture of riffle, glide and pool habitat present. In the upstream section the habitat is predominantly glide and pool created by the downstream walls and weirs. Subsequently, these modifications have also resulted in riffle habitat and varying flow regimes at the site. The most dominant riffle habitat is downstream if a small weir feature. Directly upstream of here is glide habitat. On the downstream side of the walls there is pool habitat present. Depth also varies corresponding to the different habitats present. Area of riffle were the shallowed at c. 30cm deep. Glide habitat was the deepest present and was unwadable in sections at 2m+ depths. Pool habitat varied and where present at the river edges was c. 1m deep.

The entire wetted width of the main channel is c. 105m at this survey site. The site is located adjacent to a wall and a small weir which is c. 15m in length. There is a wooded instream island just downstream of the site. The flow at Site 5 is blocked due to a wall and so is located in a slower flowing section of the river. There are sections of small islands and areas of emergent vegetation all along this stretch. The side of the river with the BnB has low growing vegetation resulting in little to no shade, with the opposite side of the river having overhanging trees and branches resulting in higher levels of shade.

At the kick sample site downstream of the small weir to the east, there is a wall which leads to a small weir. The substrate comprises mainly cobble with some sand also present. The flow downstream of the weir results in a riffle type habitat. There are some algal growths also present on the substrate. There is some build-up of silt deposits here which was noted during the disturbance from kick sampling.

At lamprey survey site 5 (a) c. 40m downstream of the small weir on the right bank. there is emergent vegetation and some silt deposits providing juvenile lamprey habitat. There are also some mature riparian trees in this area. Downstream of this site there is a further side channel leading to an island connected by a bridge from a residential house. There is also some instream vegetation here. Upstream from here and towards lamprey survey site 5 (b) the amount of instream and emergent vegetation noticeably increases due to the change in flow rate from the main channel. There is also a lot of algal growths and silt deposits here due to the slow flow. Signs of enrichment were also noted. The wetted width of this small side channel behind the wall is c. 27m. Further upstream there are more areas of silt. These areas is away from the main flow of the channel and therefore also has evidence of algal growths and lots of emergent vegetation.

5.2.5.3 Fish populations

There was a total of 41 individual fish comprising 5 species recorded at this site. No Brown Trout recorded at this site. A total of 5 Salmon recorded, resulting in a CPUE of 1 fish/min. The most common fish species recorded were Minnow and three-spined Stickleback. Stone Loach and Gudgeon were also recorded.

At Sites 5(b) and 6(c) there were 13 juvenile River / Brook Lamprey recorded. There were no lamprey recorded at Site 5 (a) and there were no Sea Lamprey recorded at Site 5 overall. The 13 River / Brook Lamprey recorded resulting in an overall lamprey density of 1.44 lamprey/m^2.

5.2.5.4 Aquatic Macroinvertebrates

A total of 24 macroinvertebrate species were recorded at Site 5, spread across 22 different families. There were no Class A pollutant sensitive macroinvertebrates recorded at this site. A total of 6 different Class B pollutant sensitive species were recorded however. These were spread across two orders. Four cased caddisflies were recorded at Site 5, the Class B *Oecetis notata* and *Lepidostoma hirtum* both recorded as present, and *Phryganea grandis* and *Potamophylax latipennis* recorded as scarce/few and small numbers respectively. Two Class B damselflies were also recorded. These were *Calopteryx splendens* as scarce/few and *Calopteryx virgo* in small numbers.

The majority of macroinvertebrate species recorded at Site 5 were Class C pollutant tolerant macroinvertebrates. Class C mayflies at this site were represented by *Baetis rhodani*, *Serratella ignita* and *Centroptilum luteolum* which were recorded as small numbers, fair numbers and present respectively. Two species of caseless caddis flies were recorded at Site 5, with *Hydropsyche* sp. in small numbers and *Polycentropus kingi* recorded as present. One True fly *Similium* sp. was also recorded as scarce/few. One beetle in the Haliplidae family was recorded and this was *Haliplus rufieollis* as scarce/few. Four species of snails were recorded at Site 5. These were *Lymnaea stagnalis* and *Theodoxus fluviatilis* both recorded as present, with *Bithniya tentaculata* recorded in small numbers and *Planorbis carinatus* recorded as scarce/few. The freshwater shrimp *Gammarus* sp. was recorded as common at this site. One Class C leech was also recorded: *Piscicola geometra* which was present. Finally for the Class C pollutant tolerant species were the bugs common backswimmer *Notonecta glauca* and water striders *Gerris* sp. both in fair numbers.

One Group D very pollutant tolerant species were recorded at this site represented by the leech *Glossiphonia* sp. was recorded as present. There were no Group E species recorded at Site 5.

Overall, Class C were the dominant macroinvertebrate group recorded at the site. No Class A species were recorded and a total of 6 Class B species were present, with some in small numbers at this site. One Group D species was recorded and no Class E species were present in the sample at this site. Site 5 is rated as Q3-4 equivalent to 'Moderate' WFD status and indicative of slightly polluted conditions.

5.2.6 Site 6

5.2.6.1 Site Location

Site 6 was located on an area of the Lower River Shannon known locally as Pa's gap. Sampling at this site was undertaken both upstream and downstream and in the middle of the weir.

Lamprey survey site 6 (a) was located c. 49m downstream of the large weir and c. 11m upstream of the small weir and wall on the right bank of the river. Lamprey survey site 6 (b) was located c. 40m upstream of lamprey survey site 6 (a) and c. 10m downstream of the large weir on the right bank of the river. Lamprey survey site 6 (c) was located c. 10m upstream of the large weir across this site just c. 3m in from the right bank of the river.

5.2.6.2 Aquatic Habitats

Survey Site 6 was located at a prominent weir known as Pa's Gap. The entire river channel is c. 100m in width here. Water depth varies but is deeper towards the middle of the site at c. 1.5m. Substrates also varied but was largely dominated by large cobble with small patches of gravel in-between. Some large boulders were also observed. There was significant bankside vegetation at this site. At the kick sampling site itself there was no emergent vegetation. There were some submerged pondweeds present and significant filamentous algae growth. The substrate consisted of mainly cobble and some silt deposits were noted upon disturbance of the river bed. The wetted width of this area is c. 120m. Some algal growths were noted on the substrate in this area also. There is a pronounced riffle at the weir site. Upstream of this the habitat is glide with an area of pool on the left bank where there was silt deposits.

On the right side of the channel there were several instream islands coming from the bank and one significant one downstream. These area had the majority of instream vegetation however there was also quite a large growth of pondweed upstream from Pa's Gap. Other small islands were observed downstream of the sampling location. There was very little shading at the survey site due to lack of trees and the only vegetation present were bullrushes and grasses. Algae was observed throughout the river channel at Site 6. Excessive siltation was also observed during kick samples. Another feature comprising boulders across the river channel was located directly c. 62m downstream of the survey site. This feature was reaching c. 20m into the river.

On the left bank downstream where lamprey survey site 6 (a) was located there are silt deposits. There is no shading in this area and no large mature trees. Emergent vegetation is present along the bank however. Suitable juvenile lamprey habitat is present in the form of silt deposits on the edge of the river. Upstream on the same bank there remains no mature trees and minimal shading. There is significant bankside emergent vegetation here and silt deposits. In this area the wetted width is c. 95m. At lamprey survey site 6 (c) which was located c. 10m upstream of the large weir there were significant algal

growths noted and some silt deposits suitable for juvenile lampreys. This is slow flow glide habitat Emergent vegetation is nit present directly at the site but is present on the riverbank. There are also no islands present here. The wetted width is c. 100m at this point.

5.2.6.3 Fish populations

At Site 6 there was a total of 46 individual fish species recorded. There were 4 Salmon and 1 Brown Trout. This resulted in a CPUE for Salmon of 0.8 fish/min and for Brown Trout of 0.2 fish/min. the most common species recorded was Minnow with 20 individuals present. Following this there were 8 Three-spined Stickleback present, 3 Eel and 2 Stone Loach.

No juvenile lamprey recorded at Site 6. The river here is very modified with lots of introduced and moved rock. This may have affected lamprey numbers. Also, this is near the upper end of the fast water at Castleconnell and there is no further lamprey spawning habitat between the World's end car park and Parteen Regulation Weir. Sea Lampreys have been observed spawning below Pa's Gap in the past.

5.2.6.4 Aquatic Macroinvertebrates

A total of 33 species of macroinvertebrates were found. These were spread across 30 families. There was one species of pollutant sensitive Class A macroinvertebrates recorded on site. These were the mayfly *Ecdyonurus* sp, which was present. Table 5 illustrates the results recorded during the survey.

A total of 7 pollutant sensitive Class B macroinvertebrates were recorded. There was just one member of the family Leptoceridae recorded as present. This is the cased caddisfly, *Oecetis notata*. Three species were recorded as scarce/few. These are the damselflies *Calopteryx splendens* and *C. virgo*, and the cased caddisfly *Lepidostoma hirtum.* Two species recorded as small numbers was the stonefly *Leuctra hippopus*, and the caddisfly *Potamophylax latipennis*. There was just one species recorded in fair numbers. This was the True Bug, *Aphelocheirus aestivalis*, in the family Aphelocheiridae.

A total of 22 pollutant tolerant Class C macroinvertebrates were observed. Five species were recorded as present. These are the mayflies *Caenis lactulose* and *Centroptilum luteolum*, the caseless caddisflies *Plectrocnemia genticulata* and *Chimarra marginate*, and the Bug *Notonecta glauca*. Four species were recorded as scarce/few. These were the mayfly *Baetis rhodani*, the beetle *Haliplus refieollis*, and the bugs *Gerris* sp. and *Sigara distincta*. Thirteen species were recorded in small numbers. These are the leech *Piscicola geometra*, the freshwater shrimp *Gammarus deubeni*, the snails *Succinea putris Lymnaea stagnalis*, *Bithnyia tentaculata* and *Planorbis carinatus*, the beetle *Gyrinus caspius*, the mayfly *Serratella ignita,* and the caseless caddisflies *Hydropsyche angustipennis, H. siltalai, H. pellucidulata H. contubernalis* and *Polycentropus flavomaculatus*.

A total of two Class D and one Class E species were observed at the site. The Class D species was the leech *Glossiphonia* sp. recorded as present, and the freshwater louse *Asellus aquaticus* recorded as scarce/few. The only Class E species recorded was the bloodworm *Chironomous* sp. as present in the sample.

Overall, Class C dominated the sample (66.66%). However, there was a significant amount of Class B macroinvertebrates recorded (21.21%) in the sample. Due to the presence of Class A species, a relatively high amount of Class B and a low amount of pollution tolerant species (9.09%), a Q rating of Q3-4 has been given to this site.

Table 5 Relative abundances according to the DAFOR scale of the plant species recorded in the subject stretch of the River Shannon at Castleconnel.

Common Name	Scientific Name	Vegetation Type	Native and Non-native	Relative Abundance
Water Mint	*Mentha aquatica*	Emergent	Native	Occasional
Yellow Iris	*Iris pseudacorus*	Emergent	Native	Occasional
Curled Pondweed	*Potamogeton* crispus	Submerged	Native	Occasional - Frequent
Broad leaved Pondweed	*Potamogeton natans*	Submerged	Native	Occasional - Frequent
Pondweed	*Potamogeton* spp.	Submerged	Native	Occasional
Fool's watercress	*Apium nodiflorum*	Emergent	Native	Occasional
Watercress	*Nasturtium officinale*	Emergent	Native	Occasional
Bistort	*Persicaria amphibia*	Emergent	Native	Occasional
Branched bur-reed	*Sparangium erectum*	Emergent	Native	Frequent - Abundant
Reed sweet-grass	*Glyceria maxima*	Emergent	Native	Frequent
Bull rush	*Typha latifolia*	Emergent	Native	Occasional
Great water-moss	*Fontinalis antipyretica*	Submerged	Native	Frequent - Abundant
Yellow water lily	*Nuphar lutea*	Emergent	Native	Occasional
Canadian waterweed	*Elodea canadensis*	Submerged	Non-native	Occasional
Water-milfoil	*Myriophyllum sp.*	Submerged	Native	Occasional
Water-crowfoot	*Ranunculus sp.*	Submerged	Native	Abundant
Common club-rush	*Schoenoplectus lacustris*	Emergent	Native	Occasional
Common Reed	*Phragmites australis*	Emergent	Native	Frequent
Giant Hogweed	*Heracleum mantegazzianum*	Emergent	Non-native	Occasional
Water Hemlock	*Oenanthe crocata*	Emergent	Native	Occasional
Unbranched Bur-reed	*Sparganium emersum*	Emergent	Native	Occasional
Water-cress	*Rorippa nasturtium-aquaticum*	Submerged	Native	Occasional
Filamentous algae	*Cladophora*	Submerged	Native	Frequent - Abundant
Common Reed	*Phragmites australis*	Emergent	Native	Frequent

Table 6 Results of the aquatic macroinvertebrate surveys at the 6 sites on the old River Shannon at Castleconnell, Co Limerick.

	Pollution sensitivity group	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
MAYFLIES (Uniramia, Ephemeroptera)							
Family Heptagenidae							
Ecdyonurus sp.	A						*
Ecdyonurus venosus	A			*			
Family Ephemeridae							
Epemera danica	A		**				
Family Caenidae							
Caenis luctuosa	C			*			*
Family Ephemerellidae)							
Serratella ignita	C	****		****	****	****	***
Family Baetidae							
Centroptilum luteolum	C					*	*
Baetis rhodani	C	***	**	****	**	***	**
STONEFLIES (Plecoptera)							
Family Leuctridae							
Leuctra hippopus	B						***
CASED CADDIS FLIES (Tricoptera)							
Family Leptoceridae							
Oecetis notata	B					*	*
Family Lepidostomatidae							
Lepidostoma hirtum	B	***	*	***		*	**
Family Phryganeidae							

	Pollution sensitivity group	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Phryganea grandis	B	***	**			**	
Family Limnephilidae							
Potamophylax latipennis	B	***		***	**	***	***
CASELESS CADDIS FLIES (Trichoptera)							
Family Hydropsychidae							
Hydropsyche sp.				***	***	***	
Hydropsyche angustipennis	C	**					***
Hydropsyche siltalai	C	****					***
Hydropsyche pellucidulata	C	**					***
Hydropsyche contubernalis	C						**
Family Rhyacophilidae							
Rhyacophila dorsalis	C	**		**			
Family Polycentopodidae							
Polydentropus kingi	C	**	*	**	**	*	
Polycentropus flavomaculatus	C	*					***
Plectrocnemia conspersa	C	*	*	*			
Plectrocnemia geniculata	C						*
Family Philopotamidae							
Chimarra marginata	C						*
DAMSELFLIES (Odonata, Zygoptera)							
Family Calopterygidae							
Calopteryx splendens	B	****	****	**	****	**	**
Calopteryx virgo	B	****	**			***	**
TRUE FLIES (Diptera)							
Family Simulidae							
Similium sp.	C	***	****	**	****	**	
Family Chironomidae							
Green chironomid	C	**	***	**	*		
Chironomous sp.	E	*	*				*
BEETLES (Coleoptera)							
Family Haliplidae							
Haliplus rufieollis	C			**	***	**	**
Family Gyrinidae							
Gyrinus caspius	C			*			***
SNAILS (Mollusca, Gastropoda)							
Family Lymnaeidae							
Lymnaea stagnalis	C	***	****	***	**	*	***
Family Hydrobiidae							
Bithynia tentaculata	C	****	***	*	*	***	***
Family Planorbiidae							
Planorbis carinatus	C					**	***
Hippeutis complanata	C						
Family Succineidae							
Succinea putris	C	*					***
Family Neritidae						*	
Theodoxus fluviatilis	C	*	*		**	*	
Family Valvatidae							
Valvata cristata	C	*					
MUSSELS (Mollucsa, Lamellibranchiata)							
Dreissena polymorpha	-	*	**	***	****		
CRUSTACEANS (Crustacea)							
Amphipods (Amphipoda)							
Family Gammaridae							

	Pollution sensitivity group	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Gammarus sp.	C	****	*****	*****	****	*****	***
Family Asellidae							
Asellus aquaticus	D	***	****	**	***		**
LEECHES (Hirudinae)							
Family Piscicolidae							
Piscicola geometra	C	**		**		*	***
Family Glossiphonidae							
Glossiphonia sp.	D		*	*	**	*	*
BUGS (Hemiptera)							
Family Aphelocheiridae							
Aphelocheirus aestivalis	B	****	****	***	*	****	****
Family Notonectidae							
Notonecta glauca	C	****	*****	***	***	****	*
Family Corixidae							
Sigara distincta	C						**
Family Gerridae							
Gerris sp.	C	****	*****	***	***	****	**
Number of families		23	19	24	19	22	28
Q-Rating		**Q3-4**					
Biological Status		**Moderate Status (Slightly Polluted)**					

* Present = 1 individual, ** Scarce/Few = <1%, *** Small numbers = <5%, **** Fair numbers = 5-10%, **** Common = 10-20%, ***** Numerous = 25-50%, ****** Dominant = 50-75%, ******* Excessive = >75%

Table 7 Overall catch results from the 6 juvenile salmonid / general fish stock survey sites assessed using electrical fishing during August 2021.

Species		Site number / Fish numbers					
Common name	Scientific name	1	2	3	4	5	6
Salmon	*Salmo salar*	16	0	0	35	5	4
Trout	*Salmo trutta*	4	0	1	3	0	1
Eel	*Anguilla anguilla*	3	4	3	4	0	3
Minnow	*Phoxinus phoxinus*	100	5	10	55	25	20
Three-spined stickleback	*Gasterosteous aculeatus*	20	10	7	30	5	8
Stone loach	*Barbatula barbatula*	5	7	2	10	4	2
Flounder*	*Platichthys flesus*	1	0	0	0	0	0
Dace	*Leuciscus leuciscus*	6	0	0	12	0	5
Roach	*Rutilus rutilus*	30	0	10	15	0	3
Perch	*Perca fluviatilis*	1	0	0	2	0	0
Gudgeon	*Gobio gobio*	4	0	0	0	2	0
Pike	*Esox lucius*	1	0	0	1	0	0
River Lamprey	*Lampetra fluviatilis*	0	0	0	2	0	0

**Seen but not captured.*

Table 8 Electrical fishing site characteristics and salmonid CPUE for the 6 juvenile salmonid / general fish stock survey sites assessed during August 2021.

Site	1	2	3	4	5	6
Time fished (minutes)	5	5	5	5	5	5
Salmon (n)	16	0	0	35	5	4
Trout (n)	4	0	1	3	0	1
Salmon/min	3.2	0	0	7	1	0.8
Trout/min	0.8	0	0.2	0.6	0	0.2

Table 9 Overall catch results from the 6 juvenile lamprey survey sites assessed using electrical fishing during August 2021.

Site	Sub Site	River / Brook lamprey (n)	Sea Lamprey (n)	River / Brook lamprey (density)	Sea Lamprey (density)
1	A	7	1	2.33	0.33
	B	11	0	3.67	0.00
	C	17	1	5.67	0.33
	Total	**35**	**2**	**3.89**	**0.22**
2	A	1	0	0.33	0.00
	B	3	0	1.00	0.00
	C	7	0	2.33	0.00
	Total	**11**	**0**	**1.22**	**0.00**
3	A	0	0	0.00	0.00
	B	0	0	0.00	0.00
	C	4	1	1.33	0.33
	Total	**4**	**1**	**0.44**	**0.11**
4	A	4	0	1.33	0.00
	B	0	0	0.00	0.00
	C	12	0	4.00	0.00
	Total	**16**	**0**	**1.78**	**0.00**
5	A	0	0	0.00	0.00
	B	5	0	1.67	0.00
	C	8	0	2.67	0.00
	Total	**13**	**0**	**1.44**	**0.00**
6	A	0	0	0.00	0.00
	B	0	0	0.00	0.00
	C	0	0	0.00	0.00
	Total	**0**	**0**	**0.00**	**0.00**

Table 10 Summary statistics for length (cm) for salmon, trout, and eel captured during the August 2021 electrical fishing survey.

Species	Site	N	Mean	Min	Max	StDev
Salmon	1	16	8.34	4.70	13.10	2.46
Salmon	4	35	7.54	4.90	10.10	1.42
Salmon	5	5	7.90	5.30	9.80	1.69
Salmon	6	4	9.35	5.10	14.10	3.74
Species	Site	N	Mean	Min	Max	StDev
Trout	3	1	17.60	17.60	17.60	
Trout	4	3	15.37	7.90	23.10	7.60
Trout	6	1	13.00	13.00	13.00	
Species	Site	N	Mean	Min	Max	StDev
Eel	1	3	17.53	15.80	20.00	2.19
Eel	2	4	15.40	10.70	22.10	4.99
Eel	3	3	20.97	9.90	29.00	9.90
Eel	4	4	13.73	8.90	18.00	4.07
Eel	6	3	26.67	13.00	34.00	11.85

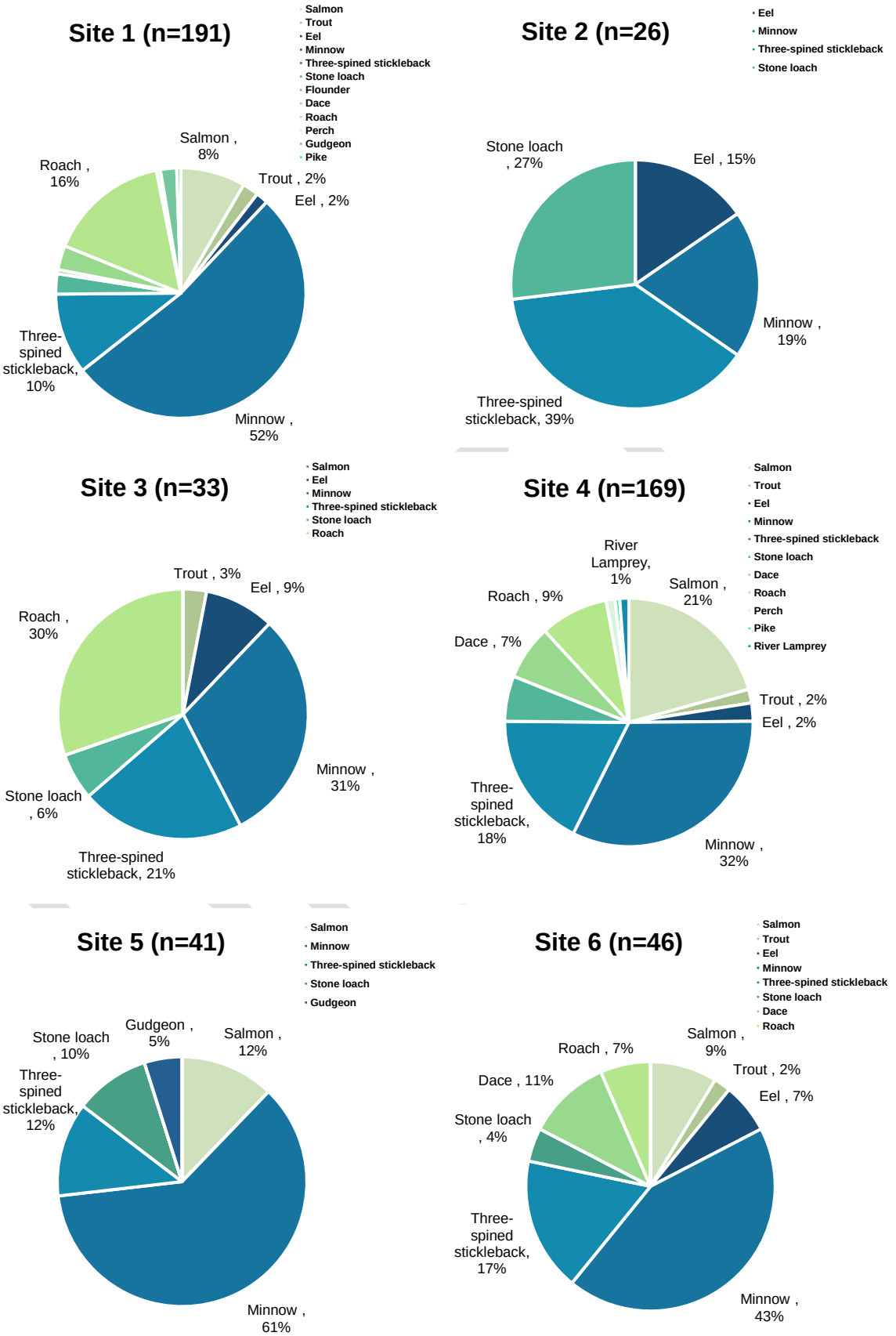


Figure 5 Relative abundances and total numbers of fish species recorded at 6 electrofishing sites on the River Shannon on Castleconnell during August 2021.

6. SUMMARY AND CONCLUSION

Limerick City and County Council is proposing a flood relief scheme for the village of Castleconnell, Co Limerick. The current report provides a baseline description of the aquatic ecology of the receiving environment. This report was based on a detailed desk study and a field survey completed Suring August 2021. This report does not provide an impact assessment or any mitigation for the proposed scheme.

The proposed flood scheme is located on and adjacent to the "old" River Shannon channel, which is the former main channel of the Shannon before the Shannon hydroelectric scheme. This section of river has been affected by extreme water abstraction and regulation since the 1920s. A statutory minimum "compensation flow" of 10 m^3 sec^{-1} is provided for the "old" River Shannon at Parteen Regulating Weir. The abstraction and regulation has had a profound effect on the ecology and hydromorphology of the river. However the channel remains for high ecological value and designated within the Lower River Shannon SAC. This site is designated for the protection of a wide range of habitats and species, including Floating river vegetation, Alluvial forests, Salmon, all three lamprey species and Otters, which have all been recorded in the wider study area. The "old" River Shannon used to be well known as a fishery historically, and has undergone fishery modifications in the past. There are numerous weirs, side channels, walls, artificially created pools, islands and riparian woodland present here. These modifications have also affected the aquatic ecology of the channel.

The current survey was completed during August 2021 and included a detailed desk study and field surveys at 6 sites within the area of the proposed flood scheme. Field work included habitat surveys, kick/sweep sampling for aquatic macroinvertebrates as well as a general fish stock assessment and juvenile lamprey survey.

The aquatic ecology of the study area is strongly influenced by the water abstraction/regulation, fisheries modifications, and background water quality. Biological water quality at all sites was rated as being unsatisfactory and the overall evaluation was 'Q3 - Moderately Polluted'. Water quality in this stretch of the river is affected by agricultural runoff throughout the Shannon catchment. However, during the current survey many agricultural impacts were observed – including a farmer washing out a slurry tank at Site 1. In the local area there are also untreated sewage inputs at O'Brien's Bridge and untreated discharge from the ESB salmon hatchery at Parteen Regulating Weir. There are multiple wastewater discharges in the wider study area, many of which are non-compliant with ELVs based on most recent available documents. The water abstraction and regulation reduces the assimilation capacity of the river. Although there are records of the Annex I habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]' from the general area, this habitat was not recorded at any of the survey sites. It is likely that the background unsatisfactory water quality, channel modifications, and the severe river regulation has made conditions generally unsustainable for this habitat. A range of common aquatic flora records have been noted for the study area, as well as invasive species such as Giant Hogweed, Himalayan Balsam, Curly waterweed and Nuttall's waterweed. The fish community of the river is dominated by non-native cyprinid species, including Minnow, Dace, and Roach. Juvenile salmon numbers were generally low but locally abundant in suitable riffle habitats. Eels were present at most of the sites in low densities. All three of the Irish lamprey species were recorded during the survey. However numbers were considered to be very low with juvenile lampreys absent in many areas of suitable habitat. Lampreys on this channel are also affected by the extreme water regulation. Also lamprey migration and habitats are impacted by the numerous fisheries structures in the channel. All migratory fish are impacted by Parteen Regulating Weir – which blocks lamprey migration. Salmon numbers above the Shannon dams are <5% of the

Conservation Escapement Target. The overall hydromorphology has been affected by the operation of Parteen Regulation Weir which prevents sediments moving along the river also. This affects spawning and nursey habitats for both salmonids and lampreys. Although juvenile salmon numbers were locally abundant, trout numbers in the river were surprisingly low.

Aquatic macroinvertebrates recorded showed an overall Q Rating at each site as Q3-4, which corresponds to Water Framework Directive status 'Moderate'. Family richness ranged from between 19 and 29 overall. There was a paucity of group A pollutant sensitive species in the study area, with the only species recorded being *Ecdyonurus* sp. and *Ephemera danica*. The highest abundance of the Group A species at any site was scarce/few. Group B species were not well represented, when compared to Group C pollutant tolerant species which were the most abundant and diverse. Group D and E very pollutant tolerant species were also not well represented, which reflects this 'Moderate' water quality rating. No rare or notable species were found. Freshwater White-clawed Crayfish were not recorded in the current survey but have been recorded here previously. A lack of recent records and the absence recorded during the current survey may indicate the presence of Crayfish plague, which has been reported further upstream in the catchment. There are records of Swan and Duck mussels (*Anodonta* spp.) from the Lower River Shannon but none were recorded during the current survey. Freshwater Pearl Mussels do not occur in the Lower River Shannon. The non-native invasive Zebra mussel was common at all sites. Water quality monitoring shows that overall ecological conditions in the study area are rated as Moderate.

Overall the Lower River Shannon in the vicinity of proposed flood scheme is a river in ecological decline as a result of water quality pressures, instream modifications, and river regulation. This is affecting the aquatic conservation interests of the Lower River Shannon SAC. Juvenile lamprey numbers in the channels near the proposed flood scheme features are very low. The habitats for salmon in the immediate of the proposed flood scheme are suboptimal, with no salmon recorded in the side channel that runs to the east of Island House. Lampreys were also absent from this channel. There are no protected or notable aquatic macroinvertebrates in the study area. Annex I floating river vegetation is also absent.

REFERENCES

AECOM, (2019a). Development at Castleconnell Fishery: Appropriate Assessment Screening Report and Natura Impact Statement. AECOM Ireland Limited, 4th Floor, Adelphi Plaza, George's Street Upper, Dun Laoghaire, Co. Dublin.

AECOM, (2019b). Development at Castleconnell Fishery: Ecological Appraisal Report. AECOM Ireland Limited, 4th Floor, Adelphi Plaza, George's Street Upper, Dun Laoghaire, Co. Dublin.

Bailey, M. and Rochford, J. (2006). Otter Survey of Ireland 2004/2005. Irish Wildlife Manuals, No. 23. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
https://www.npws.ie/sites/default/files/publications/pdf/IWM23.pdf

CFB (2008) Methods for the Water Framework Directive - Electric fishing in wadable reaches. Central Fisheries Board.

Conservation Ireland. 2018. Salmonid Waters – A guide to Irelands protected habitats & species. [online] Available at:
https://www.conserveireland.com/european/salmonid-waters

Cullen, P. and McCarthy, T. K. (2007). *Eels (Anguilla Anguilla (L.)) of the Lower River Shannon, with particular reference to seasonality in their activity and feeding ecology.* Biology & Environment Proceedings of the Royal Irish Academy. 107(2):87-94.

Environment Agency, (2003). *River Habitat Survey in Britain and Ireland Field Survey Guidance Manual: 2003 Version*' published by the Environment Agency, United Kingdom.

EPA, (2009). Inspector's Report for Castletroy Agglomeration Reg No. D0019-01.
https://epawebapp.epa.ie/licences/lic_eDMS/090151b2802a5f61.pdf

EPA (2011). Application Form for a Discharge License: Brookhaven, Montpelier.
https://epawebapp.epa.ie/licences/lic_eDMS/090151b2803f691b.pdf

EPA, (2012). Inspector's Report for agglomeration named Brookhaven, Montpelier Reg No. A0499-01.
https://epawebapp.epa.ie/licences/lic_eDMS/090151b2804392ed.pdf

EPA, (2021). 3rd Cycle Lower Shannon and Mulkear Catchment Report (HA 25D). Catchment Science & Management Unit Environmental Protection Agency. August 2021. Version No. 1.
https://catchments.ie/wp-content/files/catchmentassessments/25D%20Lower%20Shannon%20Catchment%20Summary%20WFD%20Cycle%203.pdf

ESB, (2017). Ardnacrusha Generating Station. Education Hub pdf
https://www.esb.ie/docs/default-source/education-hub/ardnacrusha-power-station#:~:text=Why%20was%20the%20hydro%20station,180%20cubic%20metres%20per%20second

ESB, (2020a). ESB Fisheries Conservation Annual Report (Year Ending December 2020). *A report on ESB fisheries conservation activities to the Department of Communications, Climate Action and the Environment.*
https://esb.ie/docs/default-source/fisheries/esb-fisheries-non-financial-annual-report-2020

ESB, (2020b). The 2020 Shannon Fisheries Partnership Report.

Fossitt, J.A. (2000) A Guide to Habitats in Ireland. The Heritage Council, Kilkenny.
Gargan, P., Fitzgerald, C., Kennedy, R., Maxwell, H., McLean, S. and Millane, M. (2021). *The Status of Irish Salmon Stocks in 2020 with Catch Advice for 2021.* Report of the Technical Expert Group on Salmon (TEGOS) to the North-South Standing Scientific Committee for Inland Fisheries. 53pp.
https://www.fisheriesireland.ie/sites/default/files/migrated/docman/The%20Status%20of%20Irish%20Salmon%20Stocks%20in%202020%20with%20Catch%20Advice%20for%202021.pdf

Gardiner, (2003). Identifying Lamprey. A Field Key for Sea, River and Brook Lamprey. Conserving Natura 2000 Rivers Conservation Techniques Series No. 4 English Nature, Peterborough.
http://publications.naturalengland.org.uk/publication/72035

Harvey J & Cowx I (2003). Monitoring the River, Brook and Sea Lamprey, Lampetra fluviatilis, L. planeri and Petromyzon marinus. Conserving Natura 2000 Rivers Monitoring Series No. 5, English Nature, Peterborough.

Heery, (1993). The Shannon Floodlands: A Natural History. *Tír Eolas*, Galway.

IFI (2010) Biosecurity protocols for fieldwork. Inland Fisheries Ireland.
https://www.fisheriesireland.ie/documents/73-biosecurity-protocol-for-field-survey-work-1/file.html

IFI, (2019). *Report on Salmon Monitoring Programmes (June 2017-June 2018) funded under the Salmon Conservation Fund.* Inland Fisheries Ireland IFI/2019/1-4491.
https://www.fisheriesireland.ie/sites/default/files/migrated/docman/Report%20on%20Salmon%20Monitoring%20Programmes%20%28June%202017-June%202018%29%20funded%20under%20the%20Salmon%20Conservation%20Fund.pdf

IFI, (2021). *Report on Salmon Monitoring Programmes 2020. Funded under the Salmon Conservation Fund.* Inland Fisheries Ireland IFI/2021/1-4544.
https://www.fisheriesireland.ie/sites/default/files/migrated/docman/Report%20on%20Salmon%20Monitoring%20Programmes%202020%20funded%20under%20the%20Salmon%20Conservation%20Fund.pdf

Irish Water, (2019). Annual Environmental Report: Ballina D0189-01.
http://epawebapp.epa.ie/licences/lic_eDMS/090151b280771492.pdf

Irish Water, (2020). Annual Environmental Report Castletroy D0019-01.
http://epawebapp.epa.ie/licences/lic_eDMS/090151b2807cd39d.pdf

Kurz, I. And Costello, M.J. (1999) An Outline of the Biology, Distribution and Conservation of Lampreys in Ireland. Irish Wildlife Manuals, No. 5.
https://www.npws.ie/sites/default/files/publications/pdf/IWM5.pdf

King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., FitzPatrick, Ú., Gargan, P.G., Kelly, F.L., O'Grady, M.F., Poole, R., Roche, W.K. & Cassidy, D. (2011) Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Kurz, I, and Costello, M. J., (1999). *An Outline of the Biology, Distribution and Conservation of Lampreys in Ireland.* Irish Wildlife Manuals, No. 5.
https://www.npws.ie/sites/default/files/publications/pdf/IWM5.pdf

McCarthy, T.K. (1997) Recreational Fisheries of Loughs Derg and Ree and some adjacent River Shannon habitats: Population Ecology, Parasitology and Disease. A Report to the Electricity Supply Board.

National Parks and Wildlife Service (2012a). Conservation Objectives: Lower River Shannon SAC 002165. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002165.pdf

NPWS, (2012b). Lower River Shannon SAC (Site Code 2165) Conservation objectives supporting document – water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (habitat code 3260). Version 1.
https://www.npws.ie/sites/default/files/publications/pdf/002165_Lower%20River%20Shannon%20SAC%20Water%20Courses%20Supporting%20Doc_V1.pdf

NPWS, (2012c). Lower River Shannon SAC (Site Code 2165) Conservation Objectives supporting document – woodland habitats. Version 1.
https://www.npws.ie/sites/default/files/publications/pdf/002165_Lower%20River%20Shannon%20SAC%20Woodland%20Supporting%20Doc_V1.pdf

O'Connor, W (2003). *Biology and Management of European Eel (Anguilla Anguilla, L) in the Shannon Estuary, Ireland.* Thesis submitted to National University of Ireland, Galway. Dr. William O'Connor, European Eel Consultancy, Tait Business centre, Dominic Street, Limerick City, Ireland.

Old Limerick Journal (1998). The River Shannon Fishery by John Rennie.
http://www.limerickcity.ie/media/Media,4115,en.pdf

O'Reilly, (2002). Rivers of Ireland: A Flyfisher's Guide. 5th Edition

Perrin, P., Martin, J., Barron, S., O'Neill, F., Mcnutt, K. & Delaney, A. (2008). National Survey of Native Woodlands 2003-2008. Volume 1: Main Report. Botanical, Environmental & Conservation Consultants Ltd. A report submitted to the National Parks and Wildlife Service.
https://www.npws.ie/sites/default/files/general/nsnw-vol-1.pdf

Reale, A. (2011). *The Shannon Scheme and It's effect on the Shannon Fisheries*.
https://www.limerick.ie/sites/default/files/atoms/files/the_shannon_scheme_and_its_effect_on_the_shannon_fisher.pdf

Standing Scientific Committee on Salmon, (2017). The Status of Irish Salmon Stocks in 2016 with Precautionary Catch Advice for 2017. Independent Scientific Report to Inland Fisheries Ireland.

https://www.fisheriesireland.ie/sites/default/files/migrated/docman/2017/research/The%20Status%20of%20Irish%20Salmon%20Stocks%20in%202016%20with%20Precautionary%20Catch%20Advice%20for%202017.pdf

Toner, P., Bowman J., Clabby, K., Lucey J., McGarrigle, M., Concannon, C., Clenaghan, C., Cunningham, P., Delaney, J., O'Boyle, S., MacCárthaigh, M., Craig, M. and Quinn R. (2005). Water Quality in Ireland 2001 – 2003. Environmental Protection Agency, Ireland

PLATES

Plate 1 Parteen Regulating Weir located upstream of the study area. Up to 97% of the water in the Lower River Shannon SAC is abstracted at this point to fuel Ardnacrusha hydroelectric station.

Plate 2 Parteen Regulating Weir with the old River Shannon (left channel) and headrace canal visible.

Plate 3 Ardnacrusha hydroelectric station with the headrace canal also visible.

Plate 4 Extreme water abstraction / regulation has had a profound impact on the old River Shannon within the study area. Flows are generally only 10 cumecs (which approximates the n99%ile flow).

Plate 5 Old River Shannon downstream of Castleconnell (with base 10 cumec flow).

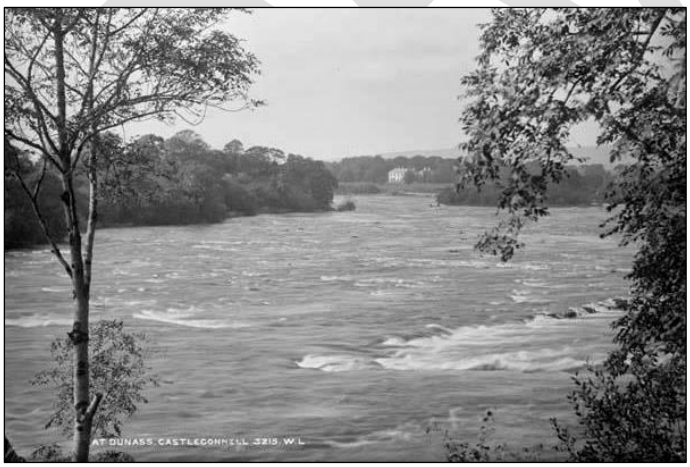


Plate 6 Lower River Shannon prior to the Shannon hydroelectric scheme. This is the same stretch of river shown in the Plate 4 and 5.

Plate 7 Adult Sea Lamprey from previous Ecofact work in the study area.

Plate 8 River Lampreys spawning in the Lower River Shannon SAC, April 2021.

Plate 9 The Lower River Shannon downstream of the of the Castleconnell footbridge, August 2021. This was Site 1 in the current survey.

Plate 10 Looking upstream from the Castleconnell footbridge, August 2021 (Site 1).

Plate 11 Looking downstream to the Castleconnell footbridge, August 2021.

Plate 12 Juvenile lamprey electrical fishing survey at Site 1 downstream of the Castleconnell footbridge, August 2021.

Plate 13 Kick sampling at Site 1 during August 2021.

Plate 14 Juvenile Brown Trout (top) and Atlantic Salmon from Site 1, August 2021.

Plate 15 Juvenile Sea Lamprey (top) and a River/Brook Lamprey ammocete from Site 1, August 2021.

Plate 16 Juvenile Sea Lamprey (top) and a River/Brook Lamprey ammocete from Site 1, August 2021.

Plate 17 Juvenile Sea Lamprey (top) and a River/Brook Lamprey ammocete from Site 1, August 2021.

Plate 18 Young-of-the-year juvenile salmon from Site 1.

Plate 19 European eels from Site 1, August 2021.

Plate 20 Gudgeon from Site 1 during the August 2021 survey.

Plate 21 Common Backswimmer (*Notonecta glauca*) from Site 1.

Plate 22 Agricultural impacts at Site 1. Farmer washed out the slurry tank at this site (via grass).

Plate 23 Lower River Shannon at Site 2. This part of the river is knowns as Castle Lough.

Plate 24 Juvenile lamprey survey at Site 2, August 2021.

Plate 25 Roach from Site 2 during August 2021.

Plate 26 The mayfly *Baetis rhodani* which was recorded at all sites in the study area.

Plate 27 Site 3 on a backchannel of the river, August 2021.

Plate 28 Dippers nest under the small bridge shown in Plate 17 (Site 3).

Plate 29 Electrical fishing survey at Site 3, August 2021.

Plate 30 Back channel of the river at Site 3 (proposed flood wall is nearby).

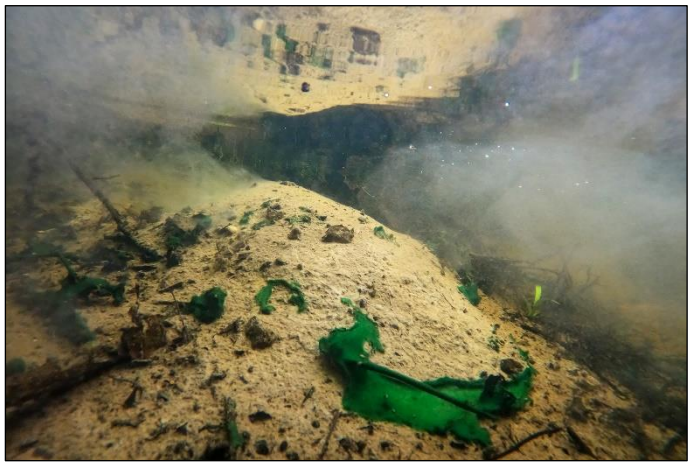


Plate 31 Silt pollution on one of the back channels at Site 3, August 2021.

Plate 32 Dace (top) and Roach from the general electrical fishing survey at Site 3.

Plate 33 Stone Loach (top) and Three-spined sticklebacks from the general electrical fishing survey at Site 3.

Plate 34 Stone Loach (top) and Minnows from the general electrical fishing survey at Site 3.

Plate 35 Juvenile lampreys from Site 3. The lower individual was a Sea Lampey ammocoete.

Plate 36 Dead Greater White-toothed Shrew (non-native species) on the riverbank at Site 3.

Plate 37 One of the channels of the old River Shannon at Site 4.

Plate 38 Survey site 4 on the channels of the old River Shannon.

Plate 39 Electrical fishing survey at Site 4, August 2021.

Plate 40 Juvenile salmon from Site 4, August 2021.

Plate 41 Juvenile salmon from Site 4, August 2021.

Plate 42 Juvenile salmon from Site 4, August 2021.

Plate 43 Fully transformed River Lampreys *Lampetra fluviatilis* from Site 4.

Plate 44 Perch recorded at Site 4 during the current survey.

Plate 45 Pike recorded at Site 4 during the current survey.

Plate 46 Amphibious Bistort *Persicaria amphibia* at Site 5.

Plate 47 Branched bur reed *Sparganium erectum* was a common emergent plant in the study area.

Plate 48 Juvenile salmon (left) and Brown Trout from Site 5.

Plate 49 Lower River Shannon at Site 6 showing one of the artificial fisheries weirs installed by the ESB. This one is known as “Pa’s Gap”.

Plate 50 Electrical fishing survey for juvenile salmonids at Site 6.

Plate 51 Kick-sampling at Site 6 during August 2021.

Plate 52 Eels recorded at Site 6 during the August 2021 survey.

Plate 53 Zebra mussel *Dreissena polymorpha* on a rock at Site 6. This species was present at all sites.

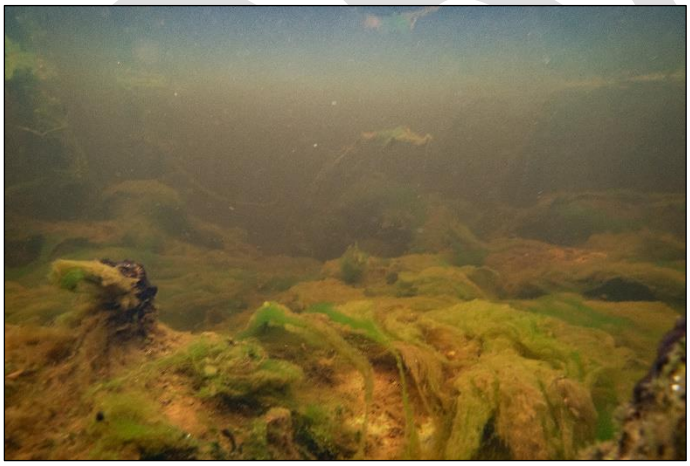


Plate 54 Lower River Shannon at Site 6 with eutrophication apparent – significant filamentous algae growth and siltation was recorded in this area. The sources of pollution affecting this area include agricultural runoff, untreated sewage discharges, and effluent from Parteen salmon hatchery.

8.7 eDNA Survey

Water sampling of the Cedarwood Stream was carried out on 13/09/2023 – This appendix includes results of eDNA survey Cedarwood results from SureScreen Scientifics

SureScreen Scientifics

Folio No: E19235
Report No: 1
Client: JBA Consulting
Contact: Johanna Healy

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN WATER FOR AQUATIC SPECIES DETECTION

SUMMARY

When aquatic organisms inhabit a waterbody such as a pond, lake or river they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm the presence or absence of the target species within the waterbody.

RESULTS

Date sample received in laboratory: 19/09/2023
Date results reported: 03/10/2023
Matters affecting result: None

TARGET SPECIES: Brook Lamprey *(Lampetra planeri)*

Lab ID	Site Name	OS Reference	SIC	DC	IC	Result	Positive Replicates
FK947	**Castleconnell- Grange House**	**R6613563302**	Pass	Pass	Pass	**Negative**	**0/12**

SureScreen Scientifics

TARGET SPECIES: European Eel *(Anguilla Anguilla)*

Lab ID	Site Name	OS Reference	SIC	DC	IC	Result	Positive Replicates
FK947	**Castleconnell- Grange House**	**R6613563302**	Pass	Pass	Pass	**Positive**	**12/12**

TARGET SPECIES: Sea Lamprey *(Petromyzon marinus)*

Lab ID	Site Name	OS Reference	SIC	DC	IC	Result	Positive Replicates
FK947	**Castleconnell- Grange House**	**R6613563302**	Pass	Pass	Pass	**Negative**	**0/12**

TARGET SPECIES: Smooth Newt *(Lissotriton vulgaris)*

Lab ID	Site Name	OS Reference	SIC	DC	IC	Result	Positive Replicates
FK947	**Castleconnell- Grange House**	**R6613563302**	Pass	Pass	Pass	**Negative**	**0/12**

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: **Lauryn Jewkes** Approved by: **Chelsea Warner**

METHODOLOGY

The samples detailed above have been analysed for the presence of target species eDNA following scientifically published eDNA assays and protocols which have been thoroughly tested, developed and verified for use by SureScreen Scientifics.

The analysis is conducted in two phases. The sample first goes through an extraction process where the filter is incubated in order to obtain any DNA within the sample. The extracted sample is then tested via real time PCR (also called q-PCR) for each of the selected target species. This process uses species-specific molecular markers (known as primers) to amplify a select part of the DNA, allowing it to be detected and measured in 'real time' as the analytical process develops. qPCR combines amplification and detection of target DNA into a single step. With qPCR, fluorescent dyes specific to the target sequence are used to label targeted PCR products during thermal cycling. The accumulation of fluorescent signals during this reaction is measured for fast and objective data analysis. The primers used in this process are specific to a part of mitochondrial DNA only found in each individual species. Separate primers are used for each of the species, ensuring no DNA from any other species present in the water is amplified.

If target species DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If target species DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

SureScreen Scientifics Ltd is ISO9001 accredited and participate in Natural England's proficiency testing scheme for GCN eDNA testing. We also carry out regular inter-laboratory checks on accuracy of results as part of our quality control procedures.

INTERPRETATION OF RESULTS

SIC: **Sample Integrity Check** [Pass/Fail]
When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.

DC: **Degradation Check** [Pass/Fail]
Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample, between the date it was made to the date of analysis. Degradation of the spiked DNA marker may indicate a risk of false negative results.

IC: **Inhibition Check** [Pass/Fail]
The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result: **Presence of eDNA** [Positive/Negative/Inconclusive]

Positive: DNA was identified within the sample, indicative of species presence within the sampling location at the time the sample was taken or within the recent past at the sampling location.

Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for species presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. Even a score as low as 1/12 is declared positive. 0/12 indicates negative species presence.

Negative: eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of species absence, however, does not exclude the potential for species presence below the limit of detection.

Inconclusive: Controls indicate inhibition or degradation of the sample, resulting in the inability to provide conclusive evidence for species presence or absence.

8.8 Arborist Report

Castleconnell FRS, Limerick:

BS5837 – Tree Survey, Arboricultural Impact Assessment (AIA)

October 2022

www.jbaconsulting.com

Draft Report

For and on behalf of:

OPW Oifig na nOibreacha Poiblí Office of Public Works

Tionscadal Éireann Project Ireland 2040

Comhairle Cathrach & Contae Luimnigh
Limerick City & County Council

JBA Project Manager

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BD18 3LF

Revision History

Revision Ref/Date	Amendments	Issued to
S3-P01 October 2022	Draft Report	Design Team

Contract

This report relates to the Castleconnell Flood Relief Scheme (FRS) commissioned by Limerick City and County Council, on behalf of the Office of Public Works. Stephen Tester of JBA Consulting carried out this work.

Prepared by ..... Stephen Tester BSc (Hons) Arbor, MArborM
Arboricultural Consultant

Reviewed by ..... Simon Watkins BSc MSc (Eng) MSc, CMLI
Principal Landscape Architect

Purpose

This document has been prepared as a Draft Report for the Design Team. JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared. JBA Consulting has no liability regarding the use of this report except to Limerick City and County Council and the Office of Public Works.

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Executive summary

JBA was commissioned to prepare a tree condition and value survey, and an Arboricultural Impact Assessment in accordance with BS5837:2012 Trees in relation to design, demolition, and construction.

The trees were assessed visually from ground level from the 19th to the 20th of October 2022. The survey has considered and recorded 227 assets including, 212x individual trees, 9x groups, 2x hedges, and 4x wooded area, which have been categorised according to BS 5837:2012 and are summarised below:

- 13 no. assets were found to be unsuitable for retention – CAT U
- 8 no. trees – were found to be of CAT A – High quality
- 37 no. individual trees were found to be of moderate quality – CAT B
- 169 no. individual trees, 2x groups & 2x woodland were considered to be of low quality – CAT C

It is noted that design Options 1, 2, and 3 as outlined in supporting documentation share similar design features, with only major differences in the potential impacts being limited to the area from Mall House to Meadowbrook Estate. It was therefore considered, unless otherwise specified, that the impacts described in the sections are a shared impact of the three Options.

In summary, a total of 55x individual trees (4x CAT B, 47x CAT C & 4x CAT U) and 3x Groups (CAT C) & 1x Hedgerow (CAT C) and combined wooded areas of 4070m² (CAT C) will need to be cleared for all three Options.

Additional removals would be needed dependent on which design option is progressed, and is summarised as:

- Option .1 would require the additional removal of 9x individual trees (7x CAT C, 2x CAT B) and a wooded area of 20 trees (CAT B).
- Options .2 & .3 would require the additional removal of 21x (CAT C) trees.

Depending on the outcome of recommended further investigation and consideration, the removal of T15, T017, T018, & T021 (3x CAT A, 1x Cat B) may need to be undertaken for all three options proposed. But at this time this has not been confirmed. Root investigation for these four mature and high amenity beech trees (T015, T017, T018, & T021) has been recommended to consider the viability of their retention, whilst allowing for the installation of a new culvert within proximity of these trees. Until further investigation has been undertaken no tree protection measures (fencing or ground protection) have been specified within proximity of these trees. This is because their retention cannot be considered viable at this juncture. Following further investigation, if their retention is achievable, then it is foreseeable that this will require a specialist methodology (such as by air pick excavation or directional tunnelling, under Arboricultural Supervision) may be required in order to allow for the retention of these trees. The alternative to further investigation is to specify their removal with considerations on replacement planting.

The extent of pruning works does differ between Options 1, and Options 2 & 3. For options 2 and 3 a total of 5x trees are required to undertake the proposal. For Option 1 a total of 16x trees will need to be pruned.

Three apple trees (T31-T33) and 1x Viburnum, 1x Pagoda, and 1x magnolia (T007-T009) of relatively limited amenity, but of notable importance to local residents. They have been shown for removal and counted in the removal totals, but it has been requested by residents and the design team, that these trees are to be relocated whilst the works are being undertaken, with a view of returning them to similar locations once works have been completed.

The survey identified two Veteran trees T075 & T092, but no ancient trees. T092 a Poplar was in a declining condition and is reaching the end of its safe useful life expectancy (CAT U), its removal is recommended. T075 a Cedar has been the subject of multiple branch failures, and retaining branching is noted to be extended with notable end weight, a tip reduction of weighted branching has been recommended. Both recommendations are not directly linked to enabling the Flood Relief Scheme, so has not been included in the removals or pruning figures, within this report.

The protection of the rest of the retained trees is considered achievable with the use of appropriate ground protection, and tree protection fencing. In addition, works such as manual excavation will be needed in certain locations such as along the Island House Driveway. All protection measures should be undertaken in accordance with BS5837:2012 'Trees in relation to design, demolition and construction – Recommendations.' Indicative tree protection measures are shown on the Tree Protection Plans where protection is needed during construction work. Again, this has been separated between Option 1 & Options 2 & 3, within Appendix D.

The Council may request that a pre-start site meeting is undertaken to ensure that the protection measures are in accordance with the recommendations outlined in this report. This is to safeguard the trees on and around the site during the continuation of the development processes.

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Abbreviations

AMS	Arboricultural Method Statement - Tree protection information
AIA	Arboricultural Implication Assessment - The assessment of the project on trees
BS5837	British Standard 5837: 2012 Trees in relation to design, demolition and construction - Recommendations.
CEZ	Control Exclusion Zone.
RPA	Root Protection Area.
LA	Local Authority.
RLSB	Red Line Site Boundary
TCP	Tree Constraints Plan.
TPO	Tree Preservation Order, a legal order issued by the LPA to protect trees.
TPP	Tree Protection Plan.
OPW	Office of Public Works

1 Introduction

1.1 Scope & brief

1.1.1 This Tree Condition & Value Survey was commissioned to identify any arboricultural constraints and assess the health and condition of the trees growing at the site and where appropriate describe appropriate recommendations for mitigation.

1.1.2 The Tree Survey was carried out in accordance with BS5837:2012 – Trees in relation to design, demolition, and construction – Recommendations, and the results of this survey will be used to inform the Arboricultural Impact Assessment which is the second part of this report.

1.1.3 The project is currently in the options appraisal stage and to support this process, the survey has been undertaken so that the various options under consideration can be compared. The survey is therefore considered to have been undertaken 'prior to development' as no works associated with the proposal have commenced at the time of writing.

1.2 Site Location and survey boundaries

1.2.1 Castleconnell is located approximately 10km northeast of Limerick City and the River Shannon forms the western boundary of the village.

Figure 1-1 Site location plan with indicative RLSB, image taken from Apple Maps

1.2.2 The area of the survey is north/ northwest of the main urbanised area of Castleconnell. A nominal location of the Post Office in Castleconnell's high street (shown as a blue point in Figure 1-1) has been chosen as a recognisable point and is approximately center to the

overall site boundary.

1.2.3 The address for the post office is: Main St, Cloon, Castleconnell, Co. Limerick, V94 TXN1, Ireland

1.2.4 The Grid Reference is: R 66162 62619

1.2.5 The corresponding *What3Words* location is: equestrian. vertically. obediently

1.3 Report limitations

1.3.1 Trees surveyed are situated on the left (east) bank of the River Shannon and were either within the red line site boundary (RLSB) by virtue of being within proximity and of a size that could have an influence on the management and or the proposal.

1.3.2 Not all trees shown on the Topographical survey such as those within garden and wooded areas were surveyed. Only trees within the influence of the proposals (see section 2) were surveyed. Only trees immediately within areas of proposed flood remediation works were surveyed. This was considered a proportionate approach to ensure the survey focussed on the proposal's impacts.

1.3.3 'Stream Maintenance' as indicated in Options 1, 2 & 3 in the location of Cedarwood Grove and Castle Court, were outside of the survey area and has not been included within the considerations of this report.

1.3.4 The trees identified in the survey were assessed visually from ground level. No aerial/ climbing inspections, removal of ivy, nor detailed investigation of the condition/ decay of the trees was undertaken.

1.3.5 At the time of publication only a Tree Survey and Impact Assessment has been undertaken. A request for an Arboricultural Method Statement (AMS) has not been made and would potentially be dependent on which option is taken forward.

1.3.6 Full limitations of this report & disclaimers are provided in Appendix A.

2 The Proposal

Castleconnell and the surrounding area were affected by flooding by the River Shannon in 2009 and 2015, following periods of prolonged rainfall. The Office of Public Works (OPW), working in partnership with Limerick City and County Council and other local authorities, commissioned JBA Consulting to assess, develop and design an appropriate, cost-effective, and sustainable flood relief scheme that aims to minimise risk to the existing community, social amenity, environment and landscape.

As part of this works JBA was commissioned to undertake a Tree Condition and valuation Survey and AIA, to inform on the feasibility and impacts of the Flood Relief solutions, which were indicated as options 1, 2, and 3.

Further details should be sort from the supporting documentation, but the following is a summary of the options:

- New flood walls & ancillary works to the northern properties on Elvers Road;
- Road raising (and demountable barrier – Options 1 & 3) north of the Scanlon Park entrance;
- New flood defence wall along the Mall Road from Mall House to Island House;
- Road raising and demountable barrier or raising of the causeway at the Island House Entrance;
- New flood defence wall from Island House to the rear of Maher's pub;
- New flood embankment to the north-west of Meadowbrook estate;
- Road raising and demountable barrier at the Coolbane Woods junction;
- New flood embankment on the south side of the Coolbane Wood access road.

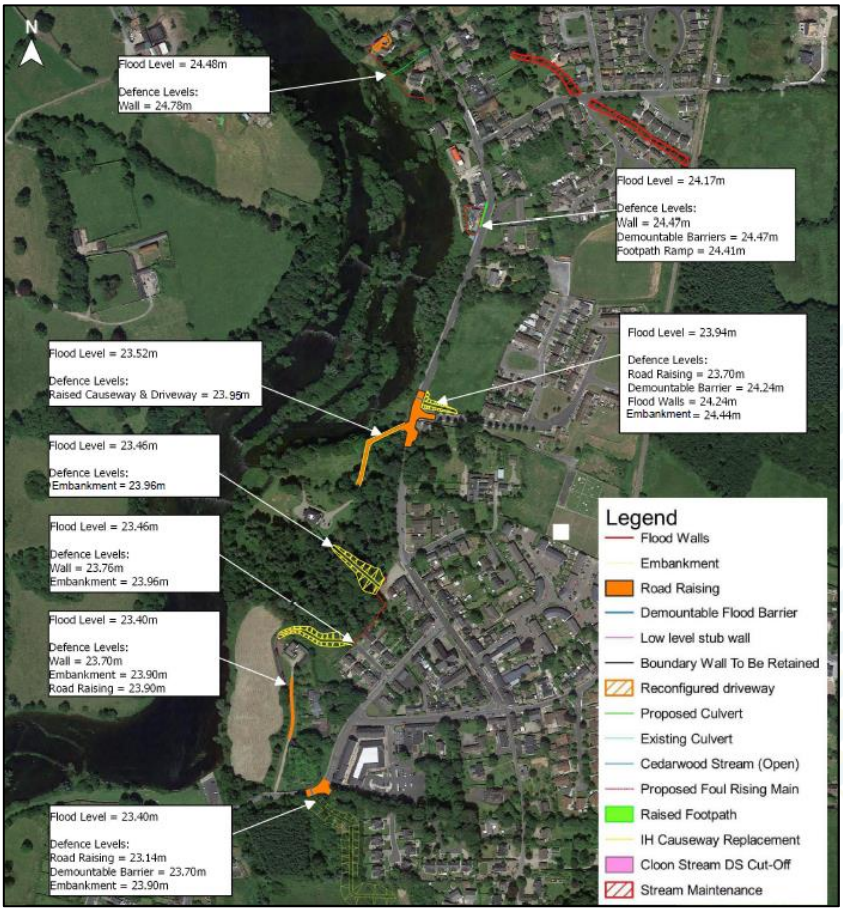

Figure 2-1 Image taken from Drawing for Option 1

3 Statutory Protection

3.1 Tree Preservation Orders

Tree Preservation Orders (TPOs) place various restrictions on the felling, pruning, or damage to trees, subject to various exemptions.

For the Republic of Ireland the legislation is covered in The 1963 Local Government (Planning and Development) Act, section 45 gives provision for the making of tree preservation orders by the planning authority where it is considered desirable to preserve trees on amenity grounds. This act was amended by the 1976 Planning Act, Section 14, which was amended by the 1992 Planning Act Section 20 which was further amended by the 2000 Planning Act which outlined the legal framework and procedures to make a TPO.

It is considered that the locations indicated in this report does not include TPOs. However, and in addition, there would be an exemption from the requirement to seek consent to fell or carry out works to trees where it is deemed that these works are strictly necessary to implement a scheme approved by the Local Authority (LA).

It is however recommended prior to any tree works being undertaken that confirmation in writing is sought from the Council that the tree removal and pruning is considered and conditioned as part of a Planning Permission Consent.

3.2 Felling Licences

The Forestry Act 2014 provides for a single licence process for tree felling. Felling licences can be valid for up to 10 years in duration, which may be extended for one or more further periods, up to a total of 5 years.

It is considered that the site is likely to be exempt from the requirement of a Felling Licence as the location is not considered to be an 'afforestation project'. Any tree removal works outside of the site boundary in the wider area may however be likely to be subject to Felling Licence requirements. However, and in addition, on the assumption that consent was granted to the scheme, this would make the scheme exempt of the requirements to apply separately for a Felling Licence but this should be confirmed with the Local Authority.

4 Tree Condition & Value Survey

4.1 Methodology

4.1.1 The site was visited on the following dates: 19th to 20th October 2022 the inspection of the trees was carried out by Stephen Tester, Arboricultural Consultant for JBA Consulting. Survey data was collected and recorded in accordance with the requirements of BS5837:2012 – Trees in relation to design, demolition, and construction - Recommendations.

4.1.2 The trees were plotted using a GIS-enabled data capture app, with the tree positions retrospectively checked using satellite imagery and a topographical survey provided by the Project Team.

4.1.3 The GIS data recorded, forms the information presented in the Tree Constraints Plans (Appendix D).

4.1.4 Individual trees were typically surveyed and included in this survey if their respective stems were over 150mm in diameter at approximately 1.5m from ground level, as they would require an individual Root Protection Areas (RPA) measurement to inform the arboricultural impact assessment.

4.1.5 Where deemed appropriate groupings, hedgerows or woodlands were surveyed as such, for example: due to the stems being <150mm diameter and/or due to their density, which would indicate that a combined RPA measurement was more appropriate than individual protection areas such as densely wooded locations with close canopies.

4.1.6 The following information was collected for each individual tree surveyed:

- Species
- Age classification
- BS5837 Category classification
- Height
- Stem diameter at 1.5m above ground level
- Crown spread in the four cardinal directions,
- Height of crown above ground level - excluding basal sprouts and epicormic growths (also known as crown clearance).

4.1.7 A visual assessment was made of the trees' physiological and structural condition, noting any disorders or biomechanical features that presented an obvious hazard to present or future users of the site; or that would affect the trees' life expectancy. Preliminary management works were deemed appropriate and proposed to either remove/reduce hazards or promote good future growth of the tree.

4.1.8 The trees' overall quality and value for retention were assessed in accordance with BS5837:2012 Table 1 (Appendix B). This was dependent on the trees' physiological and structural condition, safe useful life expectancy and arboricultural, landscape, cultural, ecological value and amenity value (as a function of size, prominence, attractiveness, and screening).

4.1.9 The root protection area (RPA) for each tree was also calculated in accordance with BS5837:20012. The RPA is an area of ground that provides sufficient soil rooting volume to ensure the survival of the tree.

4.1.10 The trees' overall quality and value for retention were assessed in accordance with BS5837:2012 (See Appendix B). The classifications given are:

A - for trees of high quality

B - for trees of moderate quality

C - for trees of low quality

U - for trees unsuitable for retention (please note: such trees may still be worth retaining for existing or potential conservation value)

The categorisation given is dependent on factors of; The trees' physiological and structural condition, safe useful life expectancy, ecological and amenity value (as a function of size, prominence, attractiveness, and screening).

4.1.11 In addition, for this scheme a request for additional survey information was requested for any ancient or veteran trees which were identified during the surveying. For this survey the Ancient Tree Forum Survey method was used to record the data from any identified ancient or veteran trees. Additional details of this can be found in Section 4.3.

4.2 Survey Results

4.2.1 The tree survey for the site can be found in Appendix C.

4.2.2 A total of 227 assets including 212x individual trees, 9x groups, 2x hedges and 4x wooded area were surveyed and recorded. Of which:

- 13 no. assets were found to be unsuitable for retention – CAT U
- 8 no. trees – were found to be of CAT A – High quality
- 37 no. individual trees, were found to be of moderate quality – CAT B
- 169 no. individual trees, 2x groups & 2x woodland were considered to be of low quality – CAT C

4.2.3 It is noted that the tree ID numbers are corresponding and no identification numbers for had been missed/ not used.

4.3 Veteran Tree Assessments

4.3.1 At request of the client, assessment of ancient or veteran trees within proximity of the proposal were individually assessed using an appropriate and recognised assessment format, which in this instance was the Ancient Tree Forums Survey Template.

4.3.2 It should be noted that: Ancient trees are veteran trees, but not all veteran trees are old enough to be ancient. In either case, Ancient and Veteran trees have features which provide valuable wildlife habitat.

An ancient tree is considered to have exceptional antiquity and is beyond the estimated life expectancy for its respective species.

Whilst a Veteran tree is considered to be a survivor/ battle scarred that may be a young tree with a relatively small girth in contrast to an ancient tree, but bearing the 'scars' of age such as decay in the trunk, branches or roots, fungal fruiting bodies, or dead wood.

4.3.3 It was noted that only two trees (T075 & T092) within the location were considered to have characteristics consistent with being of veteran status. No trees were identified as being ancient.

4.3.4 The additional surveys for these trees have been recorded using The Ancient Tree Forum survey and the results can be found in Appendix F.

4.3.5 The survey recommendations of T092 (a poplar near the entrance of Island House) is that the tree is reaching the end of its Safe Usual Life Expectancy, and there are no appropriate remedial works to retain it in its current form (as a tall pole). Its removal is therefore considered necessary on the basis on declining condition and proximity to high targets (i.e., road, footpath, utility lines).

4.3.6 T075 a Cedar along the driveway of Island House, has extended and weighted limbs with notable recent history of branch failure in the canopy associated with the loading of the branching (wind/ snow). A tip reduction of extended branching is recommended, to reduce end weight loading, whilst allowing for the retention of the tree in a reasonable form.

4.3.7 The recommendations outlined above, are not required to be enacted for flood scheme proposal to be undertaken.

4.4 Work Recommendations

4.4.1 With exception to the Ancient/ veteran tree assessments, general work recommendations to maintain the condition or safety or based on good arboricultural management was not considered needed or specified for this project. Any other recommendations will be as part of the proposal and ongoing management of the Flood remedial schemes infrastructure.

4.4.2 The ongoing management of the tree stock post-completion of the proposed improvements i.e., regarding the future management proposals of trees in this location, is outside the scope of this report.

4.4.3 Any works and or recommendations for and justification of the proposal shall be considered and outlined within the AIA.

5 Arboricultural Impact Assessment - Introduction

The works described in the proposal (Section 1) indicate that the works are to be within proximity to trees. This AIA covers trees that it is foreseeable will be impacted by the proposed works. The tree constraints, such as RPA and crown spreads, are recorded in the tree survey data in Appendix C, visual illustration of the tree constraints are shown in the Tree Protection Plans in Appendix D.

5.1 Typical Development Impacts

5.1.1 Damage can be caused to trees in various ways during construction works. Direct damage to the roots is commonly encountered and is caused by excavation, for example, to construct foundations or hardstanding or to install services. Roots are generally most frequent in the upper 0.6m of soil, with many encountered at a far shallower depth. Consequently, significant root damage can be caused by site soil stripping.

5.1.2 Damage to the soil may be as equally damaging to trees as direct root damage. Compaction is a commonly encountered problem and causes long-lasting damage to the soil. The anaerobic conditions which are often caused by compaction are unsuitable for most plant rooting and may cause tree decline. Damage to tree rooting conditions is also caused during hard-standing construction where impermeable construction prevents the infiltration of water and oxygen to the roots.

5.1.3 Other common causes of tree damage on construction sites are accidental bark damage or branch breakage by vehicles and plant, fire damage, herbicide damage and soil pollution by cement-based products, diesel, hydraulic oil, and other chemicals.

5.1.4 It is considered for this proposal that the potential for direct or indirect damage can be suitably controlled on this site with the use of appropriate control measures, including Construction Exclusion Zones (CEZ).

5.2 Options 1-3 Design Variation - impact on trees

5.2.1 It was noted that design Options 1, 2, and 3 as outlined in supporting documentation share similar design features, with only major differences in the schemes potential impacts being limited to the general location of Mall House to Meadowbrook Estate. It is therefore considered that and unless otherwise specified, the impacts described in the sections below are a shared impact of the three main Options.

6 Tree Removals - Options 1-3

6.1.1 It is noted that significant intrusions will be required in order to facilitate the Flood defence walls along the residential properties on The Elvers road, notably around the Rivergrove House B&B and the immediate properties to the south. It is considered that the extent of intrusion will impact the viable retention of trees, due to the potential damage to structural roots and basal areas of these trees, in combination with the proposed intrusion into these trees' theoretical RPAs and potential pruning to facilitate the works. This would require the removal of 21x individual trees and 1x hedgerow (H), the numbers are: T001-T010, T012, T013, T016 (H), T019, T020, T031-036 (3x Cat B, and 18x Cat C).

The tree removals are shown on Tree Impacts and Protection Plans 1 of 5 for Options 1, and Options 2 & 3.

6.1.2 It has been specifically indicated by residents, that the retention of T036 a hawthorn in the rear amenity area of Mall House on Elvers Road, is desired. However, the tree is noted to be significantly leaning and is resting on a current boundary/ retaining wall. It is not considered that its retention is viable by transplanting, or other tree protection mitigation. If retention is to occur this would require a redesign of the flood wall location or a design solution that is outside of the scope of this report.

Figure 6-1 T036 in residential property of Dunkinley, Elvers Road

6.1.3 Trees T007 - T009 and T031 - T033 are shown for removal, but it is proposed that these trees can be saved and transplanted, to still enable the works and then the trees are to be resituated in the same respective properties. Currently new locations have not been advised or indicated, so no further considerations can be given. Any other trees in the general location of the B&B and Mall House are either not considered viable for transplanting or their retention via transplanting has not been indicated.

The potential to relocate the above trees is considered viable, but to improve their

potential survival and recovery from the shock of being moved and loss of rooting; preparation works would be recommended to be undertaken prior to their transplant and relocation being undertaken. In addition, movement of the trees, is recommended during the dormancy period of the trees (i.e., winter to early spring) to give the best chance of success.

The methodology of transplanting of the trees is outside the scope of this report but could either be addressed in an Arboricultural Method Statement or in a technical note.

6.1.4 The Removal of trees to the west of the pub known as Tom Mahers, and in the northern area around Stormont House [north of the ruin of Castleconnell] are considered necessary to enable the formation of the flood bund. The removal of 19x individual trees and 3x Groups to facilitate the works in this location, there numbers are: T136-T139, T141-T146, T154-157, T159(G) T160, T161, 162(G), T174, T175, T180(G), T181 (1x Cat B, 3x Cat U, 19x Cat C).

The tree removals are shown on Tree Impacts and Protection Plans 3 of 5, & 4 of 5 for Options 1, and Options 2 & 3.

6.1.5 The removal of individual trees and two wooded areas of trees to the West and South of the road - Coolbane Wood, will be required in order to enable the formation of the bund to west of the residential properties in this location. 14x individual tree removals would be needed to facilitate the works in this location: T197-T202, T214, T215, T216, T218-T222. In addition, the clearance in wooded areas T225 & T226 would be required, in total of 384m² from T225(W), and 3687m² from T226(W). With exception to T200 - Cat U, all trees other trees are considered to be Cat C.

The tree removals are shown on Tree Impacts and Protection Plans 5 of 5 for Options 1, Options 2 & 3.

6.2 Tree Removals – Option 1

6.2.1 The formation of a raised causeway and driveway as specified for Option 1, would require additional tree removal along the driveway to Island House, this would be in addition to the locations described in Section 5.3 (above). The removal of 6x individual Trees T54, 055, 056, 057, 058 & 059 (4x CAT C, & 2 x Cat B) would be required to enact the raised causeway and driveway.

The tree removals are shown on Tree Impacts and Protection Plans 3 of 5, for Option 1.

6.2.2 The implementation of a Flood Bund to the south of Island House, would require the removal of T134 & T135 (2x Cat C) & a wooded area T227 (CAT B). T227 comprises of 20 no. mature trees in an area of 1968m² that would be required in order to facilitate and allow sufficient clearance for the installation of the bund in this location.

The tree removals are shown on Tree Impacts and Protection Plans 4 of 5, for Option 1.

6.2.3 No other additional tree removals have been identified specifically for Option .1

6.3 Tree Removals – Options 2 & 3

6.3.1 The formation of a setback footpath along The Mall would require the removal of 21x CAT C trees in order to facilitate the new footpath. This is due to many of them growing in and immediately adjacent to the current wall and also their removal is recommended due to previous poor pruning practices, which diminishes their desirable retention. These would include the following trees: T103-112, 117-122, T125-127, T129 & T130.

The Tree removals are shown on Tree Impacts and Protection Plan 3 of 5, for Option 2&3.

6.3.2 No other additional tree removals have been identified specifically for Options 2&3.

6.4 Tree removals - Summary

6.4.1 In summary a total of 55x individual trees (4x CAT B, 47x CAT C & 4x CAT U) and 3x Groups & 1x Hedgerow (CAT C) is advised for the project which is for all three Options. And a combined area of 4070m² will need to be cleared from wooded areas T225 (W) & T226 (W)

6.4.2 Option .1 would require the additional removal of 9x individual trees (7x CAT C, 2x CAT B) and a wooded area of approximately 20 mature trees (CAT B).

6.4.3 Options .2 & .3 would require the additional removal of 21x (CAT C) trees.

6.4.4 In addition, and dependant on further investigation and consideration, the removal of four and mature beech trees T15, T017, T018, & T021 (3x CAT A, 1x Cat B) may need to be undertaken for all three options proposed. But at this time this has not been confirmed.

6.4.5 For the reasons outlined above in the Sections above, the trees identified are shown for removal on the updated Tree Protection Plans (Appendix D) and summarised in the table below:

Table 6-1 Tree removals

Tree Id T No's. for Removal	Categorisation in accordance with BS5837	Locations of Removal	Total
	CAT A	Flood Walls on Elvers Road	21x Individual trees & 1x Hedgerow
07*, 08*, 36	CAT B		
01, 02, 03, 04, 05, 06, 09*, 10, 12, 13, 16 (H), 19, 20, 31*, 32*, 33*, 34, 35, 36	CAT C		
-	CAT U		
-	CAT A	Defences around Stormont House and Tom Mahers	19x Individual trees & 3x Groups
142	CAT B		
136, 137, 138, 141, 143, 144, 145, 146, 154, 157, 159(G), 160, 161, 162(G), 174, 175, 180(G), 181,	CAT C		
139, 155 ,156	CAT U		
-	CAT A	Works West and South of Coolbane Wood	15x Individual trees & 4071x m² from wooded areas
-	CAT B		
197, 198, 199, 201, 202, 214, 215, 216, 217, 218, 219, 220, 221, 222, 384 m² of 225(W), 3687m² of 226(W)	CAT C		
200	CAT U		
-	CAT A	Additional removals – Option 1	9x Individual Trees & 1968m² (or 20x trees) from a wooded area.
57, 59, T227(W)	CAT B		
54, 55, 56, 57, 58, 59, 134, 135, T140	CAT C		
-	CAT U		

-	CAT A	Additional removals – Options 2 & 3	21x Individual trees
-	CAT B		
103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 117, 118, 119, 120, 121, 122, 125, 126, 127, 129, 130	CAT C		
-	CAT U		

* Potential to transplant tree instead of removal

7 Root Protection Areas (RPAs) & Intrusions

7.1.1 The RPA is the minimum area of ground that provides sufficient soil rooting volume to ensure the survival of the tree in healthy condition. To avoid a significant impact on a tree's health it is necessary to maintain the RPA without damaging operations.

7.1.2 Where ground protection is recommended, this should be designed to account for the requirements of the works and be designed in accordance with BS5837 Trees in relation to design, demolition, and construction- recommendations.

7.1.3 The distribution and shape of the RPA should reflect the opportunities for rooting available to each tree. In this instance the RPA's have been shown as unaltered and form a symmetrical circle as it is considered reasonable even in paths and some engineered roads that some rooting underneath the impermeable surfacing is possible. In the absence of confirmation by further investigation such as trench excavation it has in this instance been considered as part of the rooting area for the trees. However, for practicality of ground protection hard surfaced areas is not to be specified, only soft ground areas may require such mitigation measures.

7.2 RPA intrusions – Options 1-3

7.2.1 RPA intrusions are required for the installation of a new culvert within the proximity of retained Tree Numbers T015, T017, T018 & T021, which are situated in the property The Grange. The new Culvert location is noted to be <8m of the main stems of these mature beech trees.

The existing closed culvert is in this general location, but the new location proposed is closer to the trees and has not fully considered the tree rooting areas of these trees. It is recommended that if the current culverts location cannot be reused that further investigation will need to be carried out to determine the extent of rooting in the location of the proposed culvert and if the location of major roots from these trees can be accommodated and retained in order to allow for the reasonable retention of the trees. If a sufficient rooting volume of these trees cannot be retained and or the loss of significant diameter roots occur, then the removal of these trees may need to be undertaken.

In addition, for T018 & T021 the location of new Flood walls is proposed to the west of their stems approximately in the same location as the existing flood/ retaining wall. It is considered that the new flood wall if installed in a similar location to the current wall, is likely to have a minor impact on trees T018 and T021, as it is considered to create an impermeable barrier and would hinder any uptake of water or nutrients on the west side of the trees. This could be mitigated by including soil improvements such as the removal of vegetation and grass, and the installation of bark rings around the trees.

7.2.2 The installation of a Flood Wall along the riverside edge and edge of driveway of Grange House will impact the rooting areas of T022, T023, & T026. It is however noted that the works with exception to T024 is on the edge of the rooting areas of these trees and will follow the compacted ground of the access road's edge. It is considered that there are sufficient areas outside the rooting area of retained trees that the works are not foreseen to impact upon retained trees.

For T026, the flood wall will stop behind the tree and will be within 4m of the base of the tree. This is considered to be less than the 6.8m RPA radius of the tree but it is considered that there is sufficient rooting available to the tree on the other side of the access road and within the unaltered rooting areas of the tree.

7.2.3 Tree T040 is situated to the south of the driveway to Dunlickey and it is considered that there are sufficient areas outside the rooting area of this tree. However, there is potential for compaction or rutting from running of heavy machinery (e.g., over 20tn)/ plant over the theoretical rooting area of the tree. This is because the access road appears to be of a lightweight construction of a gravel composite. If access by heavy plant is required, then the use of steel plates may be advisable to avoid deformation of the driveway and increased compaction of the RPA.

7.2.4 The proposed Flood Bund in the general location of the Tom Mahers pub and Stormont House will require access from both ends of the route. It is considered that there is potential for compaction in order to form the bund in this location. As the bund would require access for plant and materials which due to its proximity would be in the rooting area of a significant Cedar T152 which is situated to the rear of the pub, and a notable Aspen specimen T176 at Stormont House. The protection of sufficient rooting area of T176 is considered to be achievable with the use of Tree Protection fencing.

The RPA of the cedar T152 will need to be used for access and therefore ground protection fencing will be required, which depending on the plant and activities will need to be design and accord to Section 6.2.3.3 of the BS5837 recommendations for Temporary ground protection, in that:

Temporary ground protection should be capable of supporting any traffic entering or using the site without being distorted or causing compaction of the underlying soil.

NOTE The ground protection might comprise one of the following:

a) for pedestrian movements only, a single thickness of scaffold boards placed either on top of a driven scaffold frame, so as to form a suspended walkway, or on top of a compression-resistant layer (e.g. 100 mm depth of woodchip), laid onto a geotextile membrane;

b) for pedestrian-operated plant up to a gross weight of 2 t, proprietary, inter-linked ground protection boards placed on top of a compression-resistant layer (e.g. 150 mm depth of woodchip), laid onto a geotextile membrane;

c) for wheeled or tracked construction traffic exceeding 2 t gross weight, an alternative system (e.g., proprietary systems or pre-cast reinforced concrete slabs) to an engineering specification designed in conjunction with arboricultural advice

7.2.5 Theoretical intrusions into the rooting areas of T206 – T212 is noted for the flood bund works south of Coolbane Wood, but it is considered that there is sufficient rooting volume availability in the immediate areas around the rest of these trees that the impact is limited and the works will have no significant detriment to these retained trees.

7.3 RPA Intrusions - Option 1

7.3.1 The raising of the causeway, driveway and parapet of Island House will be in the rooting areas of the following trees: T060, T061, T063, T064, T065, T071, T075, T079, T080, T081, T082. The Parapet formation along the driveway will be within the rooting areas of the trees and will require manual excavation within the rooting areas of the trees, to expose any large diameter roots and the foundation of the parapet will need to take account of the retention of any large roots, such as by use of a floating foundation sections over large masses of roots - This in particular would necessary for T081, a mature Cat A beech tree.

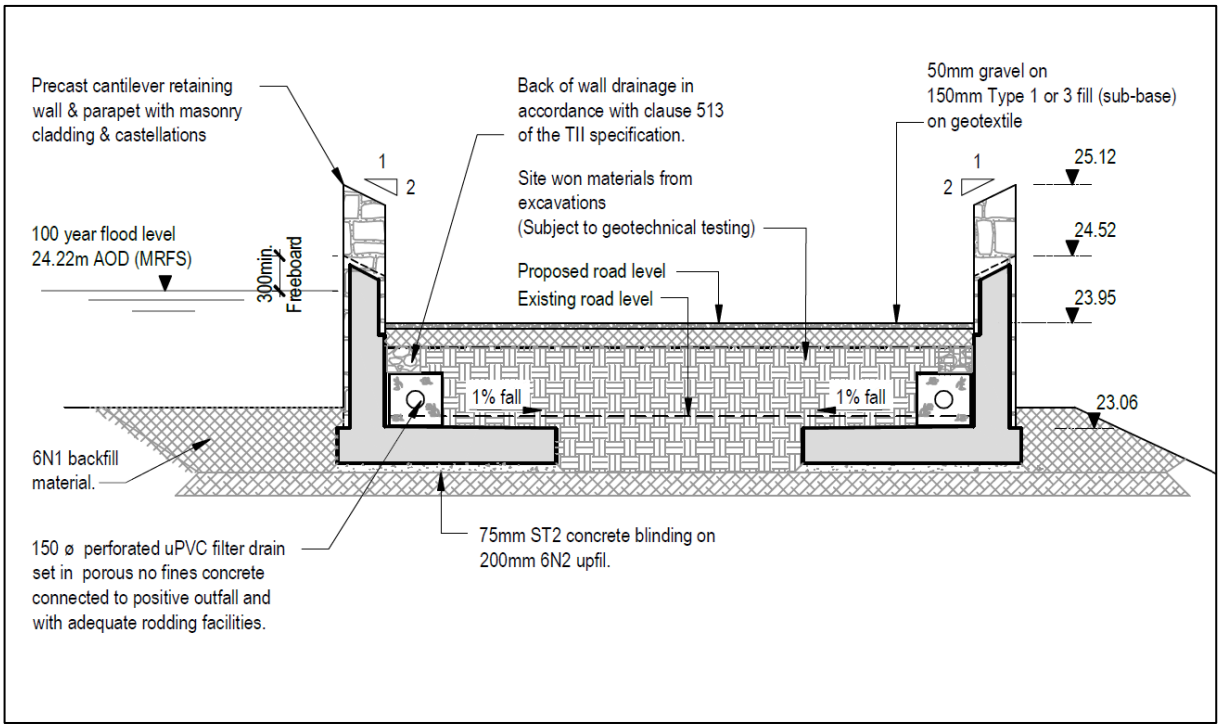

Figure 7-1 Design of Parapet along driveway of Island House, design taken from drawing 1904-JBB-XX-XX-DR-S-00008

The raising of the flood defences will be within the footprint of the existing causeway and road and will need to be graded from the road edge out into the soft ground areas and RPAs of the trees. The British Standard [BS5837] is clear that existing ground levels should be retained within the rooting areas of trees, wherever possible. But in this instance and due to the distances involved this is not considered possible, and the raising of the edges to meet the changes to the levels will be required.

The raising of the levels could be achieved with the use of a granular material that remains gas- and water-permeable throughout its design life. If a grass or seeded finish is desired? Then the last 100mm can be of good quality topsoil. It is considered that there are sufficient rooting areas outside of the driveway being raised that the works if suitably controlled and undertaken should not have a detrimental long-term impact upon retained trees.

7.4 RPA Intrusions – Option 2

7.4.1 The proposed wall raising and footpath intrusion along The Mall, will intrude significantly into the RPA of a number of trees. It is considered that a number of trees have been recommended for removal due to the works required within the immediate locations of their stems (see 6.4.3).

7.4.2 The proposed flood wall raising on the roadside of The Elvers is noted to occur in proximity of Trees T041-048 & T050- T053. The works would be 1m inside of the existing wall and a new footpath also inside that and removing the existing stone wall. Excavations and new foundations will be required for the new wall, some within the rpz's. With the area predominantly hardstanding the potential impacts to the trees and potential roots is limited, but associated development activities for the wall may mean that some intrusions into the rooting area could occur, it is however considered that this will be minimal, and there is sufficient areas outside the affected rooting areas of these retained trees. The potential impact upon retained trees is therefore considered limited.

7.5 RPA Intrusions – Option 2 & 3

7.5.1 The proposed flood wall installation and associated works to the northwest of Tom Mahers pub is noted to be in the rooting area of retained Tree T134. It is however noted that this theoretical rooting area is intersected by the river and also the installation of the wall is likely to occur from the hardstanding afforded by the pub's car park. The intrusion into the rooting area of this tree is therefore likely to be limited and the works are not considered to impact on the long-term retention potential of this tree. Trees T136-T138 are proposed to be removed and so consideration of their respective rooting areas has not been accounted for.

8 Tree pruning works

8.1.1 At this time some tree pruning/ tree surgery works are anticipated to implement the proposals. Following the tree survey, it is considered that some works on the retained trees to give clearance to facilitate the works will be required.

8.1.2 The extent of pruning works does differ between Options 1, 2 & Option 3. For options 2 and 3 a total of 5x trees are required to undertake the proposal. For Option 1 a total of 16x trees will need to be pruned. The works have been summarised below in tables.

8.1.3 The works are summarised for Option 1 in the table below.

Table 8-1 Figure 5 1 Tree works required for Option 1

Tree Numbers	Species	Recommendations & Comments
T015	Common Beech (Fagus sylvatica)	Localized pruning from the building to give 1.5m clearance and crown lift to 4m from ground level.
T057	Common Beech (Fagus sylvatica)	Crown lift to 5m from the ground level of the bridge/ road
T058	Common Beech (Fagus sylvatica)	Crown lift to 5m from the ground level of the bridge/ road
T059	Common Beech (Fagus sylvatica)	Crown lift to 5m from the ground level of the bridge/ road
T060	Common Beech (Fagus sylvatica)	Crown lift to 5m from the ground level of the bridge/ road
T075	Cedar ssp. (Cedar)	Remove snapped branching, so works beneath can be safely carried out.
T082	Common Ash (Fraxinus excelsior)	Crown lift to 5m from the ground level of the bridge/ road
T083	Sycamore (Acer pseudoplatanus)	Crown lift to 5m from the ground level of the bridge/ road

T084	Sycamore (Acer pseudoplatanus)	Crown lift to 5m from the ground level of the bridge/ road
T085	Sycamore (Acer pseudoplatanus)	Crown lift to 5m from the ground level of the bridge/ road
T086	Sycamore (Acer pseudoplatanus)	Crown lift to 5m from the ground level of the bridge/ road
T087	Sycamore (Acer pseudoplatanus)	Crown lift to 5m from the ground level of the bridge/ road
T088	Sycamore (Acer pseudoplatanus)	Crown lift to 5m from the ground level of the bridge/ road
T089	Sycamore (Acer pseudoplatanus)	Crown lift to 5m from the ground level of the bridge/ road
T090	Sycamore (Acer pseudoplatanus)	Crown lift to 5m from the ground level of the bridge/ road
T152	Atlas Cedar (Cedrus atlantica)	Crown lift to 4m to facilitate works

8.1.4 The works have been summarised for Options 2 and 3 in the table below

Table 8-2 Tree works required for Options 2 & 3

Tree Numbers	Species	Recommendations & Comments
T015	Common Beech (Fagus sylvatica)	Localized pruning from the building to give 1.5m clearance and crown lift to 4m from ground level.
T075	Cedar (Cedrus sp.)	Remove snapped branching, so works within proximity can be safely carried out.

T076	Common Beech (Fagus sylvatica)	Crown lift to 4m to facilitate works
T077	Pedunculate Oak *(Quercus robur)*	Crown lift to 4m to facilitate works
152	Atlas Cedar (Cedrus atlantica)	Crown lift to 4m to facilitate works

8.1.5 Should any additional pruning become necessary it should comply with BS3998:2010 – Tree Work Recommendations and be approved by the Project arboriculturalist before any commencement.

9 Additional Considerations

9.1 Infrastructure requirements

9.1.1 The installation of services within the rooting zones of trees can have a large detrimental impact on the long-term survival of retained trees leading to their unnecessary loss or in extreme cases roots failure in high winds which could have in this instance significant implications on the structure of the embankment.

9.1.2 It has not been indicated or proposed that any infrastructure requirements such as cabling is to be installed within the rooting areas of any retained trees.

9.2 New tree planting to mitigate removals

The location is 'well treed'; however, it is noted that to implement the proposals, that 55x individual trees, 1x hedge, 3x groups, and 4071m² of wooded area is to be lost, and dependant on the Option progressed:

Option 1 – 9x additional individuals and 1968m² (or approximately 20 mature trees) to be lost.

Option 2 & 3 – 21x additional individual tree loss.

9.2.1 If mitigation planting is to occur, then it would be recommended that the replacement locations are considered, to ensure sufficient separation clearance from the flood bunds and flood wall is maintained to reduce future management requirements.

9.3 Limitations of Tree Protection measures

9.3.1 Currently tree protection measures have only been specified for locations around the immediate location of flood defence walls or the routes proposed for Flood Bunds. Due to most of the site being adjacent to footpaths, access road, or highways, not all locations need or have been specified or deemed to require ground protection or tree protection fencing. In this sense a practical approach to tree protection has been proposed, however areas where public interaction or egress is possible may require due consideration by the design team to ensure sufficient clearance from the public is maintained during the works.

9.3.2 At this time Root investigation works Tree Numbers T015, T017, T018, T031, T032, T033 has been recommended to consider the viability of installing a new culvert within proximity of these mature beech trees. Until this has been undertaken or if it is confirmed that the removal of these four trees is acceptable, no tree protection measures (fencing or ground protection) has been specified within proximity of these trees.

9.3.3 Due to the variation and change between soft ground and hard standing locations, in numerous locations, an 'Above-ground stabilizing system' braced Heras fencing has been proposed as a reasonable approach to the protection of trees throughout the works.

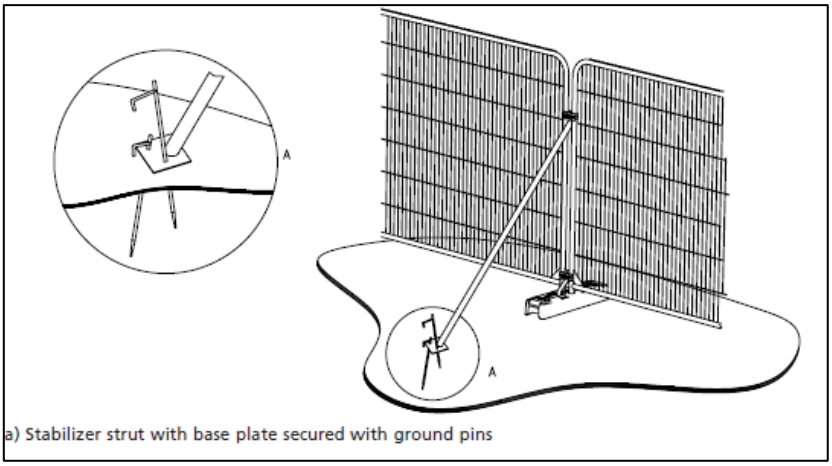

Figure 9-1 An Example of an 'above-ground stabilizing system'

If the use of this above-ground protection fencing is not considered acceptable by the council, then discussion with the Planning and Tree Officers may result in amendments to the tree protection measures as a revision to this report.

9.4 Summary of the impact on local character

9.4.1 Construction activity has the potential to affect trees further afield if appropriate protective measures are not undertaken. However, if adequate precautions to protect the retained trees are implemented then the proposal should have no significant impact on the contribution of retained trees or their contribution to local character.

9.4.2 The proposal is not considered to require or likely result in the loss of any additional trees beyond that described in this report. It is however noted that due to the site being a discontinued reservoir, the management of the trees in the long term may need to be considered as the change of use may impact how the management of the trees in the long term is undertaken.

9.4.3 It is however considered that if the works are suitably controlled, it should not result in diminishing the condition or vigour of the retained trees.

9.4.4 It is considered that Suitable protection can be assured in the locations by the use of tree protection fencing, ground protection measures and CEZ.

Appendices

A Limitations of report & disclaimers

1. No technical survey equipment was used to carry out the assessments except a diameter tape, hypsometer, mallet, and probe. The same methodology was applied to all the trees (i.e. an assessment was made starting at the base of each tree and moving up the stem into the crown, an assessment of the canopy was made by viewing the tree at distance & from underneath the canopy).

2. All assessments were carried out from ground level. A detailed inspection and/or decay detection tests have not been undertaken as this fell outside the scope of the survey. All dimensions are given in meters (m) and millimetres (mm) are approximate, unless stated otherwise.

3. This survey is, unless otherwise specified, not a full or thorough assessment of the health and safety of the trees on or adjacent to the site; and therefore, it is recommended that detailed tree inspections are undertaken on a regular basis with the express purpose of complying with the landowner's duty of care and satisfying health and safety requirements.

4. Sketches, diagrams, graphs, and photographs in this report, being intended as visual aids, are not necessarily to scale (unless stated) and should not be construed as engineering or architectural reports or surveys.

5. Unless expressed otherwise;
   1) information contained in this report covers only those items that were examined and reflects the condition of those items at the time of inspection;
   2) The inspection is limited to visual examination of accessible items. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the plant or property in question may not arise in the future.

6. Trees are living organisms whose health and condition can change rapidly. The health, condition, and safety of trees should be checked regularly. This period of validity of a report may be reduced in the case of any change in conditions to or in proximity to the tree.

7. This BS5837 survey was undertaken by walking around the site and assessing all trees of significance (in respect to the tree's stem diameters) on/or adjacent to the site for development. Unless otherwise expressed, only visual assessments were made of these trees.

8. This report, based on the survey, may contain suggested methodology for the construction process of the later-mentioned planned development this should be accorded to. In the expert opinion of the author, this is the most suitable methodology for the protection of the trees on-site during and post-construction.

9. Care has been taken to obtain all information from reliable sources. All data has been verified insofar as possible; however, the consultant can neither guarantee nor be responsible for the accuracy of information provided by others. Any legal description provided to the consultant is assumed to be correct. Any titles and ownership to any property are assumed to be good and marketable. No responsibility is assumed in character.

10. This report is for the sole use of the named client and refers to only those trees identified within the identified boundaries; alteration or use by other(s) in attempting to apply its contents for any other purpose renders the report invalid for that purpose.

11. Possession of this report or a copy thereof does not imply a right of publication or use for any purpose by any other person to whom it is addressed, without prior expressed written or verbal consent (witnessed) of the consultant.

B Table 1 - Extracted Tree Category grading and Colour Coding from BS5837:2012 and Explanatory tables

Category and definition	*Criteria (including subcategories where appropriate)*			*Plan colour*
TREES UNSUITABLE FOR RETENTION				
Category U Those in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years	• Trees that have a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other category U trees (For example: where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning) • Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline • Trees infected with pathogens of significance to the health and/or safety of other trees nearby, or very low-quality trees suppressing adjacent trees of better quality *NOTE Category U trees can have existing or potential conservation value which it might be desirable to preserve*			Dark red
TREES TO BE CONSIDERED FOR RETENTION				
	1. Mainly arboricultural values	**2. Mainly landscape values**	**3. Mainly cultural values, including conservation**	
Category A **Trees of high quality** with an estimated remaining life expectancy of at least 40 years	Trees that are particularly good examples of their species, especially if rare or unusual; or those that are essential components of groups or formal or semi-formal arboricultural features (For example the dominant and/or principal trees within an avenue)	Trees, groups, or woodlands of particular visual importance as arboricultural and/or landscape features	Trees, groups, or woodlands of significant conservation, historical, commemorative or other value (for example veteran trees or wood pasture)	Light green
Category B **Trees of moderate quality** with an estimated remaining life expectancy of at least 20 years	Trees that might be included in category A, but are downgraded because of impaired condition (e.g. presence of significant though remediable defects, including unsympathetic past management and storm damage), such that they are unlikely to be suitable for retention for beyond 40 years; or trees lacking the special quality necessary to merit the category A designation	Trees present in numbers, usually growing as groups or woodlands, such that they attract a higher collective rating than they might as individuals, or trees occurring as collectives but situated to make little visual contribution to the wider locality	Trees with material conservation or other cultural value	Mid blue
Category C **Trees of low quality** with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150 mm	Unremarkable trees of very limited merit or such impaired condition that they do not qualify for higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater collective landscape value; and/or trees offering low or only temporary/transient landscape benefits	Trees with no material conservation or other cultural value	Grey

B Explanation of Tree Condition and Definitions

Tree Conditions			
Physiological Condition		Structural Condition	
Poor	Several instances of disease, pest or pathogen, specific infections, the scale of infections, large scale or large size deadwood present. Epicormic Growth.	Poor	Defects in growth, broken/ splits in major branches, congested stems, tight forks, major leaning, hazard beams, advanced decay at critical points. Significant Deadwood present.
Fair	Frequent instance of disease or pest, damage, epicormic growth, and multiple symptoms of stress.	Fair	Several minor or occasional major defects, non-critical decay, and some dead wood are present throughout the crown.
OK	An occasional instance of disease or pest, minor symptoms of stress.	OK	Some minor defects in branch structure, pruning defects, crown off balance, etc, localized small diameter deadwood.
Good	Minor disease or pest infestation, not exhibiting symptoms of stress, small instances of dead wood.	Good	Well-grown balanced tree, open branch structure, open forks, etc.

Defining Age Class/ Maturity	Definition
Dead	Tree is dead
Newly planted	Planted recently e.g., since the last survey or within the last 2-3 years.
Young	<20% of life expectancy for species
Semi-mature	>20-50% of life expectancy for species
Early Mature	>50-70% of life expectancy for species
Mature	>70%-99% of life expectancy for species
Ancient	A tree that has resided in exceptional antiquity and is >100% beyond the estimated life expectancy for species.
Veteran	A veteran tree has features associated with advanced age (for its species), having the connotation of a 'battle-scarred survivor'.
Definitions	
Break Point	The point at which the trunk splits and the crown forms.
Compensation Growth	The growth a tree makes to strengthen specific areas that may have been

	damaged or require strengthening in reaction to environmental stress, such as internal rot in the stem or prevailing wind, etc.
Coppiced/ Pollard	Trees are typically cut just above ground level, or above animal grazing height and allowed to regrow from the cut stump.
Crown	The branches and canopy of the tree.
Deadwood	Any wood still present in the crown that has died. It can be attached to the tree or hanging within branches.
Epicormic Growth	The type of growth can be produced as a result of a tree experiencing stress, either physical or environmental.
Apical Leader	The central stem of the tree that is the most dominant in the crown.
Open Grown	A tree that grows in an open area where develops without any competition for light or space leading to a tree with a broad spreading crown.
Root Protection Area	The minimum area of ground that provides sufficient soil rooting volume to ensure the survival of the tree in healthy condition. In order to avoid a significant impact on a tree's health, it is necessary to maintain the RPA without damaging operations. Where construction is unavoidable within the RPA, it should be planned and detailed to avoid significant damage to the tree or soil.
Rot Pocket	An area usually at a branch junction where a hollow has formed and begun to rot into the tree.
Target	Person or object whether mobile or fixed, within the potential zone of impact of a tree or its branches, which might be harmed as a result of partial or total failure of the tree.
Break Point	The point at which the trunk splits and the crown forms.

C Tree Survey

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T001	Common Alder (Alnus glutinosa)	Tree	330	Radius: 4.0m. Area: 50 sq m.	2	2.5	3	2	15	1.5 1.5(S)	Semi Mature	40+ Years	Fair	Fair	None	C2	Access to river side will be needed through this location.	Options 1-3: Remove tree to facilitate works	
T002	Common Ash (Fraxinus excelsior)	Tree 2 stems	400, 330	Radius: 6.2m. Area: 121 sq m.	2.5	1.5	1.5	2	17	2.5 2.5(W)	Semi Mature	10+ Years	Fair	Fair	None	C2	Tip dieback. Epicormic at bases. Dense bramble at base.	Options 1-3: Remove tree to facilitate works	
T003	Magnolia (Magnolia sp.)	Tree	190	Radius: 2.3m. Area: 17 sq m.	1.5	1.5	1.5	1.5	3	2 2(W)	Early Mature	20+ Years	Good	Good	None	C2	Within 1m of internal wall.	Options 1-3: Remove tree to facilitate works (option to transplant)	
T004	Portuguese Laurel (Prunus lusitanica)	Tree 5 stems	80, 80, 100, 120, 100	Radius: 2.6m. Area: 21 sq m.	1	1	1	1	2.5	1	Semi Mature	40+ Years	Fair	Fair	None	C		Options 1-3: Remove tree to facilitate works	
T005	Northern Japanese Magnolia (Magnolia kobus)	Tree 3 stems	180, 220, 160	Radius: 3.9m. Area: 48 sq m.	3	3	0	3	3.5	2 2(E)	Early Mature	20+ Years	Fair	Fair	None	C	Multistemmed	Options 1-3: Remove tree to facilitate works	
T006	Crab Apple (Malus sylvestris)	Tree	220	Radius: 2.6m. Area: 21 sq m.	1	2.5	2.5	2.5	4	1 0.5(E)	Early Mature	20+ Years	Fair	Physical Defect	None	C	Bifurcated at 1.5m, so diameter measured just below. Strapped to electric post just the other side of wall and propped, possible defect? or to stop a lean? But no indication of root plate disturbance.	Options 1-3: Remove tree to facilitate works (option to transplant)	
T007	Viburnum (Viburnum sp.)	Tree 6 stems	50, 30, 50, 50, 60, 50	Radius: 1.4m. Area: 6 sq m.	2	2	2	2	2.5	0	Semi Mature	20+ Years	Fair	Fair	None	B	Japanese snowball. Property owner is keen for its retention.	Options 1-3: Remove tree to facilitate works (option to transplant)	

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T008	Japanese Pagoda (Styphnolobium japonicum)	Tree	180	Radius: 2.2m. Area: 15 sq m.					4.5	1 1(N)	Semi Mature	20+ Years	Fair	Fair	None	B1	Japanese pagoda tree.	Options 1-3: Remove tree to facilitate works (option to transplant)	
T009	Magnolia (Magnolia sp.)	Tree 2 stems	140, 140	Radius: 2.4m. Area: 18 sq m.	1	1	1.5	1	4	0	Semi Mature	20+ Years	Fair	Fair	None	C	Decayed old pruning wounds. Tight unions. Lights wrapped around stems.	Options 1-3: Remove tree to facilitate works (option to transplant)	
T010	Bird Cherry (Prunus padus)	Tree 4 stems	220, 260, 240, 220	Radius: 5.7m. Area: 102 sq m.	2.5	2.5	2.5	2.5	10	1	Semi Mature	20+ Years	Fair	Poor	None	C	Low trailing branching. Tight unions and touching stems. Elder growing at base.	Options 1-3: Remove tree to facilitate works	
T011	Crab Apple (Malus sylvestris)	Tree 2 stems	180, 80	Radius: 2.4m. Area: 18 sq m.	0	3	1.5	0	4.5	0.5	Early Mature	10+ Years	Poor	Poor	None	C	Leaning East.		
T012	Common Ash (Fraxinus excelsior)	Tree	220	Radius: 2.6m. Area: 21 sq m.	2	2	1	2	12	5	Semi Mature	20+ Years	Fair	Fair	None	C	Some minorntip dieback.	Options 1-3: Remove tree to facilitate works	
T013	Goat Willow (Salix caprea)	Group		Area: 14 sq m, plus a 1m buffer.	As shown on plans				2		Young	40+ Years	Good	Good	None	C	Young stems.	Options 1-3: Remove tree to facilitate works	
T014	Amelanchier (Amelanchier sp.)	Tree 6 stems	30, 50, 70, 50, 40, 40	Radius: 1.4m. Area: 6 sq m.	2	1	2	2	5	1.5	Semi Mature	20+ Years	Fair	Fair	None	C	Ash self set growing at base on East.		

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T015	Common Beech (Fagus sylvatica)	Tree 4 stems	400, 400, 600, 600	Radius: 12.2m. Area: 468 sq m.	8	7	7	7	19	1.5 2(N)	Over Mature	40+ Years	Fair	Fair	Medium	A	Growing adjacent to culvert and listed building. Appears stems are regrowth from possible remenants of a hedge or a reduced stem.	Options 1-3: Localised pruning from building and crown lift to 4m from ground level. Options 1-3: Root investigations will need to be undertaken to determine if retention of tree is viable for culvert works.	
T016	Leyland Cypress (Cupressocyparis leylandii X)	Hedge		Area: 68 sq m, plus a 1m buffer.	As shown on plans				4.5	0	Semi Mature	40+ Years	Fair	Poor	None	C	Topped and lapsed hedgerow adjacent to tennis court.	Options 1-3: Remove group, for culvert works.	
T017	Common Beech (Fagus sylvatica)	Tree	1310	Radius: 15.0m. Area: 707 sq m.	7.5	9	8	8	21	3 7(W)	Mature	40+ Years	Fair	Physical Defect	Low	B1	Existing culvert within 2m of base. Previously lost its top, with some indication of ongoing disfunction in top of crown. Light and cable on North side of stem to a height of approximately 5m. Minor decay and dysfunction and bark necrosis on East side of stem at base, sound wound behind.	Options 1-3: Aerial inspection of top of crown also recommended (prior to ground investigation) to look at condition of top canopy. Options 1-3: Root investigations will need to be undertaken to determine if retention of tree is viable for culvert works.	
T018	Common Beech (Fagus sylvatica)	Tree	1230	Radius: 14.8m. Area: 688 sq m.	10	10	10	10	26	4.5 5.5(N)	Mature	40+ Years	Fair	Fair	Low	A	Old pruning wounds. Old branch tear out on south side circa bifurcation point.large stub on North side circa 10m from ground level. Formes formentes on small crack 2m from ground level on south side of tree.	Options 1-3: Root investigations will need to be undertaken to determine if retention of tree is viable for culvert works.	
T019	Common Ash (Fraxinus excelsior)	Tree 2 stems	270, 300	Radius: 4.8m. Area: 72 sq m.	3	1	1	3	12	2.5 2(W)	Semi Mature	40+ Years	Fair	Fair	None	C	Tight union. Rope grown over on Eastern stem.	Options 1-3: Remove tree to facilitate works	
T020	Sycamore (Acer pseudoplatanus)	Tree	100	Radius: 1.2m. Area: 5 sq m.	1	1	1	1	3	0	Young	40+ Years	Good	Fair	None	C	Growing out of culvert exit	Options 1-3: Remove tree to facilitate works	
T021	Common Beech (Fagus sylvatica)	Tree	1090	Radius: 13.1m. Area: 539 sq m.	3	10	9	9	26	5	Mature	40+ Years	Good	Fair	Low	A1	Previously reduced/pollarded and has regrown. Light and cableon West side of stem to 4.5m from ground level.	Options 1-3: Root investigations will need to be undertaken to determine if retention of tree is viable for culvert works.	

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T022	Common Beech (Fagus sylvatica)	Tree 4 stems	510, 400, 440, 150	Radius: 9.6m. Area: 290 sq m.	7	3.5	2	5	23	1.5 4.5(N)	Early Mature	40+ Years	Fair	Fair	Low	B	Immediately adjacent to existing wall.		
T023	Common Beech (Fagus sylvatica)	Tree 4 stems	700, 800, 220, 410	Radius: 13.9m. Area: 607 sq m.	2	5	7	5	22	1.5 4.5(N)	Early Mature	40+ Years	Fair	Fair	Low	B	Tight union.		
T024	Common Ash (Fraxinus excelsior)	Tree	310	Radius: 3.7m. Area: 43 sq m.	0	0	1.5	5	7.5		Semi Mature	<10 years	Fair	Physical Defect	None	C	Significant lean west over river. Die back in crown.		
T025	Scots Pine (Pinus sylvestris)	Tree	760	Radius: 9.1m. Area: 260 sq m.	6	3	7	7	18	5 5(NW)	Early Mature	40+ Years	Good	Fair	Low	B2	Old phone line connector on north east side of stem.		
T026	Norway Spruce (Picea abies)	Tree	570	Radius: 6.8m. Area: 145 sq m.	2.5	2.5	2.5	2.5	20	2 5(W)	Early Mature	40+ Years	Fair	Fair	None	B2	Basal flare on edge of drive.		
T027	Common Beech (Fagus sylvatica)	Tree	1030	Radius: 12.4m. Area: 483 sq m.	7	7	7	7	21	4.5 3(N)	Mature	40+ Years	Fair	Fair	Low	B			
T028	Scots Pine (Pinus sylvestris)	Tree	470	Radius: 5.6m. Area: 99 sq m.	1	3	3.5	3	15	7 9(S)	Early Mature	20+ Years	Fair	Fair	Low	B	Over utility line		

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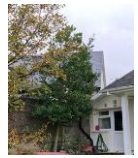
					North	East	South	West											
T029	Portuguese Laurel (Prunus lusitanica)	Tree 8 stems	120, 100, 60, 40, 10, 10, 10, 10	Radius: 2.1m. Area: 14 sq m.	1.5	1.5	1.5	1.5	7	0	Semi Mature	40+ Years	Fair	Fair	None	C			
T030	Lawson Cypress (Chamaecyparis lawsoniana)	Tree	920	Radius: 11.0m. Area: 380 sq m.	4	4	4	4	20	1.5	Early Mature	40+ Years	Fair	Fair	Low	B1			
T031	Cultivar Apple (Malus domestica)	Tree 2 stems	210, 130	Radius: 3.0m. Area: 28 sq m.	1.5	1.5	1.5	1.5	4.5	1 1(W)	Semi Mature	40+ Years	Fair	Fair	None	C	Adjacent to wall. Sentimental tree to residents.	Options 1-3: Remove tree to facilitate works (option to transplant)	
T032	Cultivar Apple (Malus domestica)	Tree	120	Radius: 1.4m. Area: 6 sq m.	1	1	1	1	1.5	0	Semi Mature	40+ Years	Fair	Fair	None	C	Sentimental tree to residents.	Options 1-3: Remove tree to facilitate works (option to transplant)	
T033	Cultivar Apple (Malus domestica)	Tree	90	Radius: 1.1m. Area: 4 sq m.	1	1	1	1	2	0.5	Semi Mature	40+ Years	Fair	Fair	None	C	Sentimental tree to residents	Options 1-3: Remove tree to facilitate works (option to transplant)	
T034	Common Holly (Ilex aquifolium)	Tree 2 stems	140, 70	Radius: 1.9m. Area: 11 sq m.	1	1	1	1	7	1.5	Semi Mature	40+ Years	Fair	Fair	None	C	Adjacent to wall.	Options 1-3: Remove tree to facilitate works	
T035	Sycamore (Acer pseudoplatanus)	Tree	240	Radius: 2.9m. Area: 26 sq m.	1.5	1.5	1.5	1.5	12	2 2(W)	Semi Mature	40+ Years	Fair	Fair	None	C	Adjacent to wall.	Options 1-3: Remove tree to facilitate works	

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T036	Common Hawthorn (Crataegus monogyna)	Tree	400	Radius: 4.8m. Area: 72 sq m.	3	2	2	5	7	0.5	Early Mature	20+ Years	Fair	Physical Defect	None	B1	Significant lean and resting on the wall.	Options 1-3: Remove tree to facilitate works [Note: neighbour (but not necessarily owner) is keen to see the retention of the tree, consider options for retention by redesign?]	
T037	Sycamore (Acer pseudoplatanus)	Tree	650	Radius: 7.8m. Area: 191 sq m.	4.5	4.5	4.5	4.5	14	2.53 4(W)	Early Mature	40+ Years	Fair	Fair	None	C2			
T038	Weeping Willow (Salix babylonica)	Tree	400	Radius: 4.8m. Area: 72 sq m.	4	4	4	4	13	1	Semi Mature	40+ Years	Fair	Fair	None	C2			
T039	Common Ash x5 (Fraxinus excelsior)	Group 5 trees		Area: 29 sq m, plus a 1m buffer.	As shown on plans				13	2	Semi Mature	40+ Years	Fair	Fair	None	C			
T040	Common Ash (Fraxinus excelsior)	Tree	420	Radius: 5.0m. Area: 79 sq m.	3	3	3	3		4.5	Semi Mature	<10 years	Poor	Fair	None	C	Branch rips and stubs. Tip dieback in crown.		
T041	Common Ash (Fraxinus excelsior)	Tree 2 stems	260, 320	Radius: 4.9m. Area: 75 sq m.	3	1	1	2.5	12	3.5	Semi Mature	20+ Years	Fair	Poor	None	C	Ivy covered stems. Pruning stubs.		
T042	Common Alder (Alnus glutinosa)	Tree	260	Radius: 3.1m. Area: 30 sq m.	1.5	1.5	1.5	1.5	13	5	Semi Mature	40+ Years	Fair	Fair	None	C			

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					North	East	South	West											
T043	Common Alder (Alnus glutinosa)	Tree	220	Radius: 2.6m. Area: 21 sq m.	1	1	1	1	13	5	Semi Mature	40+ Years	Poor	Fair	None	C	Bacterial canker on stem		
T044	Common Alder (Alnus glutinosa)	Tree 2 stems	340, 340	Radius: 5.8m. Area: 106 sq m.	1.5	1.5	1.5	1.5	13	4	Semi Mature	40+ Years	Fair	Physical Defect	Low	C	Ivy covered stems. Stems in tight proximity to each other.		
T045	Common Alder (Alnus glutinosa)	Tree 3 stems	280, 300, 280	Radius: 6.0m. Area: 113 sq m.	2.5	1	2.5	2.5	12	4.5	Semi Mature	40+ Years	Fair	Fair	None	C			
T046	Common Ash (Fraxinus excelsior)	Tree 3 stems	200, 100, 120	Radius: 3.0m. Area: 28 sq m.	1	1	1	1	11	6	Semi Mature	20+ Years	Fair	Fair	None	C			
T047	Common Ash (Fraxinus excelsior)	Tree 5 stems	120, 150, 140, 140, 100	Radius: 3.5m. Area: 38 sq m.	2	1	2	2	12		Semi Mature	20+ Years	Fair	Fair	None	C	Ivy covered stems.		
T048	Common Alder (Alnus glutinosa)	Tree	180	Radius: 2.2m. Area: 15 sq m.	1.5	1.5	1.5	1.5	7	2	Semi Mature	40+ Years	Fair	Fair	None	C			
T049	Grey Alder (Alnus incana) Common Ash (Fraxinus excelsior) Willow (Salix sp.)	Woodland		Area: 3079 sq m, plus a 1m buffer.					16		Semi Mature	40+ Years	Fair	Fair	Low	B2	Wooded area predominantly made up of willow		

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					North	East	South	West											
T050	Common Alder (Alnus glutinosa)	Tree	300	Radius: 3.6m. Area: 41 sq m.	2.5	2.5	2.5	2.5	8	3	Semi Mature	40+ Years	Fair	Fair	None	C2			
T051	Common Ash (Fraxinus excelsior)	Tree 3 stems	200, 120, 220	None - due to Retention Category of U.	2.5	2.5	2.5	2.5	9		Semi Mature	<10 years	Poor	Fair	None	U	Ivy covered stems. Decline and dieback in crown, with epicormic growth throughout.		
T052	Sycamore (Acer pseudoplatanus)	Tree	260	Radius: 3.1m. Area: 30 sq m.	2.5	1	1	2.5	10		Semi Mature	40+ Years	Fair	Fair	None	C			
T053	Weeping Willow (Salix babylonica)	Group		Area: 152 sq m, plus a 1m buffer.	As shown on plans				5		Young	40+ Years	Fair	Fair	Low	C	Groupingnof willow understorey		
T054	White Poplar (Populus alba) Pedunculate Oak (Quercus robur)	Group		Area: 140 sq m, plus a 1m buffer.	As shown on plans				7		Young	40+ Years	Fair	Fair	None	C		Option 1: Remove to facilitate works	
T055	Goat Willow (Salix caprea)	Tree 5 stems	110, 60, 60, 50, 100	Radius: 2.1m. Area: 14 sq m.	3	3	3	3	9		Semi Mature	40+ Years	Fair	Fair	None	C2		Option 1: Remove to facilitate works	
T056	Goat Willow (Salix caprea)	Tree 7 stems	100, 100, 90, 110, 90, 100, 90	Radius: 3.1m. Area: 30 sq m.	2	2	2	2	11		Semi Mature	40+ Years	Fair	Fair	None	C2		Option 1: Remove to facilitate works	

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					North	East	South	West											
T057	Common Beech (Fagus sylvatica)	Tree	550	Radius: 6.6m. Area: 137 sq m.	4.5	4	1.5	1	19	1 4(E)	Early Mature	40+ Years	Fair	Fair	None	B2	Low trailing branching	Option 1: Remove to facilitate works	
T058	Common Beech (Fagus sylvatica)	Tree	270	Radius: 3.2m. Area: 32 sq m.	4.5	2	0	0	12	1 4(E)	Semi Mature	40+ Years	Fair	Physical Defect	None	C2	Bark wound on North side of stem at 2m from ground level.	Option 1: Remove to facilitate works	
T059	Common Beech (Fagus sylvatica)	Tree	570	Radius: 6.8m. Area: 145 sq m.	5	4	1.5	2	25	1 14(E)	Early Mature	40+ Years	Fair	Fair	None	B2	Cabling on West Side of stem.	Option 1: Remove to facilitate works	
T060	Common Beech (Fagus sylvatica)	Tree	670	Radius: 8.0m. Area: 201 sq m.	6	6	6	6	26	1 4(E)	Early Mature	40+ Years	Fair	Fair	None	B2	Bifurcated.	Option 1: Crown lift to 5m from the ground level of the bridge/ road	
T061	Common Beech (Fagus sylvatica)	Tree	620	Radius: 7.4m. Area: 172 sq m.	3	3	5	4	25	4 4(S)	Early Mature	40+ Years	Fair	Fair	None	B2		Option 1: Crown lift to 5m from the ground level of the road	
T062	Common Beech (Fagus sylvatica)	Tree	220	Radius: 2.6m. Area: 21 sq m.	2	2	2	2	9	2	Semi Mature	40+ Years	Fair	Fair	None	C2		Option 1: Crown lift to 5m from the ground level of the road	
T063	Common Beech (Fagus sylvatica)	Tree	200	Radius: 2.4m. Area: 18 sq m.	1.5	1.5	1.5	1.5	9	2	Semi Mature	40+ Years	Fair	Fair	None	C2		Option 1: Crown lift to 5m from the ground level of the road	No Photo

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					North	East	South	West											
T064	Common Beech (Fagus sylvatica)	Tree	230	Radius: 2.8m. Area: 25 sq m.	2	2	2	2	9	2	Semi Mature	40+ Years	Fair	Fair	None	C2		Option 1: Crown lift to 5m from the ground level of the road	
T065	European Lime (Tilia x europaea)	Tree	700	Radius: 8.4m. Area: 222 sq m.	6	3	5	5	26	2.5	Early Mature	40+ Years	Fair	Fair	Low	B	Dense epicormic growth around base to bifurcation point, unable to inspect.	Option 1: Crown lift to 5m from the ground level of the road	
T066	Lawson Cypress (Chamaecyparis lawsoniana)	Tree	620	Radius: 7.4m. Area: 172 sq m.	2	2	2	2	20	2 2(W)	Early Mature	40+ Years	Fair	Poor	None	C2	Bifurcated. Tree was trifucated but a split out has occurred.		
T067	Common Ash (Fraxinus excelsior)	Tree	470	Radius: 5.6m. Area: 99 sq m.	5	1.5	1.5	5	25	6 5(W)	Early Mature	<10 years	Poor	Fair	None	C	Tree appears to be in decline, with sparse crown.		
T068	Common Ash (Fraxinus excelsior)	Tree	350	Radius: 4.2m. Area: 55 sq m.	1	3	1	3	25	16	Early Mature	<10 years	Poor	Fair	None	C	Tree appears to be in decline, with sparse crown. Bifurcated.		
T069	Common Ash (Fraxinus excelsior)	Tree	340	Radius: 4.1m. Area: 53 sq m.	1	3	1	5	21	9	Early Mature	<10 years	Poor	Fair	None	C	Tree appears to be in decline, with sparse crown. Bifurcated.		
T070	Common Beech (Fagus sylvatica)	Tree	710	Radius: 8.5m. Area: 227 sq m.	8	5	5	4	30	4 4.5(N)	Early Mature	40+ Years	Good	Good	None	B2			

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T071	Sycamore (Acer pseudoplatanus)	Tree	1020	Radius: 12.2m. Area: 468 sq m.	8	8	4	8	30	5 6(W)	Mature	40+ Years	Good	Fair	Low	A1	Bifurcated. Tight union.		
T072	Sycamore (Acer pseudoplatanus)	Tree	830	Radius: 10.0m. Area: 314 sq m.	3	3	3	3	22	9 9(E)	Early Mature	40+ Years	Good	Fair	Low	B2	Bifurcated.		
T073	Common Ash (Fraxinus excelsior)	Tree	1500	Radius: 15.0m. Area: 707 sq m.	8	8	8	8	32	12 10(E)	Over Mature	20+ Years	Fair	Fair	Low	A1	Diameter estimated due to proximity with water. Two main boughs, of which one is bifurcated.		
T074	Sycamore (Acer pseudoplatanus)	Tree	860	Radius: 10.3m. Area: 333 sq m.	7	7	7	4	25	9 9(E)	Mature	20+ Years	Fair	Physical Defect	Low	B2	Bark wound on south side at base, partially decayed.		
T075	Cedar (Cedrus sp.)	Tree	1620	Radius: 15.0m. Area: 707 sq m.	14	3.5	12	9	23	12 12(NW)	Veteran	40+ Years	Poor	Fair	Low	A1	Branch snap outs. Tree has lost its top. Hanging snapped branching.	Options 1-3: Remove snapped branching, so works beneath can be safely carried out.	
T076	Common Beech (Fagus sylvatica)	Tree	300	Radius: 3.6m. Area: 41 sq m.	3	3	3	3	18	2	Semi Mature	40+ Years	Fair	Fair	None	B		Options 2 & 3: Crown lift to 4m to facilitate works	
T077	Common Beech (Fagus sylvatica)	Tree 2 stems	220, 470	Radius: 6.2m. Area: 121 sq m.	1	4	5	5	20	2 1(E)	Early Mature	40+ Years	Fair	Fair	None	C		Options 2 & 3: Crown lift to 4m to facilitate works	

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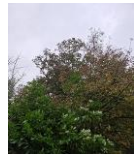
					North	East	South	West											
T078	Common Beech (Fagus sylvatica)	Tree	270	Radius: 3.2m. Area: 32 sq m.	2	2	2	2	22		Semi Mature	40+ Years	Fair	Fair	None	C			
T079	Sycamore (Acer pseudoplatanus)	Tree	780	Radius: 9.4m. Area: 278 sq m.	5	5	5	5	22	8	Early Mature	40+ Years	Fair	Fair	None	B			
T080	Common Beech (Fagus sylvatica)	Tree	700	Radius: 8.4m. Area: 222 sq m.	2	6	5	6	21	3 4(W)	Early Mature	40+ Years	Fair	Fair	Low	B			
T081	Common Beech (Fagus sylvatica)	Tree	1110	Radius: 13.3m. Area: 556 sq m.	10	10	7	6	26	0 4(E)	Over Mature	40+ Years	Fair	Fair	Low	A1	Maze Gill at base. Lights and cabling on North side of stem. Dead stubs in crown.		
T082	Common Ash (Fraxinus excelsior)	Tree	800	Radius: 9.6m. Area: 290 sq m.	6	6	4	2.5	22	9	Mature	20+ Years	Fair	Fair	Low	B	Has either died or has dropped its leaves sooner than other ash in area. Unless confirmed as dead, will consider as living.	Re-inspect in late spring. Option 1: Crown lift to 5m from the ground level of the bridge/ road	
T083	Sycamore (Acer pseudoplatanus)	Tree	300	Radius: 3.6m. Area: 41 sq m.	2.5	2.5	2	2.5	14	6	Semi Mature	40+ Years	Fair	Fair	None	C		Option 1: Crown lift to 5m from the ground level of the bridge/ road	
T084	Sycamore (Acer pseudoplatanus)	Tree	300	Radius: 3.6m. Area: 41 sq m.	2.5	2.5	2	2.5	14	6	Semi Mature	40+ Years	Fair	Fair	None	C		Option 1: Crown lift to 5m from the ground level of the bridge/ road	

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T085	Common Ash (Fraxinus excelsior)	Tree	400	Radius: 4.8m. Area: 72 sq m.	3	2	1.5	2	20	16	Semi Mature	20+ Years	Fair	Fair	None	C	Bifurcated with a previous branch tear out at union.	Option 1: Crown lift to 5m from the ground level of the bridge/ road	
T086	Sycamore (Acer pseudoplatanus)	Tree	400	Radius: 4.8m. Area: 72 sq m.	3	3	3	3	17	6	Semi Mature	40+ Years	Fair	Fair	None	C		Option 1: Crown lift to 5m from the ground level of the bridge/ road	
T087	Sycamore (Acer pseudoplatanus)	Tree	300	Radius: 3.6m. Area: 41 sq m.	4	2.5	1	2.5	12	6	Semi Mature	40+ Years	Fair	Fair	None	C		Option 1: Crown lift to 5m from the ground level of the bridge/ road	
T088	Common Ash (Fraxinus excelsior)	Tree	350	Radius: 4.2m. Area: 55 sq m.	2.5	2.5	2.5	2.5	20	7 7(W)	Semi Mature	40+ Years	Fair	Fair	None	C	Ivy covered stem.	Option 1: Crown lift to 5m from the ground level of the bridge/ road	
T089	Sycamore (Acer pseudoplatanus)	Tree	400	Radius: 4.8m. Area: 72 sq m.	2.5	2.5	2.5	2.5	14	6 7(NE)	Semi Mature	40+ Years	Fair	Fair	None	C	Ivy covered stem	Option 1: Crown lift to 5m from the ground level of the bridge/ road	
T090	Sycamore (Acer pseudoplatanus)	Tree	420.300	too small to calc.	4	3	3	2.5	15	4	Semi Mature	40+ Years	Fair	Fair	None	C		Option 1: Crown lift to 5m from the ground level of the bridge/ road	
T091	Sycamore (Acer pseudoplatanus)	Tree	280	Radius: 3.4m. Area: 36 sq m.	1.5	1.5	1.5	1.5	14	3	Semi Mature	40+ Years	Fair	Fair	None	C	Ivy covered stem.		

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T092	White Poplar (Populus alba)	Tree	1500	None - due to Retention Category of U.	0	0	0	0	14		Veteran	<10 years	Poor	Decaying	Low	U	Tree is almost dead with only 3x epicormic sprouts at top of main bough/ on central stem. Ivy clad stem. Adjacent to road. Adjacent to utility line.	Remove tree. Recommendation not linked to facilitate works.	
T093	Common Ash (Fraxinus excelsior)	Tree	200	Radius: 2.4m. Area: 18 sq m.	1	1	1	1	15	8	Semi Mature	40+ Years	Fair	Fair	None	C	Ivy clad stem.		
T094	Sycamore (Acer pseudoplatanus)	Tree	200	Radius: 2.4m. Area: 18 sq m.	1	1	1	1	8	4	Semi Mature	40+ Years	Fair	Poor	None	C	Poor pruning cuts and shaping.		
T095	Common Ash (Fraxinus excelsior)	Tree	200	Radius: 2.4m. Area: 18 sq m.	1	1	1	1	11	8	Semi Mature	40+ Years	Fair	Fair	None	C	Ivy covered stem		
T096	Sycamore (Acer pseudoplatanus)	Tree	200	Radius: 2.4m. Area: 18 sq m.	1	1	1	1	7	4	Semi Mature	40+ Years	Fair	Poor	None	C	Poor pruning cuts and shaping.		
T097	Sycamore (Acer pseudoplatanus)	Tree	200	None - due to Retention Category of U.	0	0	0	0	6		Semi Mature	Dead	Dead	Poor	Low	U	Ivy covered pole, no regrowth noted.		
T098	Sycamore (Acer pseudoplatanus)	Tree	240	Radius: 2.9m. Area: 26 sq m.	1	1	1	1	8	4	Semi Mature	40+ Years	Fair	Poor	None	C	Poor pruning cuts and shaping.		

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T099	Common Ash (Fraxinus excelsior)	Tree	480	Radius: 5.8m. Area: 106 sq m.	4	4	4	4	25	18	Early Mature	40+ Years	Fair	Fair	None	B			
T100	Common Ash (Fraxinus excelsior)	Tree	140	Radius: 1.7m. Area: 9 sq m.	0.5	0.5	0.5	0.5	6	4	Young	40+ Years	Fair	Poor	None	C	Poor pruning cuts and shaping.		
T101	Sycamore (Acer pseudoplatanus)	Tree	100	Radius: 1.2m. Area: 5 sq m.	1	1	1	1	7	4	Young	40+ Years	Fair	Poor	None	C			
T102	White Poplar (Populus alba)	Tree	700	Radius: 8.4m. Area: 222 sq m.	7	4	7	7	32	16	Mature	40+ Years	Fair	Good	None	A1	East side denuded, as similar large tree recently lost in proximity to it.		
T103	Common Ash (Fraxinus excelsior)	Tree	140	Radius: 1.7m. Area: 9 sq m.	0.5	0.5	0.5	0.5	7		Young	40+ Years	Fair	Fair	None	C	Poor form. Adjacent to utility pole. Ivy covered stem.		
T104	Sycamore (Acer pseudoplatanus)	Tree	100	Radius: 1.2m. Area: 5 sq m.	0.5	0.5	0.5	0.5	7		Young	40+ Years	Fair	Fair	None	C	Ivy covered stem. Poor pruning cuts and form.		
T105	Sycamore (Acer pseudoplatanus)	Tree	300	Radius: 3.6m. Area: 41 sq m.	0.5	0.5	0.5	0.5	13	4(N)	Semi Mature	40+ Years	Fair	Fair	None	C	Ivy covered stem.		

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T106	Common Ash (Fraxinus excelsior)	Tree	100	Radius: 1.2m. Area: 5 sq m.	0.5	0.5	0.5	0.5	7		Young	40+ Years	Fair	Fair	None	C	Ivy covered stem. Poor pruning cuts and form.		
T107	Sycamore (Acer pseudoplatanus)	Tree	100	Radius: 1.2m. Area: 5 sq m.	0.5	0.5	0.5	0.5	7		Young	40+ Years	Fair	Fair	None	C	Ivy covered stem. Poor pruning cuts and form.		
T108	Sycamore (Acer pseudoplatanus)	Tree	300	Radius: 3.6m. Area: 41 sq m.	2	2	2	2	13	4	Semi Mature	40+ Years	Fair	Fair	None	C	Ivy covered stem.		
T109	Common Ash (Fraxinus excelsior)	Tree	300	Radius: 3.6m. Area: 41 sq m.	2	0.5	0.5	0.5	13		Young	40+ Years	Fair	Fair	None	C	Ivy covered stem.		
T110	Sycamore (Acer pseudoplatanus)	Tree	300	None - due to Retention Category of U.	0	0	0	0	13		Semi Mature	Dead	Dead	Decaying	Low	U	Ivy covered stem. No growth.		
T111	Common Alder (Alnus glutinosa)	Tree	300	Radius: 3.6m. Area: 41 sq m.	2.5	2.5	2.5	2.5	16	8	Semi Mature	40+ Years	Fair	Fair	Low	C	Ivy covered stem		
T112	Common Ash (Fraxinus excelsior)	Tree	250	Radius: 3.0m. Area: 28 sq m.	2	2	2	2	14		Semi Mature	40+ Years	Fair	Fair	None	C	Pruning stubs.		

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T113	Sycamore (Acer pseudoplatanus)	Tree	350	Radius: 4.2m. Area: 55 sq m.	2.5	2.5	2.5	2.5	18		Semi Mature	40+ Years	Fair	Fair	None	C			
T114	Common Beech (Fagus sylvatica)	Tree	300	Radius: 3.6m. Area: 41 sq m.	2.5	2.5	2.5	2.5	16		Semi Mature	40+ Years	Fair	Fair	None	C			
T115	Common Beech (Fagus sylvatica)	Tree	280	Radius: 3.4m. Area: 36 sq m.	2.5	2.5	2.5	2.5	16	2	Semi Mature	40+ Years	Fair	Fair	None	C			
T116	Common Hawthorn (Crataegus monogyna)	Tree 3 stems	120, 100, 60	Radius: 2.0m. Area: 13 sq m.	1	1	1	1	8	2	Young	40+ Years	Fair	Fair	None	C2	Bird nest in upper crown.		
T117	Sycamore (Acer pseudoplatanus)	Tree	350	Radius: 4.2m. Area: 55 sq m.	2.5	2.5	2.5	2.5	18		Semi Mature	40+ Years	Fair	Fair	None	C			
T118	Sycamore (Acer pseudoplatanus)	Tree 2 stems	320, 180	Radius: 4.4m. Area: 61 sq m.	2.5	2.5	2.5	2.5	18	4	Semi Mature	40+ Years	Fair	Fair	None	C	Ivy covered stem		
T119	Sycamore (Acer pseudoplatanus)	Tree 3 stems	220, 240, 280	Radius: 5.1m. Area: 82 sq m.	2.5	1	2.5	2.5	18	3	Semi Mature	40+ Years	Fair	Fair	None	C	Ivy covered stems		

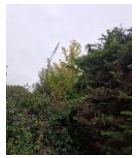
Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T120	Sycamore (Acer pseudoplatanus)	Tree 3 stems	220, 240, 280	Radius: 5.1m. Area: 82 sq m.	2.5	1	2.5	2.5	18	3	Semi Mature	40+ Years	Fair	Fair	None	C	Ivy covered stems. Growing out of wall.		
T121	Sycamore (Acer pseudoplatanus)	Tree	320	Radius: 3.8m. Area: 45 sq m.	2.5	1	2.5	2.5	18	3 4(W)	Semi Mature	40+ Years	Fair	Fair	None	C			
T122	Sycamore (Acer pseudoplatanus)	Tree 2 stems	200, 220	Radius: 3.6m. Area: 41 sq m.	2	2	2	2	14		Semi Mature	40+ Years	Fair	Poor	None	C	Poor pruning cuts. 1x stem ivy covered.		
T123	Common Alder (Alnus glutinosa)	Tree	180	Radius: 2.2m. Area: 15 sq m.	1	1	1	1	7		Semi Mature	40+ Years	Fair	Fair	None	C	Epicormic. Phototrophic lean towards road.		
T124	Sycamore (Acer pseudoplatanus)	Tree	400	Radius: 4.8m. Area: 72 sq m.	2	2	2	2	14	4	Semi Mature	40+ Years	Fair	Fair	None	C	Poor pruning cuts and form. Growing out of base of wall. Adjacent to utility pole.		
T125	Sycamore (Acer pseudoplatanus)	Tree 2 stems	220, 200	Radius: 3.6m. Area: 41 sq m.	2	2	2	1	14	9	Semi Mature	40+ Years	Fair	Fair	None	C	Pruning stubs		
T126	Sycamore (Acer pseudoplatanus)	Tree 2 stems	200, 200	Radius: 3.4m. Area: 36 sq m.	1	1	1	1	12	9	Semi Mature	40+ Years	Fair	Fair	None	C	Pruning stubs.		

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T127	Sycamore (Acer pseudoplatanus)	Tree 3 stems	260, 200, 180	Radius: 4.5m. Area: 64 sq m.	1	1	1	1	12	3	Semi Mature	40+ Years	Fair	Fair	None	C	Pruning stubs. Ivy covered stems.		
T128	Common Ash (Fraxinus excelsior)	Tree 3 stems	300, 280, 100	Radius: 5.1m. Area: 82 sq m.	2	2	2	2	18	8	Semi Mature	40+ Years	Fair	Fair	None	C			
T129	Sycamore (Acer pseudoplatanus)	Tree 3 stems	220, 200, 180	Radius: 4.2m. Area: 55 sq m.	1	1	1	1	7	4	Semi Mature	40+ Years	Fair	Poor	None	C	Poor pruned form. Stubs. Adjacent to utility pole.		
T130	Sycamore (Acer pseudoplatanus)	Tree 4 stems	280, 380, 100, 140	Radius: 6.0m. Area: 113 sq m.	4	2	1	4	15	6 4(N)	Semi Mature	40+ Years	Fair	Poor	Low	C	Branching touching utilities lines.		
T131	Common Ash (Fraxinus excelsior)	Tree 5 stems	200, 80, 60, 60, 80	Radius: 2.9m. Area: 26 sq m.	2	2	2	2	14		Young	40+ Years	Fair	Fair	None	C			
T132	Sycamore (Acer pseudoplatanus)	Tree	260	Radius: 3.1m. Area: 30 sq m.	2	2	1	2	13	6 6(E)	Semi Mature	40+ Years	Fair	Fair	None	C	Elm undergrowth.		
T133	Sycamore (Acer pseudoplatanus)	Tree	320.280	too small to calc.	2	1	2	2	15	6 6(E)	Semi Mature	40+ Years	Fair	Fair	None	C	Elm undergrowth.		

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T134	Sycamore (Acer pseudoplatanus)	Tree 6 stems	420, 220, 200, 200, 360, 370	Radius: 9.1m. Area: 260 sq m.	4	4	5	4	16	2.5	Semi Mature	40+ Years	Fair	Fair	None	C2	Adjacent to watercourse	Options 1: Remove tree to facilitate works	
T135	Common Ash (Fraxinus excelsior)	Tree	700	Radius: 8.4m. Area: 222 sq m.	4	4	5	4	20	12	Early Mature	40+ Years	Fair	Fair	None	C	Bifurcated at 2m	Options 1: Remove tree to facilitate works	
T136	Common Ash (Fraxinus excelsior)	Tree	280	Radius: 3.4m. Area: 36 sq m.	1.5	1.5	1.5	1.5	14	2	Semi Mature	40+ Years	Fair	Fair	None	C	Epicormic growth through crown. Ivy covered stem.	Options 1: Remove tree to facilitate works	
T137	Common Ash (Fraxinus excelsior)	Tree	200	Radius: 2.4m. Area: 18 sq m.	1	1	1	1	12	3	Young	10+ Years	Diseased	Fair	None	C	Ivy covered stem. Dieback in crown.	Options 1: Remove tree to facilitate works	
T138	Sycamore (Acer pseudoplatanus)	Tree	150	Radius: 1.8m. Area: 10 sq m.	1	1	1	1	6	1.5	Semi Mature	40+ Years	Fair	Fair	None	C		Options 1: Remove tree to facilitate works	
T139	Common Ash (Fraxinus excelsior)	Tree	400	None - due to Retention Category of U.	1	4	2	3	15	3 3(E)	Semi Mature	Dead	Dead	Decaying	None	U		Options 1: Remove tree to facilitate works	
T140	Common Ash (Fraxinus excelsior)	Tree 3 stems	400, 180, 180	Radius: 5.7m. Area: 102 sq m.	2	2	2	2	15	4 4(N)	Semi Mature	<10 years	Diseased	Fair	None	C	Tip dieback and crown decline.		

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T141	Sycamore (Acer pseudoplatanus)	Tree 2 stems	400, 200	Radius: 5.4m. Area: 92 sq m.	4	4	2	4	20	5	Semi Mature	40+ Years	Fair	Fair	Low	C	Ivy covered stem.	Options 1: Remove tree to facilitate works	
T142	Common Beech (Fagus sylvatica)	Tree	500	Radius: 6.0m. Area: 113 sq m.	3.5	7	3.5	5	20	4 4(E)	Early Mature	40+ Years	Fair	Poor	None	B	Tight union, with large ear ribs. Extended branch over parking area on East Side of crown.	Options 1: Remove tree to facilitate works	
T143	Common Beech (Fagus sylvatica)	Tree 3 stems	300, 400, 180	Radius: 6.4m. Area: 129 sq m.	5	6	7	5	20	3 4(E)	Early Mature	40+ Years	Fair	Fair	None	C	Tight unions	Options 1: Remove tree to facilitate works	
T144	Sycamore x7 (Acer pseudoplatanus)	Group 7 trees		Area: 21 sq m, plus a 1m buffer.	As shown on plans				15	4	Early Mature	40+ Years	Fair	Fair	None	C	Topped trees. Stems covered in ivy.	Options 1: Remove tree to facilitate works	
T145	Sycamore (Acer pseudoplatanus)	Tree	280	Radius: 3.4m. Area: 36 sq m.	1	1	1	1	15	10	Semi Mature	40+ Years	Fair	Fair	None	C		Options 1: Remove tree to facilitate works	
T146	Sycamore (Acer pseudoplatanus)	Tree	400	Radius: 4.8m. Area: 72 sq m.	1	1	1	3	15	9	Semi Mature	40+ Years	Fair	Fair	None	C	Bifurcated	Options 1: Remove tree to facilitate works	
T147	Sycamore (Acer pseudoplatanus)	Tree 3 stems	240, 120, 150	Radius: 3.7m. Area: 43 sq m.	1	1	3	1	15	9	Semi Mature	40+ Years	Fair	Fair	None	C	Ivy covered stems		

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T148	Lawson Cypress (Chamaecyparis lawsoniana)	Tree 3 stems	280, 300, 310	Radius: 6.2m. Area: 121 sq m.	2	2	2	2	10	3	Semi Mature	40+ Years	Fair	Fair	None	C			
T149	Laurel Cherry (Prunus laurocerasus)	Tree 4 stems	220, 230, 300, 320	Radius: 6.5m. Area: 133 sq m.	3	5	5	3	8	2	Early Mature	40+ Years	Fair	Fair	None	C	Adjacent to shed		
T150	Sycamore (Acer pseudoplatanus)	Tree 4 stems	300, 300, 280, 300	Radius: 7.1m. Area: 158 sq m.	2.5	2.5	2.5	2.5	16	3 3(N)	Semi Mature	40+ Years	Fair	Fair	None	C	Ivy covered stems		
T151	Western Red Cedar (Thuja plicata)	Tree	740	Radius: 8.9m. Area: 249 sq m.	3	4	4	4	18	2	Early Mature	40+ Years	Fair	Fair	None	B2	Low trailing branching.		
T152	Atlas Cedar (Cedrus atlantica)	Tree	1400	Radius: 15.0m. Area: 707 sq m.	5	5	5	5	20	2.5 2.5(W)	Over Mature	40+ Years	Fair	Fair	Low	B1	Dieback and decline in lower crown. Ivy covered stem. Significant diameter >100mm deadwood throughout crown.	Options 1-3: Crown lift to 4m to facilitate works	
T153	Common Ash (Fraxinus excelsior) Sycamore x12 (Acer pseudoplatanus)	Group 13 trees		Area: 136 sq m, plus a 1m buffer.	As shown on plans				18		Semi Mature	40+ Years	Fair	Fair	None	C	Grouping of trees, stems avg. 250-300mm diameter		
T154	Aspen (Populus tremula)	Tree	300	Radius: 3.6m. Area: 41 sq m.	1.5	1.5	1.5	1.5	18	8	Semi Mature	40+ Years	Fair	Fair	None	C	Thick undergrowth, diameter estimated.	Options 1-3: Remove tree to facilitate works	

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T155	Sycamore (Acer pseudoplatanus)	Tree 3 stems	300, 300, 100	None - due to Retention Category of U.	0	0	0	0	9		Dead	Dead	Dead	Decaying	None	U	Dead poles	Options 1-3: Remove tree to facilitate works	
T156	Sycamore (Acer pseudoplatanus)	Tree	300	None - due to Retention Category of U.	0	0	0	0	9		Dead	Dead	Dead	Decaying	None	U	Dead poles	Options 1-3: Remove tree to facilitate works	
T157	Sycamore (Acer pseudoplatanus)	Tree	200	Radius: 2.4m. Area: 18 sq m.	1.5	1.5	1.5	1.5	10	2	Semi Mature	40+ Years	Fair	Fair	None	C	Ivy covered stem	Options 1-3: Remove tree to facilitate works	
T158	Common Ash (Fraxinus excelsior)	Tree 3 stems	200, 100, 310	Radius: 4.6m. Area: 66 sq m.	4	4	4	4	18		Semi Mature	40+ Years	Fair	Fair	None	C	Ivy covered stems		
T159	Goat Willow x5 (Salix caprea)	Group 5 trees		Area: 19 sq m, plus a 1m buffer.	As shown on plans				10		Semi Mature	40+ Years	Fair	Fair	None	C	Pollarded willow	Options 1-3: Remove tree to facilitate works	
T160	Aspen (Populus tremula)	Tree	200	Radius: 2.4m. Area: 18 sq m.	0.5	0.5	0.5	0.5	10		Young	40+ Years	Fair	Fair	None	C		Options 1-3: Remove tree to facilitate works	
T161	Japanese Cedar (Cryptomeria japonica)	Tree	300	Radius: 3.6m. Area: 41 sq m.	1	2	2	2	4	1	Semi Mature	20+ Years	Fair	Fair	None	C		Options 1-3: Remove tree to facilitate works	

Created by OTISS.
Estimates shown with a # or * symbol.

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T162	Aspen x12 (Populus tremula)	Group 12 trees		Area: 105 sq m, plus a 1m buffer.	As shown on plans				14		Semi Mature	40+ Years	Fair	Fair	None	C2		Options 1-3: Remove tree to facilitate works	
T163	Lawson Cypress (Chamaecyparis lawsoniana)	Tree	730	Radius: 8.8m. Area: 243 sq m.	2.5	2.5	2.5	2.5	16	1	Early Mature	40+ Years	Fair	Fair	None	B2	Layering branching		
T164	Lawson Cypress (Chamaecyparis lawsoniana)	Tree	560.430	too small to calc.	2.5	2.5	2.5	2.5	16	1	Early Mature	40+ Years	Fair	Fair	None	B2	Layering branching		
T165	Lawson Cypress (Chamaecyparis lawsoniana)	Tree	800	Radius: 9.6m. Area: 290 sq m.	2.5	2.5	2.5	2.5	16	1	Early Mature	40+ Years	Fair	Fair	None	B2	Layering branching/ phoenix branching. Diameter estimated at base.		
T166	Lawson Cypress (Chamaecyparis lawsoniana)	Tree	820	Radius: 9.8m. Area: 302 sq m.	2.5	2.5	2.5	2.5	18	1	Early Mature	40+ Years	Fair	Fair	None	B2	Bifurcated		
T167	Lawson Cypress (Chamaecyparis lawsoniana)	Tree	880	Radius: 10.6m. Area: 353 sq m.	2.5	2.5	2.5	2.5	16	1	Early Mature	40+ Years	Fair	Fair	None	B2			
T168	Sycamore (Acer pseudoplatanus)	Tree	520	Radius: 6.2m. Area: 121 sq m.	3.5	3.5	3.5	3.5	16	3 4(E)	Early Mature	40+ Years	Fair	Fair	None	B2			

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T169	Common Ash (Fraxinus excelsior)	Tree	320	Radius: 3.8m. Area: 45 sq m.	1	3	1	3	16	7 6(W)	Early Mature	40+ Years	Fair	Fair	None	C2			
T170	Common Ash (Fraxinus excelsior)	Tree 3 stems	350, 380, 280	Radius: 7.1m. Area: 158 sq m.	6	3	2	4	17	3 2(E)	Early Mature	40+ Years	Fair	Fair	None	C			
T171	Silver Birch (Betula pendula)	Tree	210	Radius: 2.5m. Area: 20 sq m.	1.5	1.5	1.5	1.5	14	4	Semi Mature	40+ Years	Good	Fair	None	C2			
T172	Silver Birch (Betula pendula)	Tree	160	Radius: 1.9m. Area: 11 sq m.	1.5	1.5	1.5	1.5	10	4	Semi Mature	40+ Years	Good	Fair	None	C2			
T173	Silver Birch (Betula pendula)	Tree	160	Radius: 1.9m. Area: 11 sq m.	1.5	1.5	1.5	1.5	14	4	Semi Mature	40+ Years	Good	Fair	None	C2			
T174	Silver Birch (Betula pendula)	Tree	160	Radius: 1.9m. Area: 11 sq m.	1.5	1.5	1.5	1.5	14	4	Semi Mature	40+ Years	Good	Good	None	C2		Options 1-3: Remove tree to facilitate works	
T175	Silver Birch (Betula pendula)	Tree	260	Radius: 3.1m. Area: 30 sq m.	2	2	2	2	15	4 4(W)	Semi Mature	40+ Years	Good	Fair	None	C2		Options 1-3: Remove tree to facilitate works	

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T176	Aspen (Populus tremula)	Tree 2 stems	620, 640	Radius: 10.7m. Area: 360 sq m.	5	6	5	5	24	4 4(S)	Early Mature	40+ Years	Fair	Fair	Low	B2	Ivy covered stems.		
T177	Lawson Cypress 'c.v.' (Chamaecyparis lawsoniana)	Tree	400	Radius: 4.8m. Area: 72 sq m.	3.5	3.5	3.5	3.5	13	0	Early Mature	40+ Years	Good	Good	None	C2			
T178	Lawson Cypress (Chamaecyparis lawsoniana)	Tree	400	Radius: 4.8m. Area: 72 sq m.	3.5	3.5	3.5	3.5	20	0	Early Mature	40+ Years	Good	Fair	None	C2	Ivy covered stem	Options 1-3: Remove tree to facilitate works	
T179	Sycamore (Acer pseudoplatanus)	Tree	280	Radius: 3.4m. Area: 36 sq m.	0	2	4	1	10	3 3(S)	Semi Mature	40+ Years	Fair	Fair	None	C		Options 1-3: Remove tree to facilitate works	
T180	Lawson Cypress x5 (Chamaecyparis lawsoniana)	Group 5 trees		Area: 98 sq m, plus a 1m buffer.	As shown on plans				20		Semi Mature	40+ Years	Fair	Fair	Low	C	Line of cypress, providing screening. Wall beneath stem.		
T181	Common Ash (Fraxinus excelsior)	Tree	580	Radius: 7.0m. Area: 154 sq m.	3	3	3	3	18	3(E)	Early Mature	40+ Years	Fair	Fair	None	C	Bifurcated. Topped with multi spire regrowth.		
T182	Lawson Cypress (Chamaecyparis lawsoniana)	Tree 5 stems	560, 410, 420, 280, 500	Radius: 11.9m. Area: 445 sq m.	3	3	3	3	20	2	Early Mature	40+ Years	Fair	Fair	None	C2	Tight unions		

Created by OTISS.
Estimates shown with a # or * symbol.

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
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T183	Lawson Cypress (Chamaecyparis lawsoniana)	Tree	300	Radius: 3.6m. Area: 41 sq m.	2.5	1.5	2.5	2	10		Semi Mature	40+ Years	Fair	Fair	None	C2	First tree in lapsed hedge line, nearest outbuilding.		
T184	Sycamore (Acer pseudoplatanus)	Tree 3 stems	100, 130, 130	Radius: 2.5m. Area: 20 sq m.	2	2	2	2	8	0 0.5(SE)	Young	40+ Years	Fair	Fair	None	C			
T185	Sycamore (Acer pseudoplatanus)	Tree	300	Radius: 3.6m. Area: 41 sq m.	2	3	2	2	8	0.5 0.5(SE)	Semi Mature	40+ Years	Fair	Fair	None	C			
T186	Sycamore (Acer pseudoplatanus)	Tree	300	Radius: 3.6m. Area: 41 sq m.	3	3	2	2	8	0.5 0.5(SE)	Semi Mature	40+ Years	Fair	Fair	None	C			
T187	Common Ash (Fraxinus excelsior)	Tree 3 stems	100, 100, 90	Radius: 2.0m. Area: 13 sq m.	1	1	1	1	9	2	Young	40+ Years	Fair	Fair	None	C			
T188	Aspen (Populus tremula)	Tree	200	Radius: 2.4m. Area: 18 sq m.	2	2	2	2	13	2	Semi Mature	40+ Years	Fair	Fair	None	C			
T189	Common Ash (Fraxinus excelsior)	Tree 2 stems	150, 150	None - due to Retention Category of U.	1.5	1	1.5	1.5	12	4	Young	<10 years	Diseased	Poor	None	U	Dieback in crown		

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T190	Common Ash (Fraxinus excelsior)	Tree 2 stems	160	None - due to Retention Category of U.	1.5	1	1.5	1.5	9.5	4	Young	<10 years	Diseased	Poor	None	U	Dieback in crown		
T191	Common Ash (Fraxinus excelsior)	Tree 2 stems	280	Radius: 4.8m. Area: 72 sq m.	2	1	1.5	3	14	6	Semi Mature	40+ Years	Fair	Fair	None	C	Lean towards the west.		
T192	Aspen (Populus tremula)	Tree	240	Radius: 2.9m. Area: 26 sq m.	2	2	2	2	17	9	Semi Mature	40+ Years	Fair	Fair	None	C			
T193	Aspen (Populus tremula)	Tree	240	Radius: 2.9m. Area: 26 sq m.	2	2	2	2	17	9	Semi Mature	40+ Years	Fair	Fair	None	C			
T194	Common Ash (Fraxinus excelsior)	Tree 2 stems	330, 300	Radius: 5.4m. Area: 92 sq m.	2.5	1	2.5	2.5	17	6	Semi Mature	40+ Years	Fair	Fair	None	C			
T195	Common Ash (Fraxinus excelsior)	Tree	270	Radius: 3.2m. Area: 32 sq m.	2.5	2	2.5	1	17	6	Semi Mature	40+ Years	Fair	Fair	None	C	Growing against wall.		
T196	Common Ash (Fraxinus excelsior)	Tree	240	Radius: 2.9m. Area: 26 sq m.	1	1	1	1	17	9	Semi Mature	40+ Years	Fair	Fair	None	C			

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T197	Common Hawthorn (Crataegus monogyna)	Tree	200	Radius: 2.4m. Area: 18 sq m.	2.5	2	2	2	4.5	2 2(N)	Semi Mature	40+ Years	Fair	Fair	None	C		Options 1-3: Remove tree to facilitate works	
T198	Common Ash (Fraxinus excelsior)	Tree 2 stems	180, 340	Radius: 4.6m. Area: 66 sq m.	3	3	1	3	20	5 5(N)	Semi Mature	40+ Years	Fair	Fair	None	C		Options 1-3: Remove tree to facilitate works	
T199	Common Ash (Fraxinus excelsior)	Tree	600	Radius: 7.2m. Area: 163 sq m.	5	3	1	3	20	5 5(N)	Semi Mature	40+ Years	Fair	Fair	None	C		Options 1-3: Remove tree to facilitate works	
T200	Sycamore (Acer pseudoplatanus)	Tree	100	None - due to Retention Category of U.	0	0	0	0	7		Young	Dead	Dead	Decaying	None	U	Dead. Ivy covered.	Options 1-3: Remove tree to facilitate works	
T201	Sycamore (Acer pseudoplatanus)	Tree 2 stems	320, 310	Radius: 5.4m. Area: 92 sq m.	4	3	3	3	18	4.5 5(N)	Semi Mature	20+ Years	Fair	Physical Defect	None	C	Tight union.	Options 1-3: Remove tree to facilitate works	
T202	Sycamore (Acer pseudoplatanus)	Tree	320	Radius: 3.8m. Area: 45 sq m.	2	2	2	2	18	9	Semi Mature	20+ Years	Fair	Fair	None	C		Options 1-3: Remove tree to facilitate works	
T203	Larch (Larix sp.)	Tree	100	None - due to Retention Category of U.	0	0	0	0	11		Young	Dead	Dead	Decaying	None	U	Dead. Ivy covered.		

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
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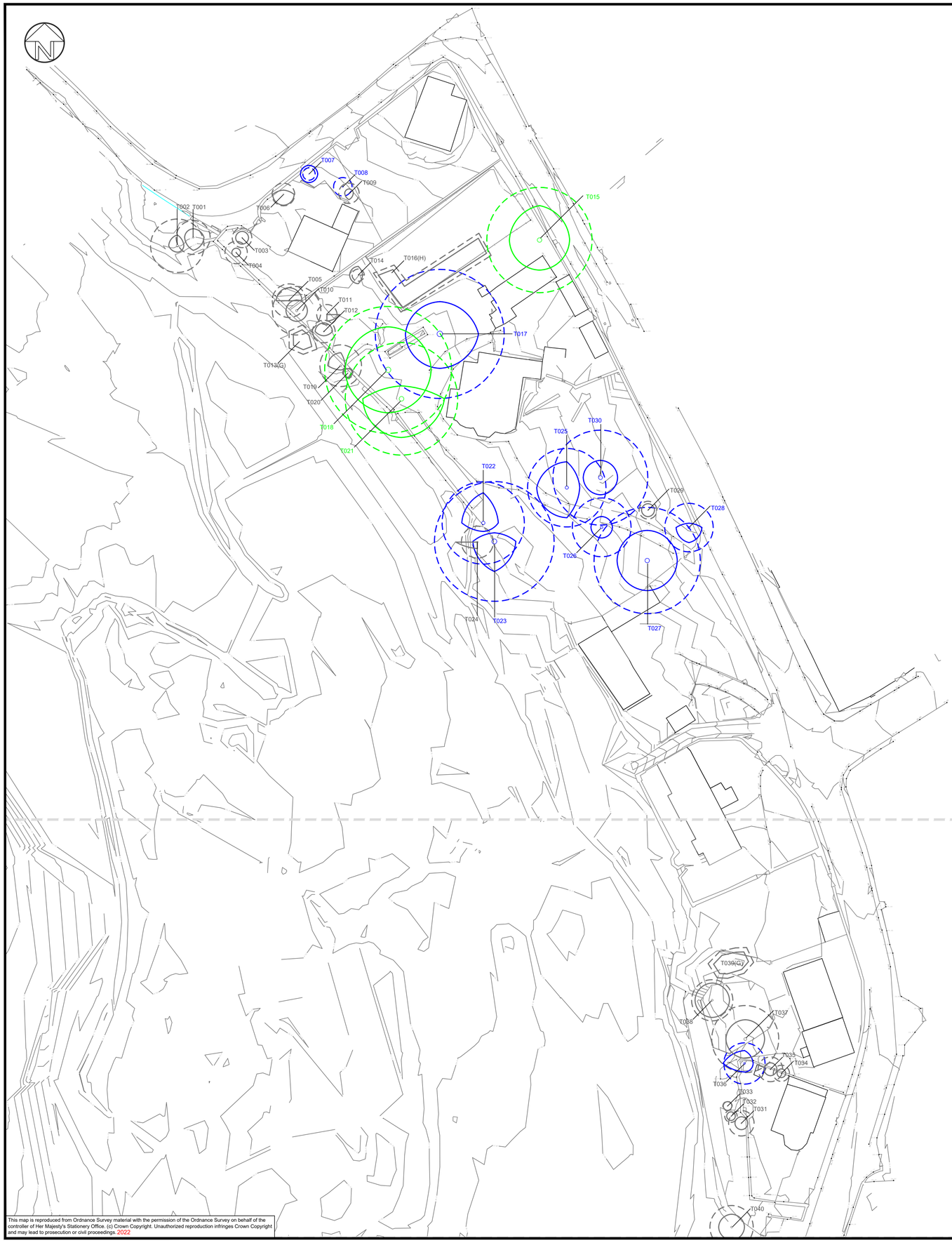
T204	Lawson Cypress (Chamaecyparis lawsoniana)	Tree	280	Radius: 3.4m. Area: 36 sq m.	5	3	0	3	10	4.5 3(N)	Semi Mature	40+ Years	Fair	Fair	None	C			
T205	Lawson Cypress (Chamaecyparis lawsoniana)	Tree	350	Radius: 4.2m. Area: 55 sq m.	5	3	0	3	10	4.5 3(N)	Semi Mature	40+ Years	Fair	Fair	None	C			
T206	Sycamore (Acer pseudoplatanus)	Tree	700	Radius: 8.4m. Area: 222 sq m.	6	4	4	4	20	4(NE)	Early Mature	40+ Years	Fair	Fair	None	C	Ivy covered stem.		
T207	Larch (Larix sp.)	Tree	240	Radius: 2.9m. Area: 26 sq m.	3	0	0	0	18		Semi Mature	40+ Years	Fair	Fair	None	C			
T208	Western Red Cedar (Thuja plicata)	Tree	470	Radius: 5.6m. Area: 99 sq m.	3	2	1	2	16	3	Semi Mature	40+ Years	Fair	Fair	None	C			
T209	Western Red Cedar (Thuja plicata)	Tree	440	Radius: 5.3m. Area: 88 sq m.	1	2	3	2	16	3	Semi Mature	40+ Years	Fair	Fair	None	C	Bifurcated		
T210	Common Ash (Fraxinus excelsior)	Tree	480	Radius: 5.8m. Area: 106 sq m.	3	3	1	3	20	12	Early Mature	10+ Years	Fair	Physical Defect	None	C	Bifurcated. Bark wound and missing bark on East Side (Road side) at base of tree, approximately 50% of cambium missing.		

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T211	Common Ash (Fraxinus excelsior)	Tree 3 stems	310, 300, 280	Radius: 6.2m. Area: 121 sq m.	3	3	3	3	20	8	Semi Mature	40+ Years	Fair	Fair	None	C			
T212	Common Beech (Fagus sylvatica)	Tree 5 stems	560, 400, 310, 770, 200	Radius: 13.2m. Area: 547 sq m.	7	7	7	7	19	4 4(W)	Mature	40+ Years	Fair	Fair	None	B2	Regrowth from cut stump.		
T213	Laurel Cherry (Prunus laurocerasus)	Hedge		Area: 44 sq m, plus a 1m buffer.					6		Semi Mature	40+ Years	Fair	Fair	None	C	Cherry laurel hedge/ screen		
T214	Sycamore (Acer pseudoplatanus)	Tree	300	Radius: 3.6m. Area: 41 sq m.	2	2	2	2	14	8	Semi Mature	40+ Years	Fair	Fair	Low	C	Ivy covered stem.	Options 1-3: Remove tree to facilitate works	
T215	Sycamore (Acer pseudoplatanus)	Tree	300	Radius: 3.6m. Area: 41 sq m.	2.5	2.5	3	2.5	16	8	Semi Mature	40+ Years	Fair	Fair	None	C	Ivy covered stem		
T216	Willow (Salix sp.)	Tree 2 stems	280, 100	Radius: 3.6m. Area: 41 sq m.	2	2	2	2	14	4 3(S)	Semi Mature	40+ Years	Fair	Fair	None	C	Bifurcated	Options 1-3: Remove tree to facilitate works	
T217	Common Hawthorn (Crataegus monogyna)	Tree 6 stems	120, 110, 80, 80, 60, 120	Radius: 2.9m. Area: 26 sq m.	2	2	2	2	8	2	Semi Mature	40+ Years	Fair	Fair	None	C			

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T218	Common Alder (Alnus glutinosa)	Tree	300	Radius: 3.6m. Area: 41 sq m.	1	1	2.5	3	10	6 6(S)	Semi Mature	40+ Years	Fair	Fair	None	C		Options 1-3: Remove tree to facilitate works	
T219	Common Alder (Alnus glutinosa)	Tree 3 stems	300, 280, 220	Radius: 5.6m. Area: 99 sq m.	3	3	3	3	10	6	Semi Mature	40+ Years	Fair	Fair	None	C		Options 1-3: Remove tree to facilitate works	
T220	Common Hawthorn (Crataegus monogyna)	Tree	240	Radius: 2.9m. Area: 26 sq m.	1.5	1.5	1.5	1.5	7	0.5	Semi Mature	40+ Years	Fair	Fair	None	C		Options 1-3: Remove tree to facilitate works	
T221	Common Hawthorn (Crataegus monogyna)	Tree	100.110.110.90.90.100	too small to calc.	1.5	1.5	1.5	1.5	7	0.5	Semi Mature	40+ Years	Fair	Fair	None	C		Options 1-3: Remove tree to facilitate works	
T222	Common Alder (Alnus glutinosa)	Tree 3 stems	310, 250, 250	Radius: 5.6m. Area: 99 sq m.	3	3	3	3	10	6	Semi Mature	40+ Years	Fair	Fair	None	C		Options 1-3: Remove tree to facilitate works	
T223	Common Ash (Fraxinus excelsior)	Tree 4 stems	300, 200, 200, 200	None - due to Retention Category of U.	2	2	2	2	14		Semi Mature	Dead	Dead	Decaying	None	U			
T224	Common Ash (Fraxinus excelsior)	Tree	450	None - due to Retention Category of U.	3	3	3	3	18		Mature	Dead	Dead	Decaying	Low	U	Bifurcated. Situated by development site and existing residential.		

Tree ID Ref	Species	Full Structure	Stem Diameter (mm)	RPA	Branch Spread (m)				Height (m)	Crown Clearance (m) & Lowest Branch	Life Stage	Rem. Contrib.	Physiological Condition	Structural Condition	Bat Potential	Retention Category	Survey Observations / Comments	Preliminary Management Recommendations	Photo
					North	East	South	West											
T225	Sycamore (Acer pseudoplatanus) Common Ash (Fraxinus excelsior) Horse Chestnut (Aesculus hippocastanum) Common Hawthorn (Crataegus monogyna) White Poplar (Populus alba)	Woodland		Area: 776 sq m, plus a 1m buffer.	As shown on plans				20		Semi Mature	40+ Years	Fair	Fair	Low	C	Wooded area of predominantly pioneer species. Of limited individual amenity value and quality of trees. Roadside trees have been individually surveyed.		
T226	Goat Willow (Salix caprea) Willow (Salix sp.) Common Hawthorn (Crataegus monogyna) Common Alder (Alnus glutinosa) White Poplar (Populus alba)	Woodland		Area: 5644 sq m, plus a 1m buffer.	As shown on plans				8		Semi Mature	40+ Years	Fair	Fair	Low	C2	Alluvial Woodland - predominantly made up of multi- stemmed willow. Trees are of limited individual amenity value, an unmade footpath runs from the northwest corner of the site to the south east corner. Some minor rubbish dumping along the path is noted.	Options 1-3: Remove tree to facilitate works	
T227	Common Ash (Fraxinus excelsior) Sycamore (Acer pseudoplatanus) Common Beech (Fagus sylvatica)	Woodland		Area: 1968 sq m, plus a 1m buffer.	As shown on plans				25		Mature	40+ Years	Good	Good	Low	B2	Location of a proposed for option for an embankment. Wooded area of approximately 20no. trees,of limited individual amenity value but combined affords reasonable value to the location, especially when viewed from the roadside. The embankment would require all trees with its extent to be cleared in order to undertake works.	Options 1: Remove tree to facilitate works	No Photo

D Tree Constraint Plans



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SCALE 1:500

No.	Construction Risk	Maintenance Risk	Demolition Risk
1			
2			

In addition to the hazards/risks normally associated with the types of work detailed on this drawing take note of the above.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

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Drawing Notes

1. This drawing is to be read in conjunction with:-

KEY

	CATEGORY	COLOUR	
	U	DARK RED	(STEM & CANOPY)
	A	LIGHT GREEN	(STEM & CANOPY)
	B	MID BLUE	(STEM & CANOPY)
	C	GREY	(STEM & CANOPY)
	ROOT PROTECTION AREA		(COLOUR DEPENDS ON CATEGORY)

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Project

CASTLECONNELL FRS

Title

Tree Constraints Plan 1 of 5

for

Client

Limerick City and County Council

Drawn:	L TAYLOR	24/10/22	Designed:	S TESTER	24/10/22
Checked:	S TESTER	25/10/22	Approved:	S WATKINS	15/11/22
Project Reference:	2022s1238		Scale:	AS SHOWN @ A1	

Drawing Number:	Status:	Revision:	Sheet Size:
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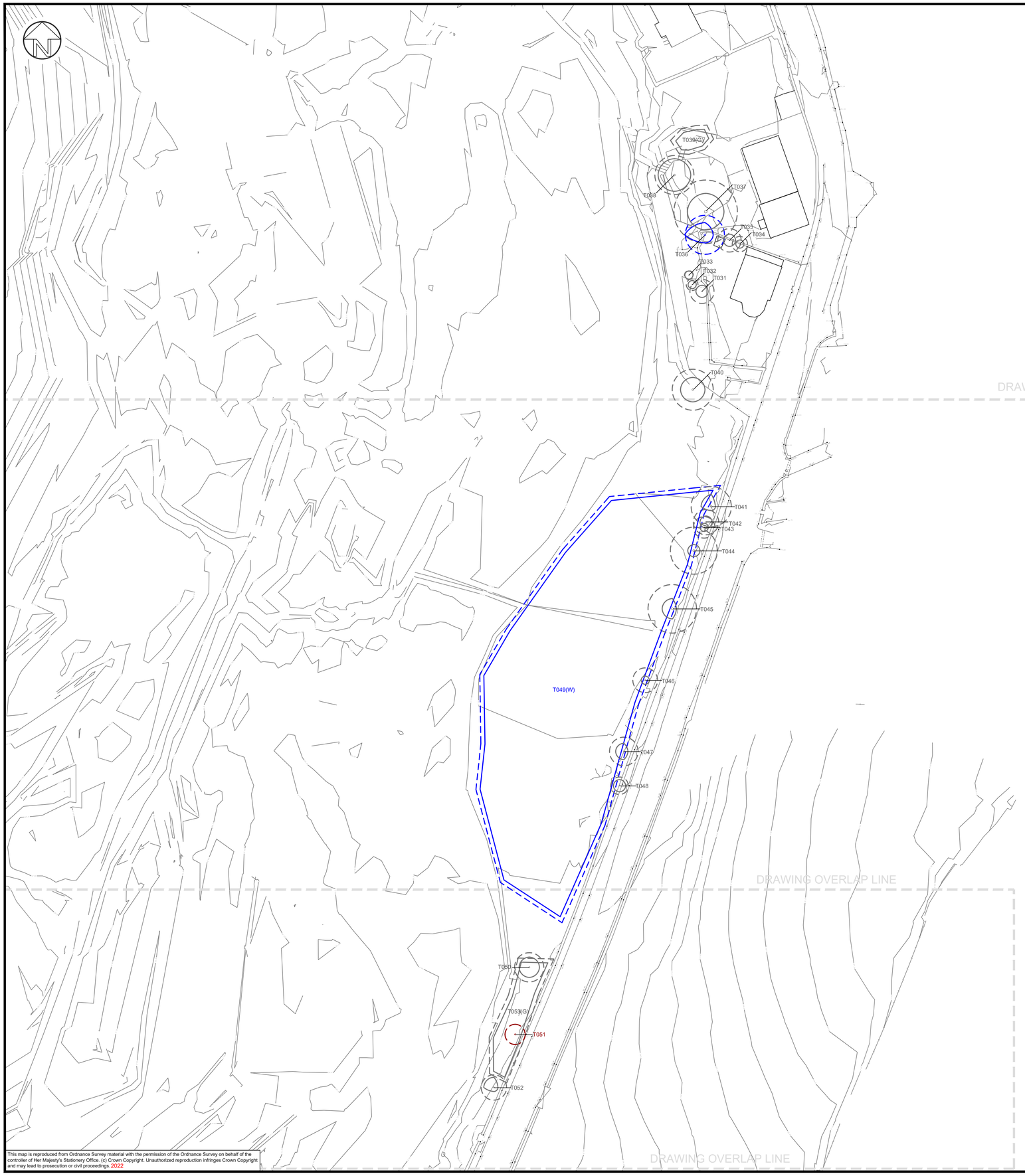

No.	Construction Risk	Maintenance Risk	Demolition Risk
1			
2			

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	ROOT PROTECTION AREA	(COLOUR DEPENDS ON CATEGORY)	

10 5 0 10 20 30 40 50m

SCALE 1:500

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Project

CASTLECONNELL FRS

Title

Tree Constraints Plan 2 of 5

for

Client

Limerick City and County Council

Drawn:	L TAYLOR 24/10/22	Designed:	S TESTER 24/10/22
Checked:	S TESTER 25/10/22	Approved:	S WATKINS 15/11/22
Project Reference:	2022s1238	Scale:	AS SHOWN @ A1

Drawing Number:	Status:	Revision:	Sheet Size:
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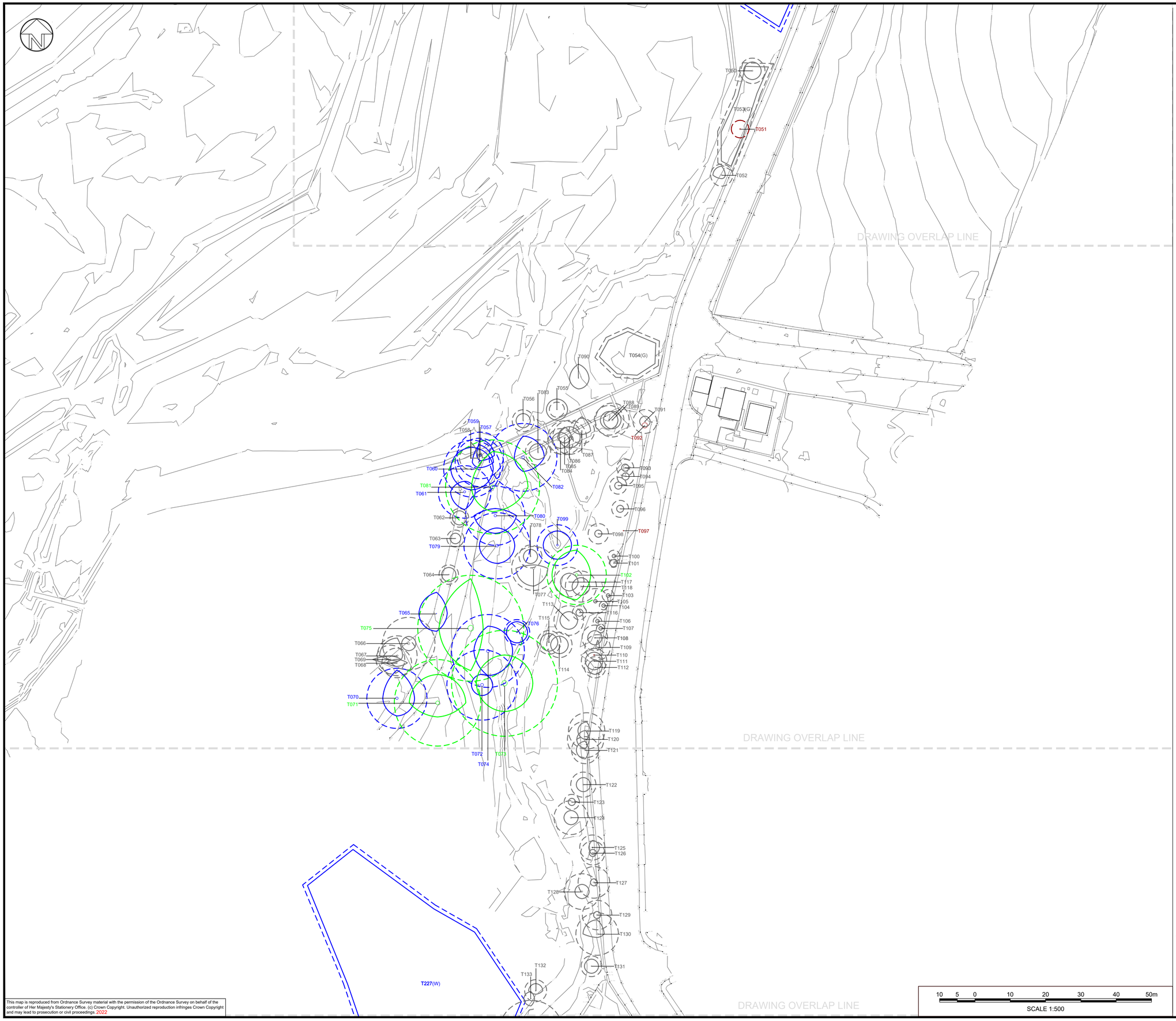

No.	Construction Risk	Maintenance Risk	Demolition Risk
1			
2			

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	ROOT PROTECTION AREA	(COLOUR DEPENDS ON CATEGORY)	

10 5 0 10 20 30 40 50m
SCALE 1:500

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Project

CASTLECONNELL FRS

Title

Tree Constraints Plan 3 of 5

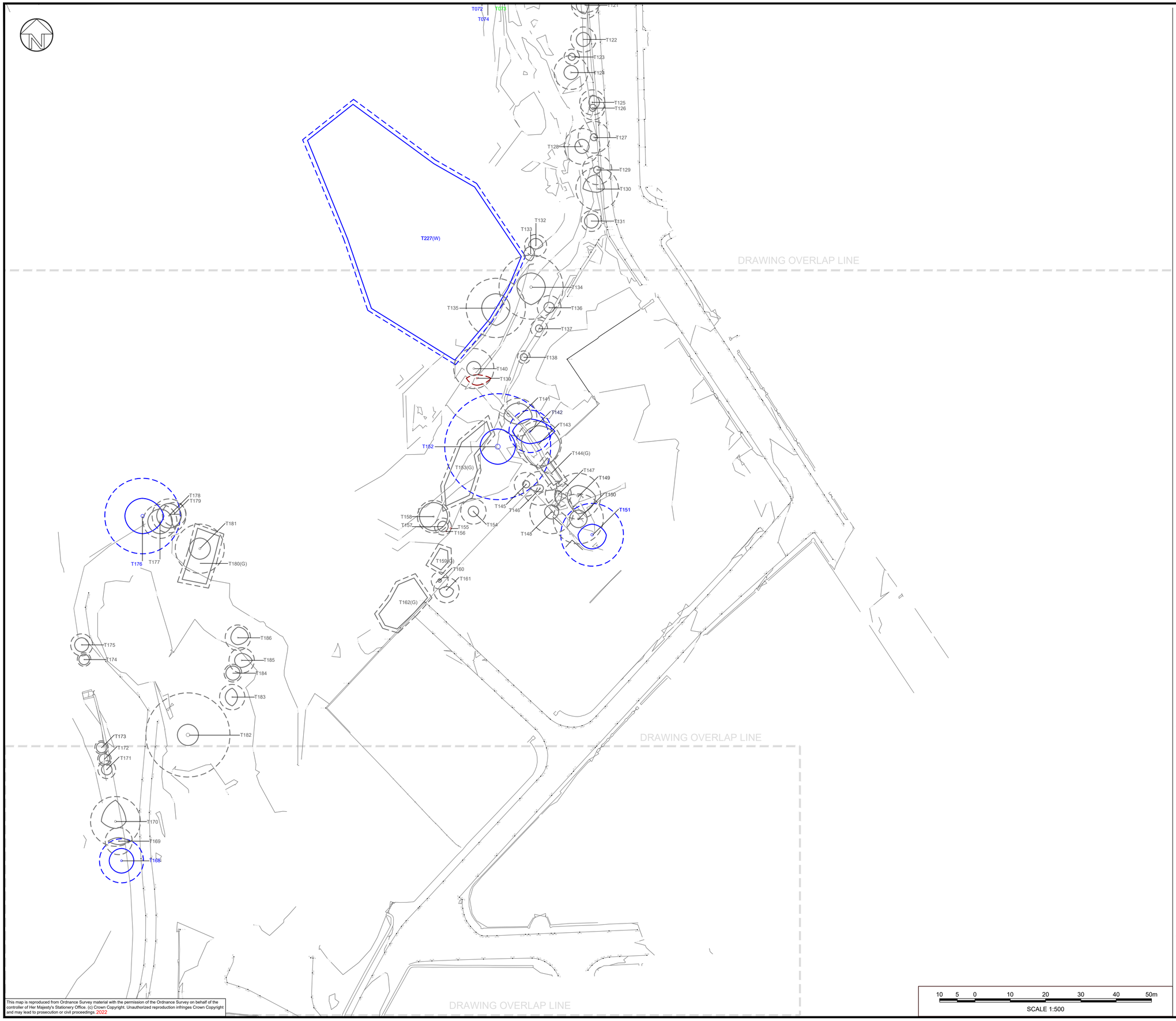
for

Client

Limerick City and County Council

Drawn:	L TAYLOR 24/10/22	Designed:	S TESTER 24/10/22
Checked:	S TESTER 25/10/22	Approved:	S WATKINS 15/11/22
Project Reference:	2022s1238	Scale:	AS SHOWN @ A1

Drawing Number:	Status:	Revision:	Sheet Size:
19104-JBAU-XX-XX-DR-X-03003	S3	P01.01	A1



10 5 0 10 20 30 40 50m

SCALE 1:500

No.	Construction Risk	Maintenance Risk	Demolition Risk
1			
2			

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Project

CASTLECONNELL FRS

Title

Tree Constraints Plan 4 of 5

for

Client

Limerick City and County Council

Drawn:	L TAYLOR 24/10/22	Designed:	S TESTER 24/10/22
Checked:	S TESTER 25/10/22	Approved:	S WATKINS 15/11/22
Project Reference:	2022s1238	Scale:	AS SHOWN @ A1
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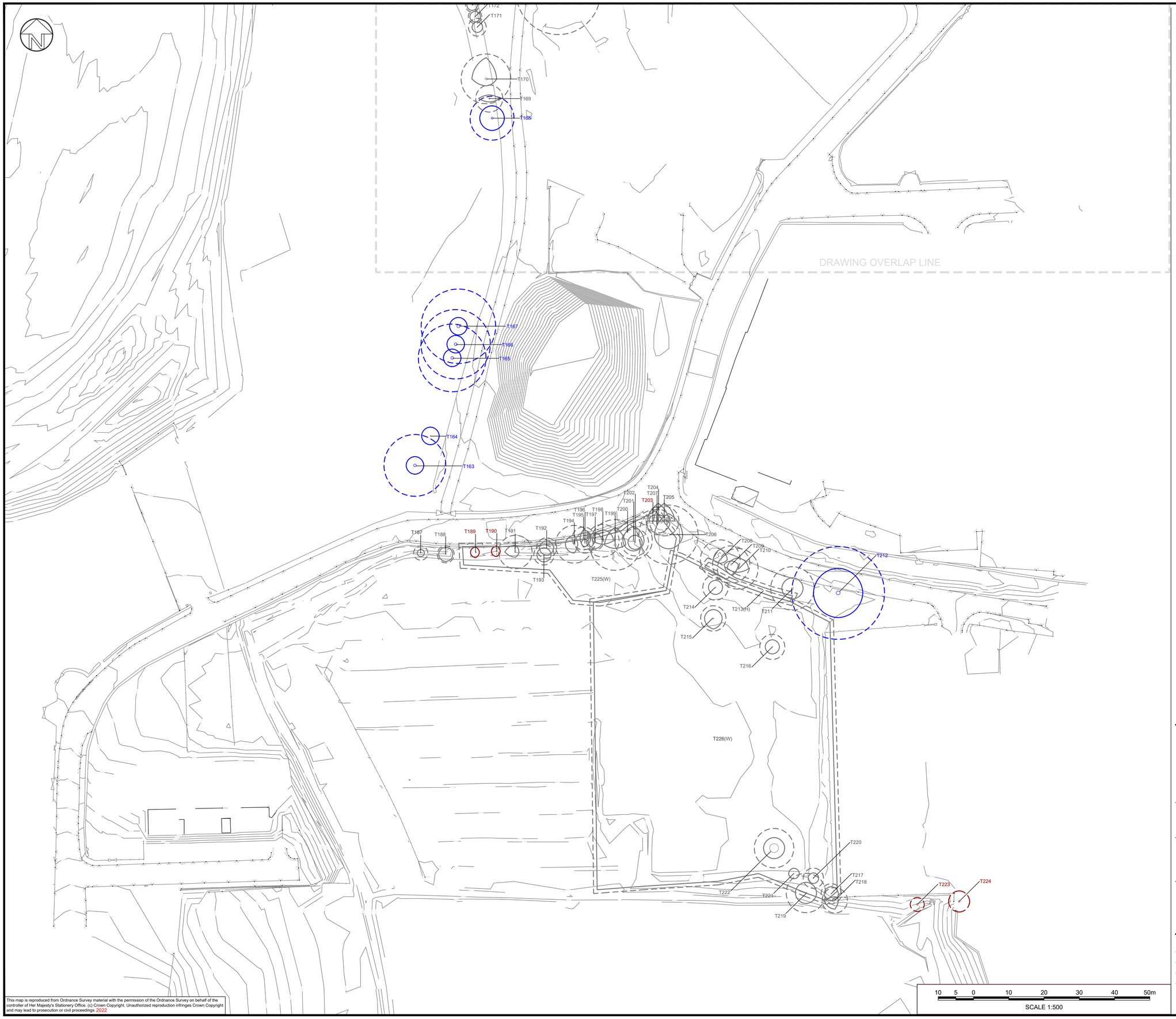
		Revision:	P01.01
		Sheet Size:	A1



No.	Construction Risk	Maintenance Risk	Demolition Risk
1			
2			

In addition to the hazards/risks normally associated with the types of work detailed on this drawing take note of the above.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

General Notes

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E. The electronic version of this drawing is not to be used for setting out.
F. Refer to Contract Specification for details of materials and workmanship to be used for the works shown on this drawing.

Drawing Notes

1. This drawing is to be read in conjunction with:-

KEY

	CATEGORY	COLOUR	
	U	DARK RED	(STEM & CANOPY)
	A	LIGHT GREEN	(STEM & CANOPY)
	B	MID BLUE	(STEM & CANOPY)
	C	GREY	(STEM & CANOPY)
	ROOT PROTECTION AREA		(COLOUR DEPENDS ON CATEGORY)

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Project

CASTLECONNELL FRS

Title

Tree Constraints Plan 5 of 5

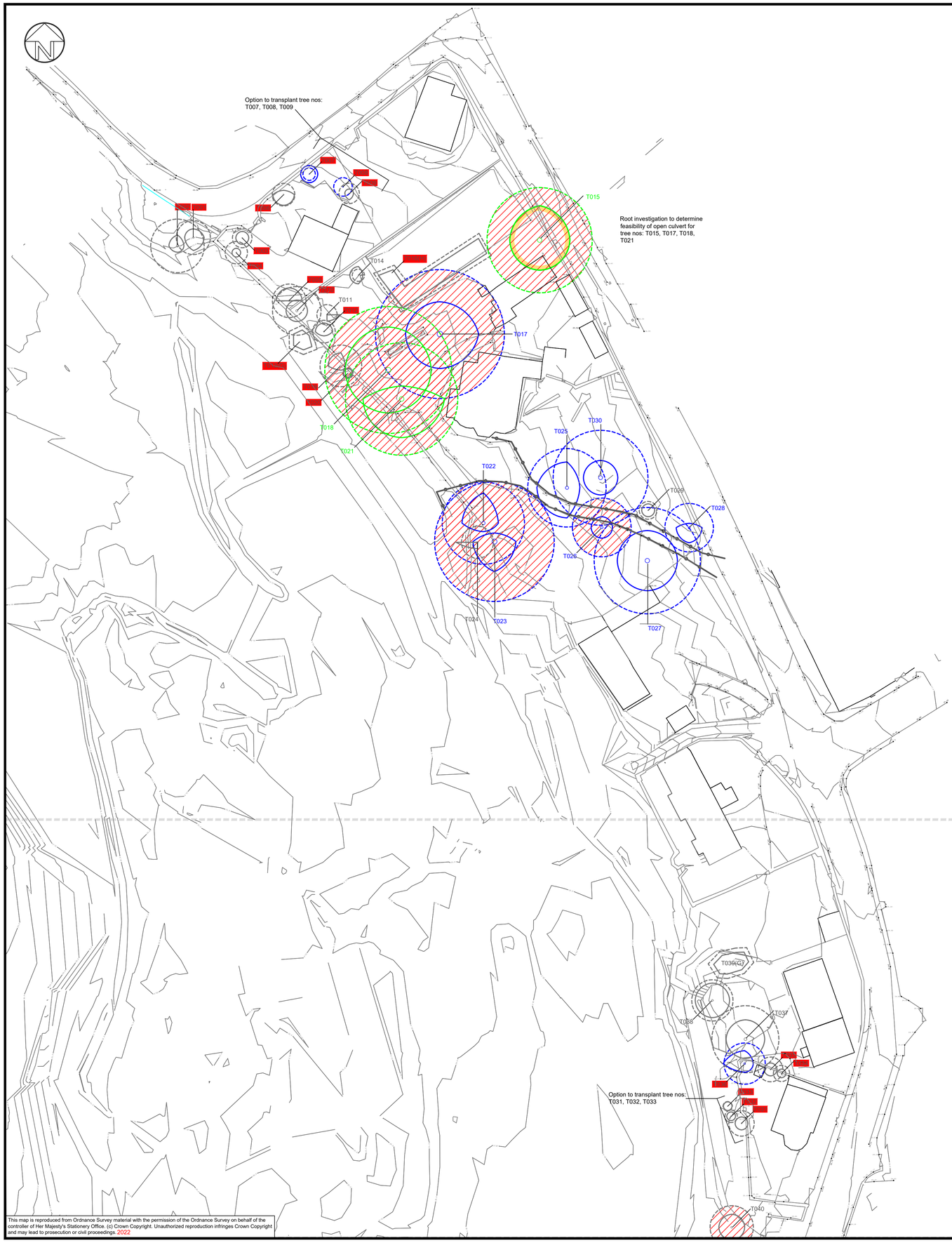
for

Client

Limerick City and County Council

Drawn: L TAYLOR 24/10/22	Designed: S TESTER 24/10/22		
Checked: S TESTER 25/10/22	Approved: S WATKINS 15/11/22		
Project Reference: 2022s1238	Scale: AS SHOWN @ A1		
Drawing Number: 19104-JBAU-XX-XX-DR-X-03005	Status: S3	Revision: P01.01	Sheet Size: A1

E Tree Protection Plans



No.	Construction Risk	Maintenance Risk	Demolition Risk
1			
2			

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

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Drawing Notes

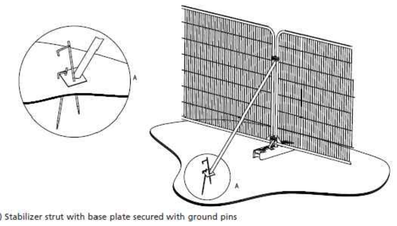
1. This drawing is to be read in conjunction with:-

KEY

	CATEGORY	COLOUR	
	U	DARK RED	(STEM & CANOPY)
	A	LIGHT GREEN	(STEM & CANOPY)
	B	MID BLUE	(STEM & CANOPY)
	C	GREY	(STEM & CANOPY)
	ROOT PROTECTION AREA	(COLOUR DEPENDS ON CATEGORY)	
	TREE PROTECTION FENCING TO BS5837 2018		
T###	TREE TO BE REMOVED		
	TREE TO BE PRUNED		
	ROOT INTRUSIONS (NOTABLE)		

NOTES

1. Options to transplant for T nos: 07, 08, 09, 31, 32, 33.
2. Root investigation to determine feasibility of open culvert for T nos: 15, 17, 18, 21. Results of investigation to determine if further tree protection measures or tree removal is required.
3. Tree protection fencing indicated below:



a) Stabilizer strut with base plate secured with ground pins

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Project

CASTLECONNELL FRS

Title

Tree Impacts and Protection Plan: Option 2&3
1 of 5

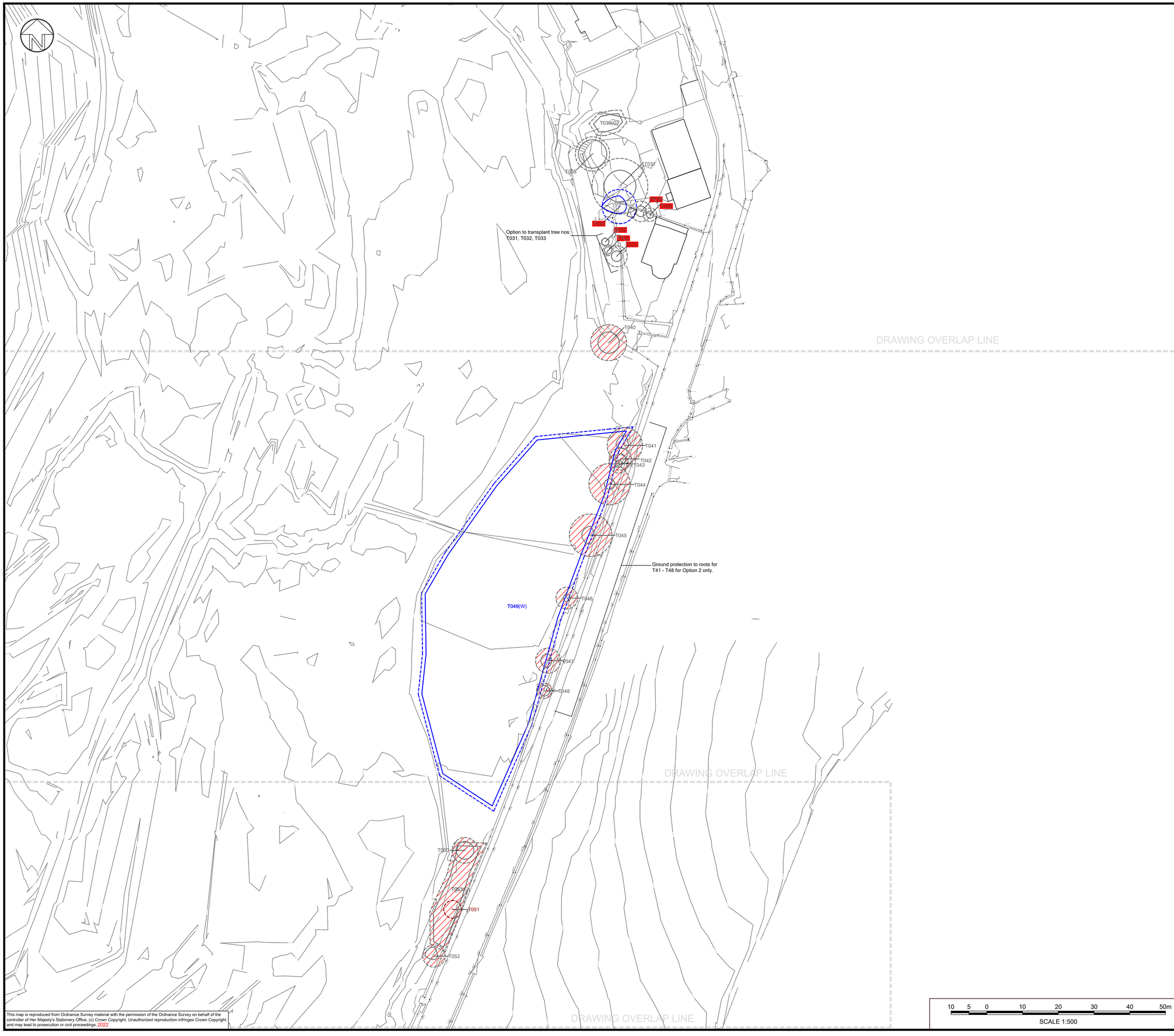
for

Client

Limerick City and County Council

Drawn:	L TAYLOR	08/11/22	Designed:	S TESTER	08/11/22
Checked:	S TESTER	14/11/22	Approved:	S WATKINS	15/11/22
Project Reference:	2022s1238		Scale:	AS SHOWN @ A1	

Drawing Number:	Status:	Revision:	Sheet Size:
19104-JBAU-XX-XX-DR-X-03006	S3	P01.01	A1



10 5 0 10 20 30 40 50m

SCALE 1:500

No.	Construction Risk	Maintenance Risk	Demolition Risk
1			
2			

In addition to the hazards/risks normally associated with the types of work detailed on this drawing take note of the above.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

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Drawing Notes

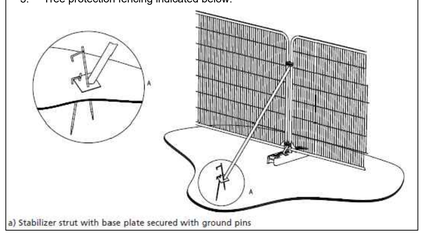
1. This drawing is to be read in conjunction with:-

KEY

	CATEGORY	COLOUR	
	U	DARK RED	(STEM & CANOPY)
	A	LIGHT GREEN	(STEM & CANOPY)
	B	MID BLUE	(STEM & CANOPY)
	C	GREY	(STEM & CANOPY)
	ROOT PROTECTION AREA (COLOUR DEPENDS ON CATEGORY)		
	TREE PROTECTION FENCING TO BS5837 2018		
T##	TREE TO BE REMOVED		
	TREE TO BE PRUNED		
	ROOT INTRUSIONS (NOTABLE)		

NOTES

1. Options to transplant for T nos: 07, 08, 09, 31, 32, 33.
2. Root investigation to determine feasibility of open culvert for T nos: 15, 17, 18, 21.Results of investigation to determine if further tree protection measures or tree removal is required.
3. Tree protection fencing indicated below:



a) Stabilizer strut with base plate secured with ground pins

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Project

CASTLECONNELL FRS

Title

Tree Impacts and Protection Plan: Option 2&3
2 of 5

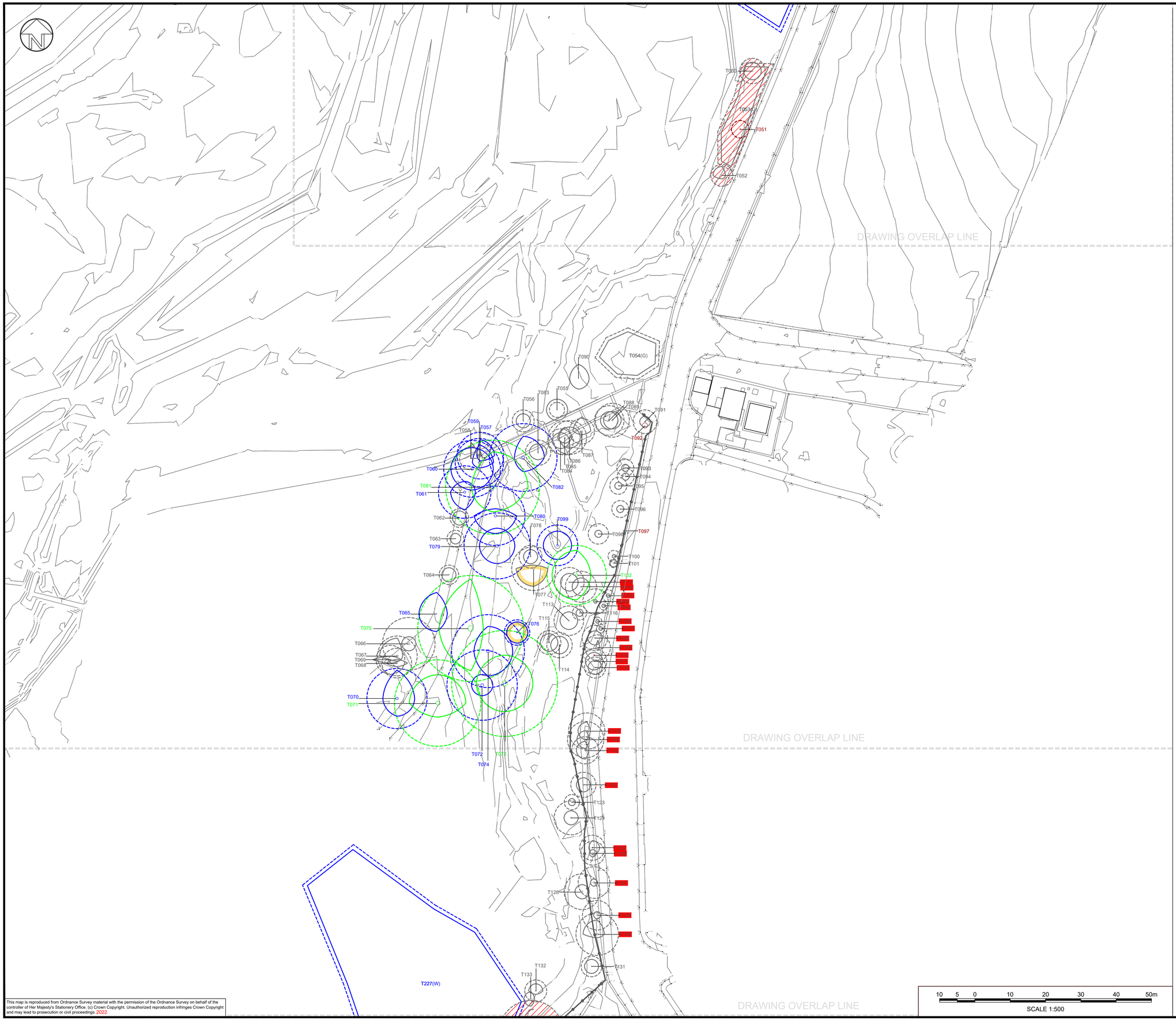
for

Client

Limerick City and County Council

Drawn:	L TAYLOR	08/11/22	Designed:	S TESTER	08/11/22
Checked:	S TESTER	14/11/22	Approved:	S WATKINS	14/11/22
Project Reference:	2022s1238		Scale:	AS SHOWN @ A1	

Drawing Number:	Status:	Revision:	Sheet Size:
19104-JBAU-XX-XX-DR-X-03007	S3	P01.01	A1



10 5 0 10 20 30 40 50m

SCALE 1:500

No.	Construction Risk	Maintenance Risk	Demolition Risk
1			
2			

In addition to the hazards/risks normally associated with the types of work detailed on this drawing take note of the above.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

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Drawing Notes

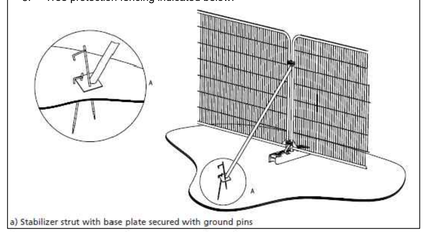
1. This drawing is to be read in conjunction with:-

KEY

	CATEGORY	COLOUR	
	U	DARK RED	(STEM & CANOPY)
	A	LIGHT GREEN	(STEM & CANOPY)
	B	MID BLUE	(STEM & CANOPY)
	C	GREY	(STEM & CANOPY)
	ROOT PROTECTION AREA (COLOUR DEPENDS ON CATEGORY)		
	TREE PROTECTION FENCING TO BS5837 2018		
T##	TREE TO BE REMOVED		
	TREE TO BE PRUNED		
	ROOT INTRUSIONS (NOTABLE)		

NOTES

1. Options to transplant for T nos: 07, 08, 09, 31, 32, 33.
2. Root investigation to determine feasibility of open culvert for T nos: 15, 17, 18, 21.Results of investigation to determine if further tree protection measures or tree removal is required.
3. Tree protection fencing indicated below:



a) Stabilizer strut with base plate secured with ground pins

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Project

CASTLECONNELL FRS

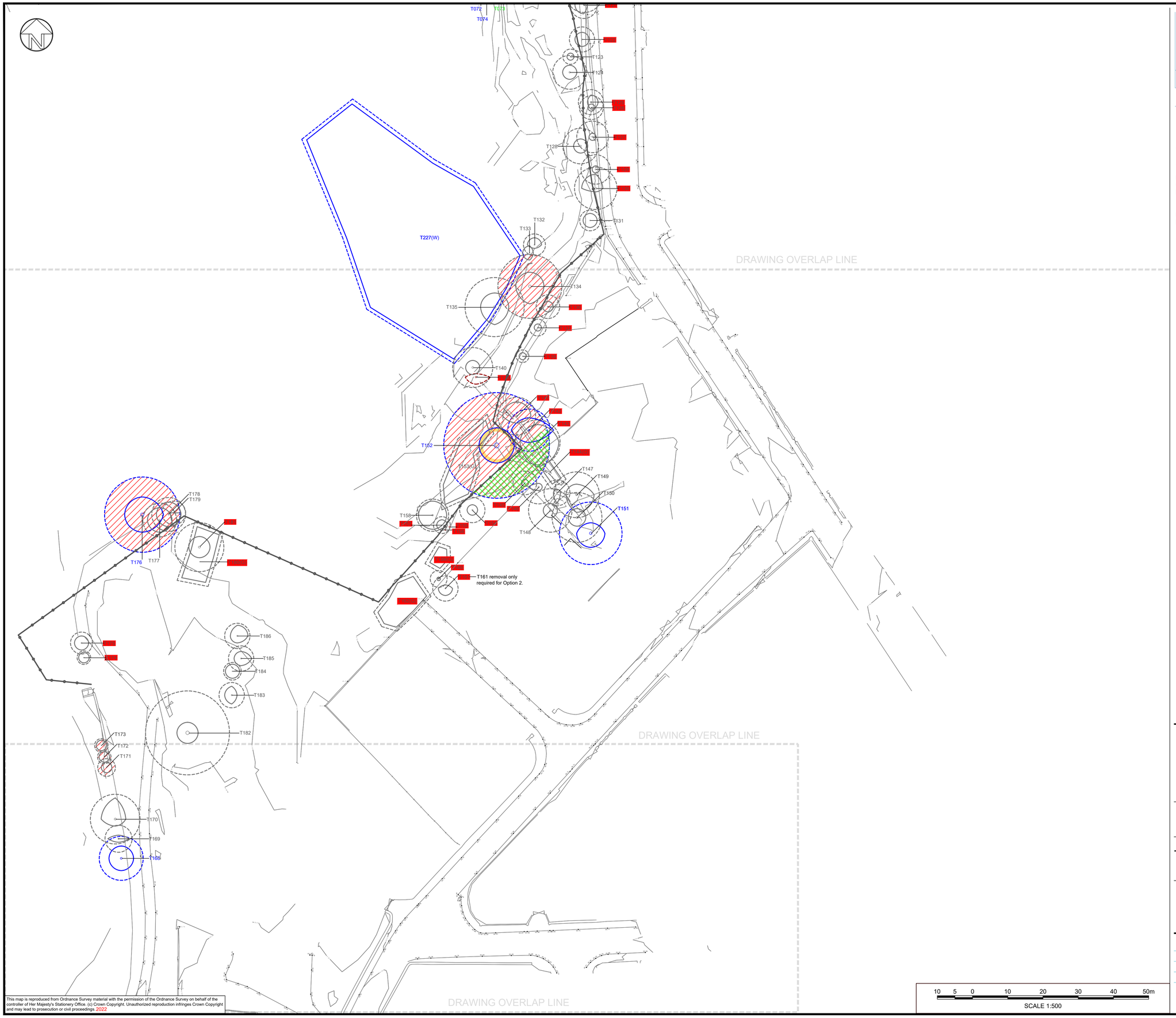
Title

Tree Impacts and Protection Plan: Option 2&3
3 of 5
for

Client

Limerick City and County Council

Drawn: L TAYLOR 08/11/22	Designed: S TESTER 08/11/22		
Checked: S TESTER 14/11/22	Approved: S WATKINS 15/11/22		
Project Reference: 2022s1238	Scale: AS SHOWN @ A1		
Drawing Number:	Status:	Revision:	Sheet Size:
19104-JBAU-XX-XX-DR-X-03008	S3	P01.01	A1



10 5 0 10 20 30 40 50m

SCALE 1:500

No.	Construction Risk	Maintenance Risk	Demolition Risk
1			
2			

In addition to the hazards/risks normally associated with the types of work detailed on this drawing take note of the above.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

General Notes

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Drawing Notes

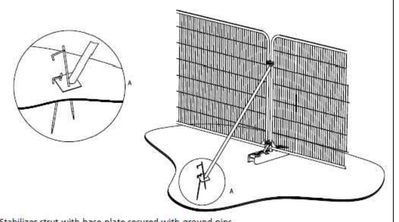
1. This drawing is to be read in conjunction with:-

KEY

	CATEGORY	COLOUR	
	U	DARK RED	(STEM & CANOPY)
	A	LIGHT GREEN	(STEM & CANOPY)
	B	MID BLUE	(STEM & CANOPY)
	C	GREY	(STEM & CANOPY)
	ROOT PROTECTION AREA	(COLOUR DEPENDS ON CATEGORY)	
	TREE PROTECTION FENCING TO BS5837 2018		
T##	TREE TO BE REMOVED		
	TREE TO BE PRUNED		
	ROOT INTRUSIONS (NOTABLE)		
	GROUND PROTECTION		

NOTES

1. Root investigation to determine feasibility of open culvert for T nos: 15, 17, 18, 21. Results of investigation to determine if further tree protection measures or tree removal is required.
2. Tree protection fencing indicated below:



a) Stabilizer strut with base plate secured with ground pins

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Project

CASTLECONNELL FRS

Title

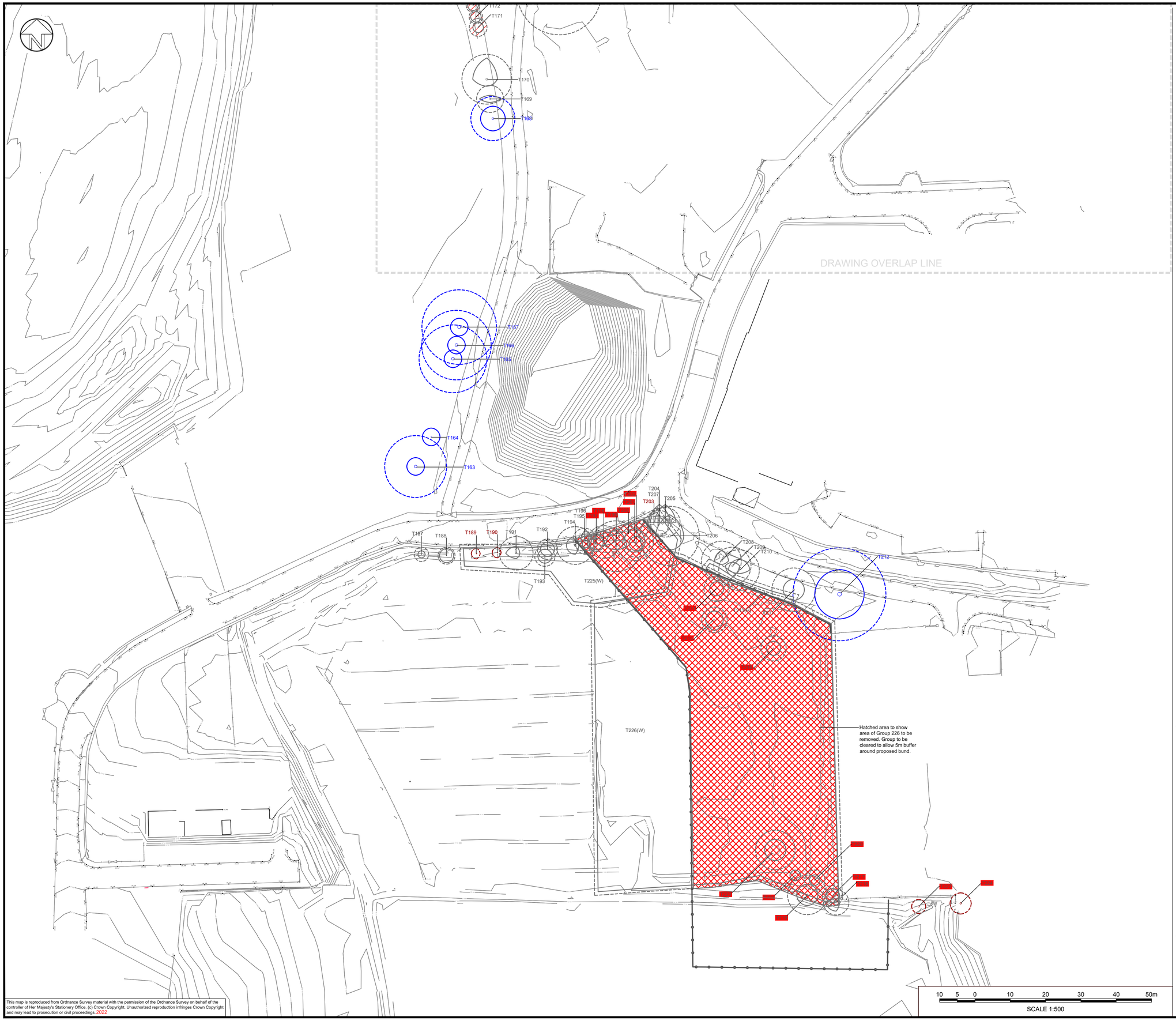
Tree Impacts and Protection Plan: Option 2&3
4 of 5

for

Client

Limerick City and County Council

Drawn:	L TAYLOR	08/11/22	Designed:	S TESTER	08/11/22
Checked:	S TESTER	14/11/22	Approved:	S WATKINS	15/11/22
Project Reference:	2022s1238		Scale:	AS SHOWN @ A1	
Drawing Number:	19104-JBAU-XX-XX-DR-X-03009		Status: S3	Revision: P01.01	Sheet Size: A1



No.	Construction Risk	Maintenance Risk	Demolition Risk
1			
2			

In addition to the hazards/risks normally associated with the types of work detailed on this drawing take note of the above.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

General Notes

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Drawing Notes

1. This drawing is to be read in conjunction with:-

KEY

	CATEGORY	COLOUR	
	U	DARK RED	(STEM & CANOPY)
	A	LIGHT GREEN	(STEM & CANOPY)
	B	MID BLUE	(STEM & CANOPY)
	C	GREY	(STEM & CANOPY)
	ROOT PROTECTION AREA	(COLOUR DEPENDS ON CATEGORY)	
	TREE PROTECTION FENCING TO BS5837 2018		
T##	TREE TO BE REMOVED		
	TREE TO BE PRUNED		
	ROOT INTRUSIONS (NOTABLE)		
	PARTIAL REMOVAL OF GROUP		

NOTES

1. Root investigation to determine feasibility of open culvert for T nos: 15, 17, 18, 21.Results of investigation to determine if further tree protection measures or tree removal is required.
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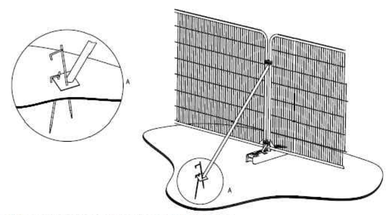

a) Stabilizer strut with base plate secured with ground pins

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Project

CASTLECONNELL FRS

Title

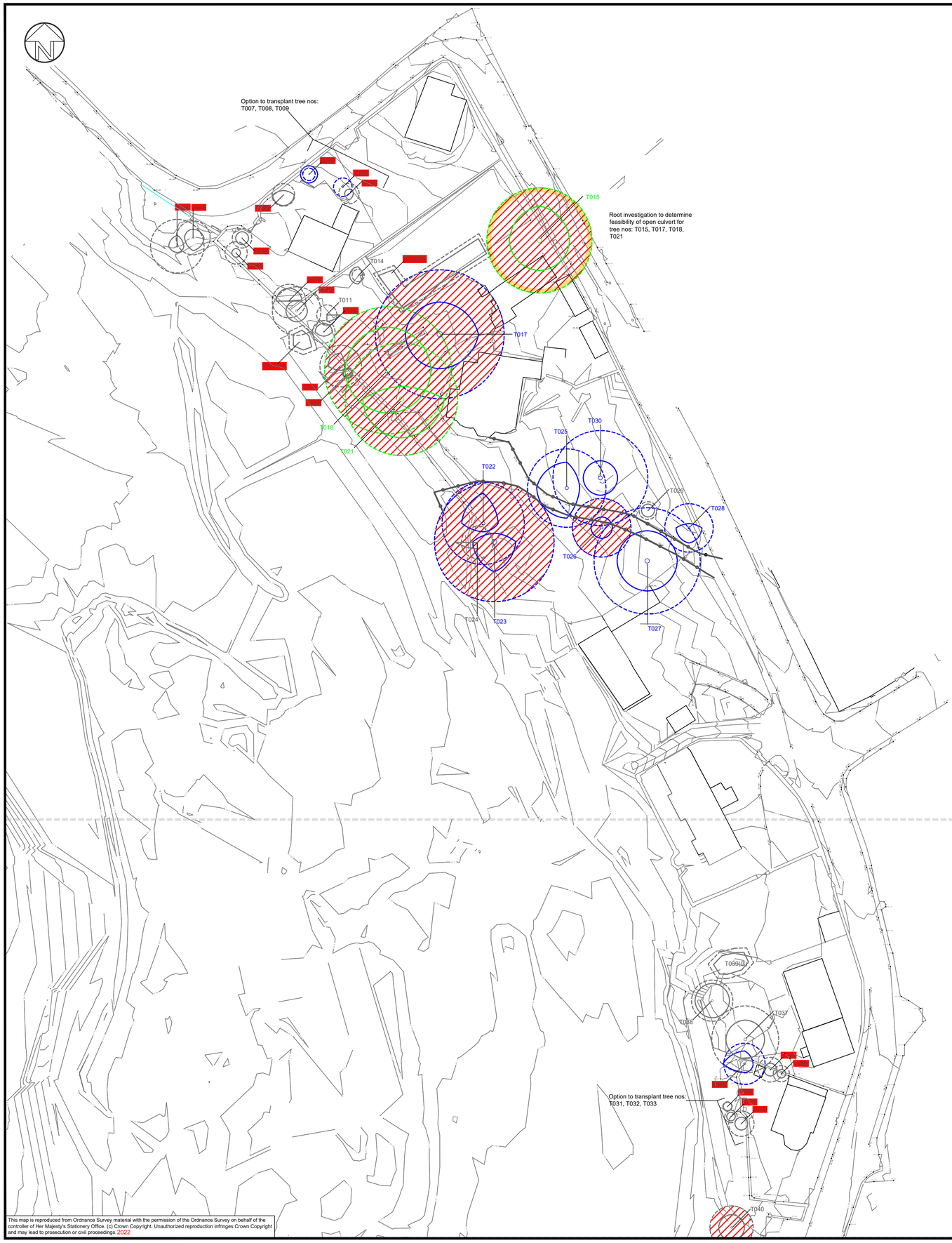
Tree Impacts and Protection Plan: Option 2&3
5 of 5

for

Client

Limerick City and County Council

Drawn: L TAYLOR 08/11/22	Designed: S TESTER 08/11/22		
Checked: S TESTER 14/11/22	Approved: S WATKINS 15/11/22		
Project Reference: 2022s1238	Scale: AS SHOWN @ A1		
Drawing Number:	Status:	Revision:	Sheet Size:
19104-JBAU-XX-XX-DR-X-03010	S3	P01.01	A1



No.	Construction Risk	Maintenance Risk	Demolition Risk
1			
2			

In addition to the hazards/risks normally associated with the types of work detailed on this drawing take note of the above.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

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KEY

	CATEGORY	COLOUR	
	U	DARK RED	(STEM & CANOPY)
	A	LIGHT GREEN	(STEM & CANOPY)
	B	MID BLUE	(STEM & CANOPY)
	C	GREY	(STEM & CANOPY)
	ROOT PROTECTION AREA	(COLOUR DEPENDS ON CATEGORY)	
	TREE PROTECTION FENCING TO BS5837 2018		
T###	TREE TO BE REMOVED		
	TREE TO BE PRUNED		
	ROOT INTRUSIONS (NOTABLE)		
	GROUND PROTECTION		

NOTES

1. Options to transplant for T nos: 07, 08, 09, 31, 32, 33.
2. Root investigation to determine feasibility of open culvert for T nos: 15, 17, 18, 21. Results of investigation to determine if further tree protection measures or tree removal is required.
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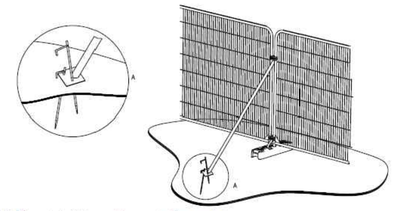

a) Stabilizer strut with base plate secured with ground pins

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Project

CASTLECONNELL FRS

Title

Tree Impacts and Protection Plan: Option 1
1 of 5

for

Client

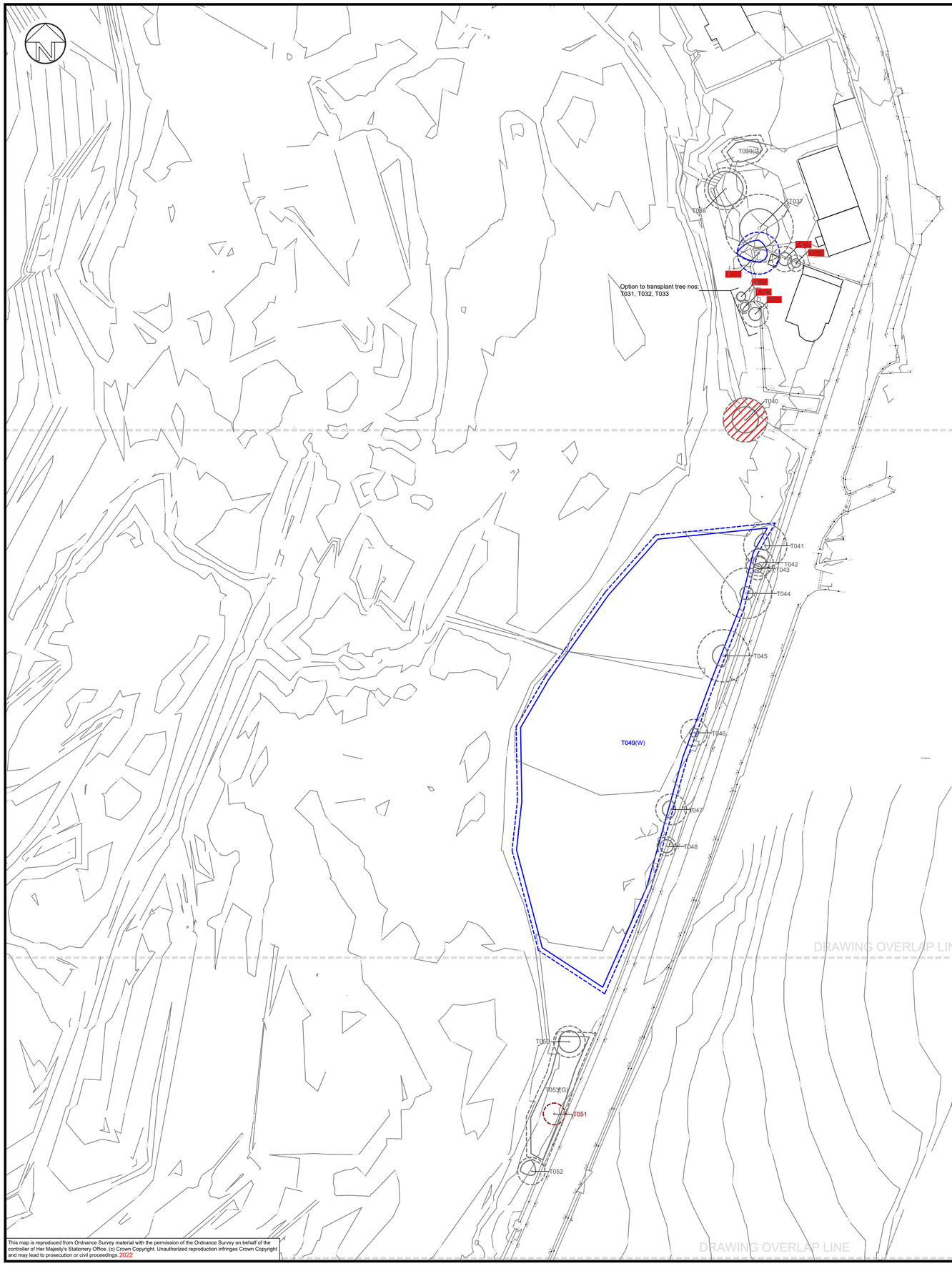
Limerick City and County Council

Drawn:	L TAYLOR	08/11/22	Designed:	S TESTER	08/11/22
Checked:	S TESTER	14/11/22	Approved:	S WATKINS	15/11/22
Project Reference:	2022s1238		Scale:	AS SHOWN @ A1	

Drawing Number:	Status:	Revision:	Sheet Size:
19104-JBAU-XX-XX-DR-X-03011	S3	P01.01	A1

10 5 0 10 20 30 40 50m

SCALE 1:500



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10 5 0 10 20 30 40 50m

SCALE 1:500

No.	Construction Risk	Maintenance Risk	Demolition Risk
1			
2			

In addition to the hazards/risks normally associated with the types of work detailed on this drawing take note of the above.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

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KEY

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	A	LIGHT GREEN	(STEM & CANOPY)
	B	MID BLUE	(STEM & CANOPY)
	C	GREY	(STEM & CANOPY)
	ROOT PROTECTION AREA	(COLOUR DEPENDS ON CATEGORY)	
	TREE PROTECTION FENCING TO BS5837 2018		
T##	TREE TO BE REMOVED		
	TREE TO BE PRUNED		
	ROOT INTRUSIONS (NOTABLE)		
	GROUND PROTECTION		

NOTES

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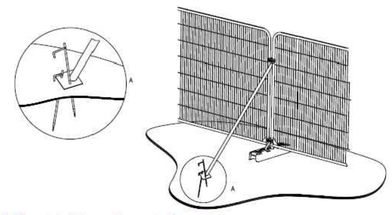

a) Stabilizer strut with base plate secured with ground pins

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Project

CASTLECONNELL FRS

Title

Tree Impacts and Protection Plan: Option 1
2 of 5

for

Client

Limerick City and County Council

Drawn: L TAYLOR 08/11/22	Designed: S TESTER 08/11/22		
Checked: S TESTER 14/11/22	Approved: S WATKINS 15/11/22		
Project Reference: 2022s1238	Scale: AS SHOWN @ A1		
Drawing Number: 19104-JBAU-XX-XX-DR-X-03012	Status: S3	Revision: P01.01	Sheet Size: A1

DRAWING OVERLAP LINE

DRAWING OVERLAP LINE

DRAWING OVERLAP LINE

No.	Construction Risk	Maintenance Risk	Demolition Risk
1			
2			

In addition to the hazards/risks normally associated with the types of work detailed on this drawing take note of the above.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

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KEY

	CATEGORY	COLOUR	
	U	DARK RED	(STEM & CANOPY)
	A	LIGHT GREEN	(STEM & CANOPY)
	B	MID BLUE	(STEM & CANOPY)
	C	GREY	(STEM & CANOPY)
	ROOT PROTECTION AREA	(COLOUR DEPENDS ON CATEGORY)	
	TREE PROTECTION FENCING TO BS5837 2018		
T##	TREE TO BE REMOVED		
	TREE TO BE PRUNED		
	ROOT INTRUSIONS (NOTABLE)		
	GROUND PROTECTION		

NOTES

1. Options to transplant for T nos: 07, 08, 09, 31, 32, 33.
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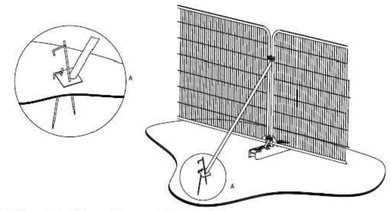

a) Stabilizer strut with base plate secured with ground pins

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Project

CASTLECONNELL FRS

Title

Tree Impacts and Protection Plan: Option 1
3 of 5

for

Client

Limerick City and County Council

Drawn:	L TAYLOR	08/11/22	Designed:	S TESTER	08/11/22
Checked:	S TESTER	14/11/22	Approved:	S WATKINS	15/11/22
Project Reference:	2022s1238		Scale:	AS SHOWN @ A1	

Drawing Number:	Status:	Revision:	Sheet Size:
19104-JBAU-XX-XX-DR-X-03013	S3	P01.01	A1

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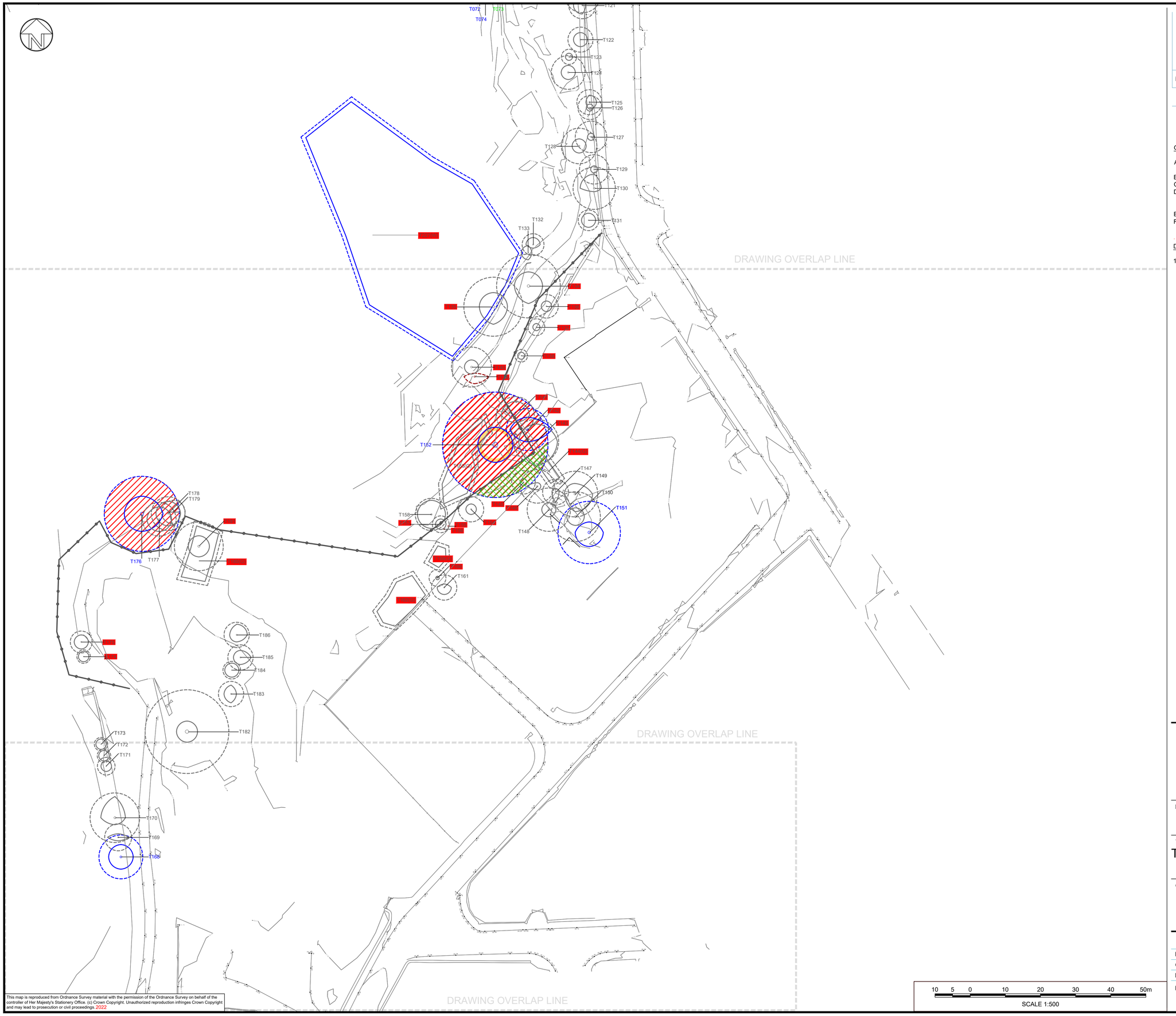
SCALE 1:500



10 5 0 10 20 30 40 50m

SCALE 1:500

No.	Construction Risk	Maintenance Risk	Demolition Risk
1			
2			

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

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T###	TREE TO BE REMOVED		
	TREE TO BE PRUNED		
	ROOT INTRUSIONS (NOTABLE)		
	GROUND PROTECTION		

NOTES

1. New temporary ground protection should be capable of supporting any traffic entering or using the site without being distorted or causing compaction of underlying soil.
2. The ground protection might comprise one of the following:
a. For pedestrian movements only, a single thickness of scaffold boards placed on top of a driven scaffold frame, so as to form a suspended walkway, or on top of a compression-resistant layer (e.g. 100mm depth of woodchip), laid on to a geotextile membrane.
b. For pedestrian-operated plant up to a gross weight of 2t, proprietary, inter-linked ground protection boards placed on top of a compression resistant layer (e.g. 150mm depth of woodchip), laid on to a geotextile membrane.
c. For wheeled or tracked construction traffic exceeding 2t gross weight, an alternative system (e.g. proprietary systems or pre-cast reinforced concrete slabs) to an engineering specification designed in conjunction with arboricultural advice, to accomodate the likely loading to which it will be subjected.

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Project

CASTLECONNELL FRS

Title

Tree Impacts and Protection Plan: Option 1
4 of 5

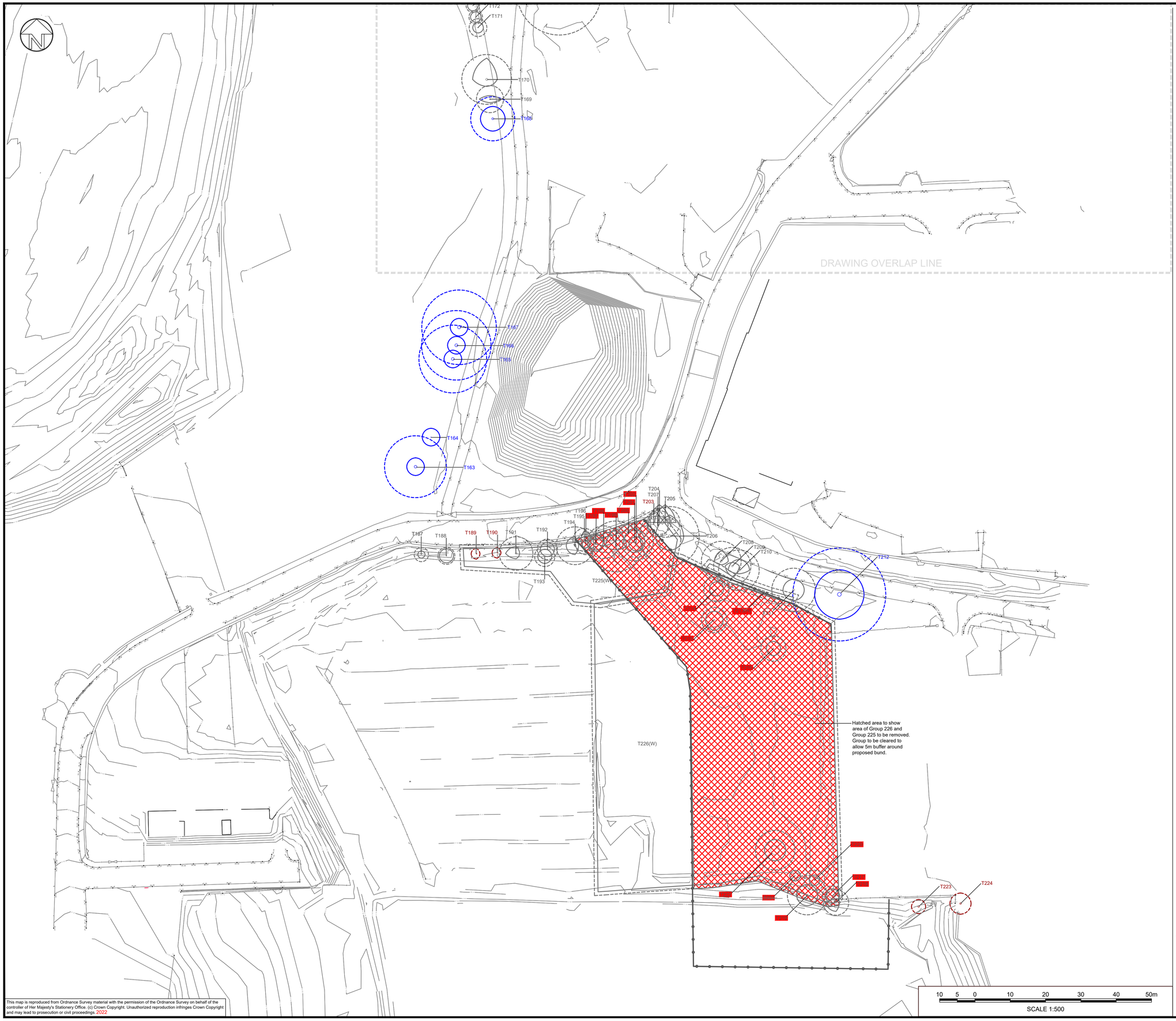
for

Client

Limerick City and County Council

Drawn:	L TAYLOR 08/11/22	Designed:	S TESTER 8/11/22
Checked:	S TESTER 14/11/22	Approved:	S WATKINS 15/11/22
Project Reference:	2022s1238	Scale:	AS SHOWN @ A1

Drawing Number:	Status:	Revision:	Sheet Size:
19104-JBAU-XX-XX-DR-X-03014	S3	P01.01	A1



No.	Construction Risk	Maintenance Risk	Demolition Risk
1			
2			

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TREE PROTECTION FENCING TO BS5837 2018
T## TREE TO BE REMOVED
TREE TO BE PRUNED
ROOT INTRUSIONS (NOTABLE)
GROUND PROTECTION
PARTIAL REMOVAL OF GROUP

NOTES

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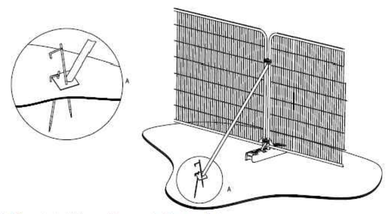

a) Stabilizer strut with base plate secured with ground pins

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Project

CASTLECONNELL FRS

Title

Tree Impacts and Protection Plan: Option 1
5 of 5
for

Client

Limerick City and County Council

Drawn: L TAYLOR 08/11/22	Designed: S TESTER 08/11/22		
Checked: S TESTER 14/11/22	Approved: S WATKINS 15/11/22		
Project Reference: 2022s1238	Scale: AS SHOWN @ A1		
Drawing Number:	Status:	Revision:	Sheet Size:
19104-JBAU-XX-XX-DR-X-03015	S3	P01.01	A1

F Veteran Tree Assessments

Step 1. Mandatory information and features assessment

Recorder	Stephen Tester	Date	19th October 2022

Location

Grid Reference	E 566040.44, N 662826.99	What3Words	ignorance.alienating.ignites
Site Name	Castleconnell	Other Identifier	T075
Access	Junction of The Mall and Scanlon Park		or ☐ Woodland Trust site
Context	Driveway to Island House, Cloon, Castleconnell		

Name

Species	[XC] Cedar	or ☐ unsure	
Tree Identifier	T075 on Tree Survey	Local/ Historic Name	

About the tree

Girth (m)	1620mm *estimated	at	1.3m above ground level	above ground
Form	Standing tree, with live partial canopy, and nearly full outline			
Status	☑ Alive	☐ Dead	☐ Unsure	
	and ☑ Standing	☐ Fallen	☐ Fragmented	☐ Remnant

Veteran features

Epiphytes	☒ Cuckoo tree	☒ Ivy	☒ Mistletoe
	☒ Moss	☒ Lichen	☒ Fern
	☐ Other		

Evidence of	☒ Invertebrates	No evidence of invertebrates
	☑ Bats	Possible bat habitat due to hazard limbs and failed branching
	☒ Fungi	No evidence of fungal infection or colonisation

Decaying wood (all that apply)

☑ In the crown	☐ < 10% decaying wood	☐ < 50%	☑ > 50%	☐ > 90%
	☐ Visible hollowing	☐ other holes or water pockets		Lost top
☒ On the ground				
☒ Hollowing trunk	☐ with opening	☐ with holes < 15 cm	☐ with holes > 15 cm	

Step 2. Identification of threats to tree

	Threat Type	Agent	Notes	
Roots	Encroachment	☒ Digging/ ditching/ ploughing		
		☒ Compaction		
	Inputs	☒ Fertilisers		
		☒ Pesticides		
		☐ Other run-off		
Trunk	Damage	☒ Animals		
		☒ Machinery		
		☒ Vandalism		
	Evidence of change	☑ Inappropriate tree surgery & Storm [2, 7]	Tip reduction would be advisable.	
Crown	Competition	☒ Non-native trees		
		☑ Native trees	Beech, ash and lime in proximity but reasonable clearances between trees noted, but competition for light possibly a factor in decline of crown condition.	
	Dieback	☒ Disease		
		☒ Dieback		
Tree	Knowledge of future change	☒ Development ☑ Change in land use	Driveway appears to be original and likely hasnt changed since planting	
	Isolation?	☒ No veteran trees within area?		T092 in proximity
	Other	☐ *(Specify)*		

Step 3. Restoration strategy

Is the tree threatened? *(Yes if any threats identified above)*

Overall threat status	☐ Critical	☑ Threatened	☐ Secure

Proposed action *(For all critical or threatening agents identified in step 2):*

Threat type	Agent	Standard work proposal	Priority
Tree is liable to further branch/ crown failure, which would further reduce live branch availability.	Landowner	Recommend removal of hazard limbs, and consider tip reduction to reduce extended limbs	Within 1 year

Repeat assessment

Direction of change	

Step 1. Mandatory information and features assessment

Recorder	Stephen Tester	Date	19th October 2022

Location

Grid Reference	E 566089.71, N 662884.42	What3Words	bandit.coded.ornate
Site Name	Castleconnell	Other Identifier	T092
Access	Junction of The Mall and Scanlon Park		or ☐ Woodland Trust site
Context	Entrance way to Island House, Cloon, Castleconnell		

Name

Species	[PO] White Poplar	or ☐ unsure	
Tree Identifier	T092 on Tree Survey	Local/ Historic Name	

About the tree

Girth (m)	1500mm *estimated	at	1.5m above ground level	above ground
Form	Shredded Tree, with limited primary branching			
Status	☑ Alive	☐ Dead	☐ Unsure	
	and ☑ Standing	☐ Fallen	☐ Fragmented	☐ Remnant

Veteran features

Epiphytes	☒ Cuckoo tree	☑ Ivy	☒ Mistletoe
	☒ Moss	☒ Lichen	☒ Fern
	☐ Other		

Evidence of	☐ Invertebrates	
	☐ Bats	
	☑ Fungi	Multiple brackects on main stem

Decaying wood (all that apply)

☐ In the crown	☐ < 10% decaying wood	☐ < 50%	☐ > 50%	☑ > 90%
	☐ Visible hollowing	☑ other holes or water pockets		
☐ On the ground				
☐ Hollowing trunk	☐ with opening	☑ with holes < 15 cm	☐ with holes > 15 cm	

Step 2. Identification of threats to tree

	Threat Type	Agent	Notes	
Roots	Encroachment	☒ Digging/ ditching/ ploughing		
		☒ Compaction		
	Inputs	☒ Fertilisers		
		☒ Pesticides		
		☐ Other run-off		
Trunk	Damage	☒ Animals		
		☒ Machinery		
		☒ Vandalism		
	Evidence of change	☑ Inappropriate tree surgery & or Storm? [2, 7]	Tree has been stripped and subject of apparent poor pruning practices.	
Crown	Competition	☒ Non-native trees		
		☑ Native trees	Significant sycamore (naturalised) self-sets around its rooting area	
	Dieback	☒ Disease		
		☑ Dieback	Its regrowth is limited to 3x small epicormic growths in top of crown which is not sustainable	
Tree	Knowledge of future change	☒ Development ☑ Change in land use	Flood defence works will further impact on the viable and reasonable retention.	
	Isolation?	☒ No veteran trees within area?		T075 in proximity
	Other	☐ *(Specify)*		

Step 3. Restoration strategy

Is the tree threatened? *(Yes if any threats identified above)*

Overall threat status	☑ Critical	☐ Threatened	☐ Secure

Proposed action *(For all critical or threatening agents identified in step 2):*

Threat type	Agent	Standard work proposal	Priority
Due to high level of targets and location (adjacent to road) tree retention not recommended & tree appears to of run out of energy reserves with only three small epicormic growths noted in crown.	Landowner/ highways?	Recommend tree is felled to high stump and stem allowed to rot in location for wildlife value.	Within 1 year

Repeat assessment

Direction of change	- N/A = Removal of tree recommended

G References

British Standards Institution (2012) British Standards (BS) 5837:2012 Trees in relation to design, demolition and construction – Recommendations

British Standards Institution (2010) *British Standards (BS) 3998:2010 Tree Work – Recommendations.*

Arboricultural Association (2016) Guidance Note 7: Tree Surveys – A Guide to Good Practice

Definitions A-Z of Tree Terms https://treeterms.co.uk/

ConserveIreland
https://www.conserveireland.com/national/tree-preservation-order-t-p-o

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JBA Group Ltd is certified to:
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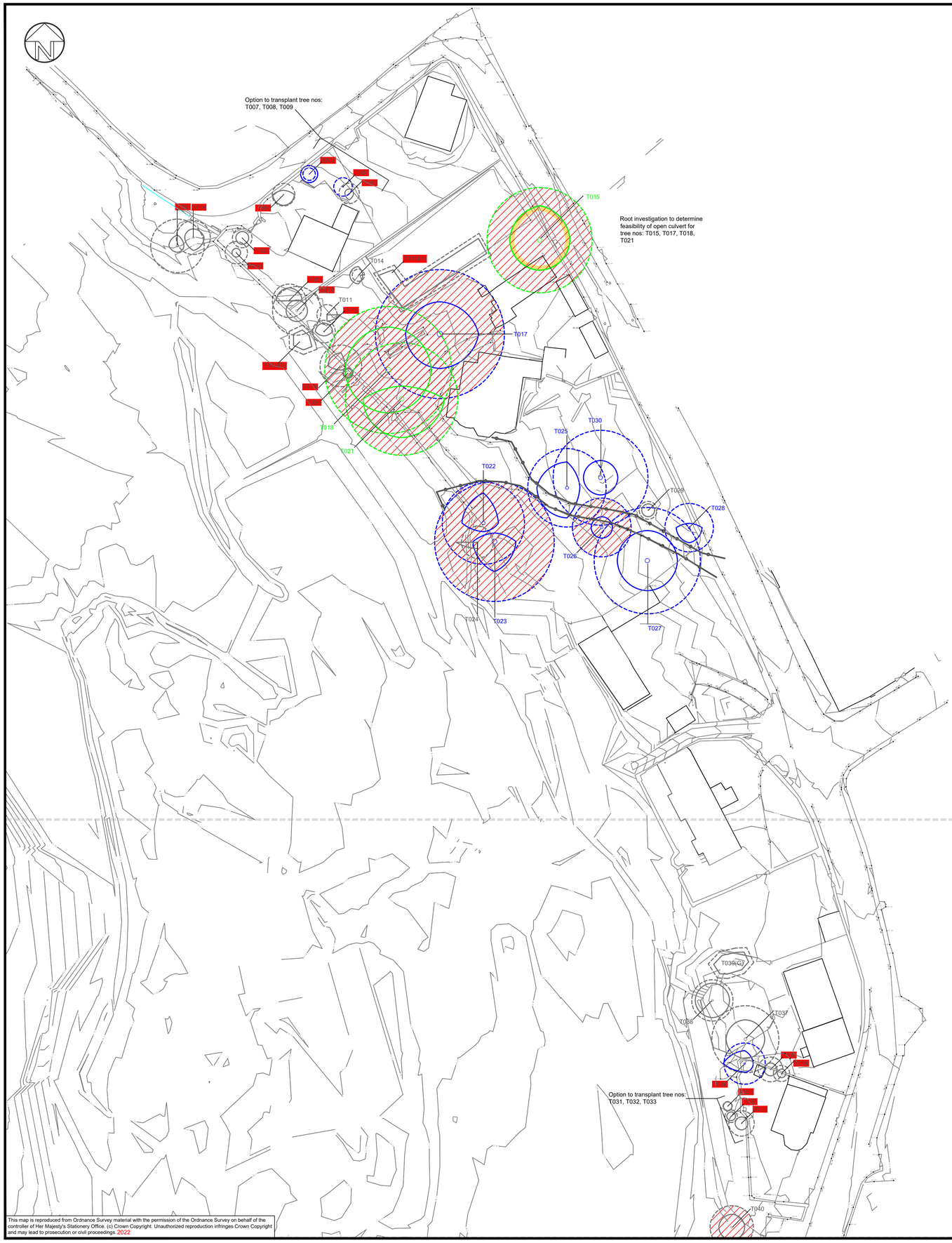
ISO 45001:2018



No.	Construction Risk	Maintenance Risk	Demolition Risk
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2			

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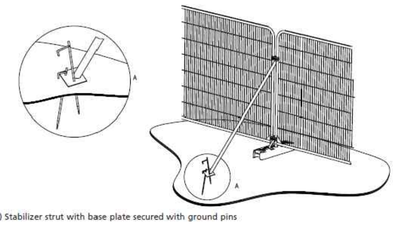

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Project

CASTLECONNELL FRS

Title

Tree Impacts and Protection Plan: Option 2&3
1 of 5

for

Client

Limerick City and County Council

Drawn:	L TAYLOR	08/11/22	Designed:	S TESTER	08/11/22
Checked:	S TESTER	14/11/22	Approved:	S WATKINS	15/11/22
Project Reference:	2022s1238		Scale:	AS SHOWN @ A1	

Drawing Number:	Status:	Revision:	Sheet Size:
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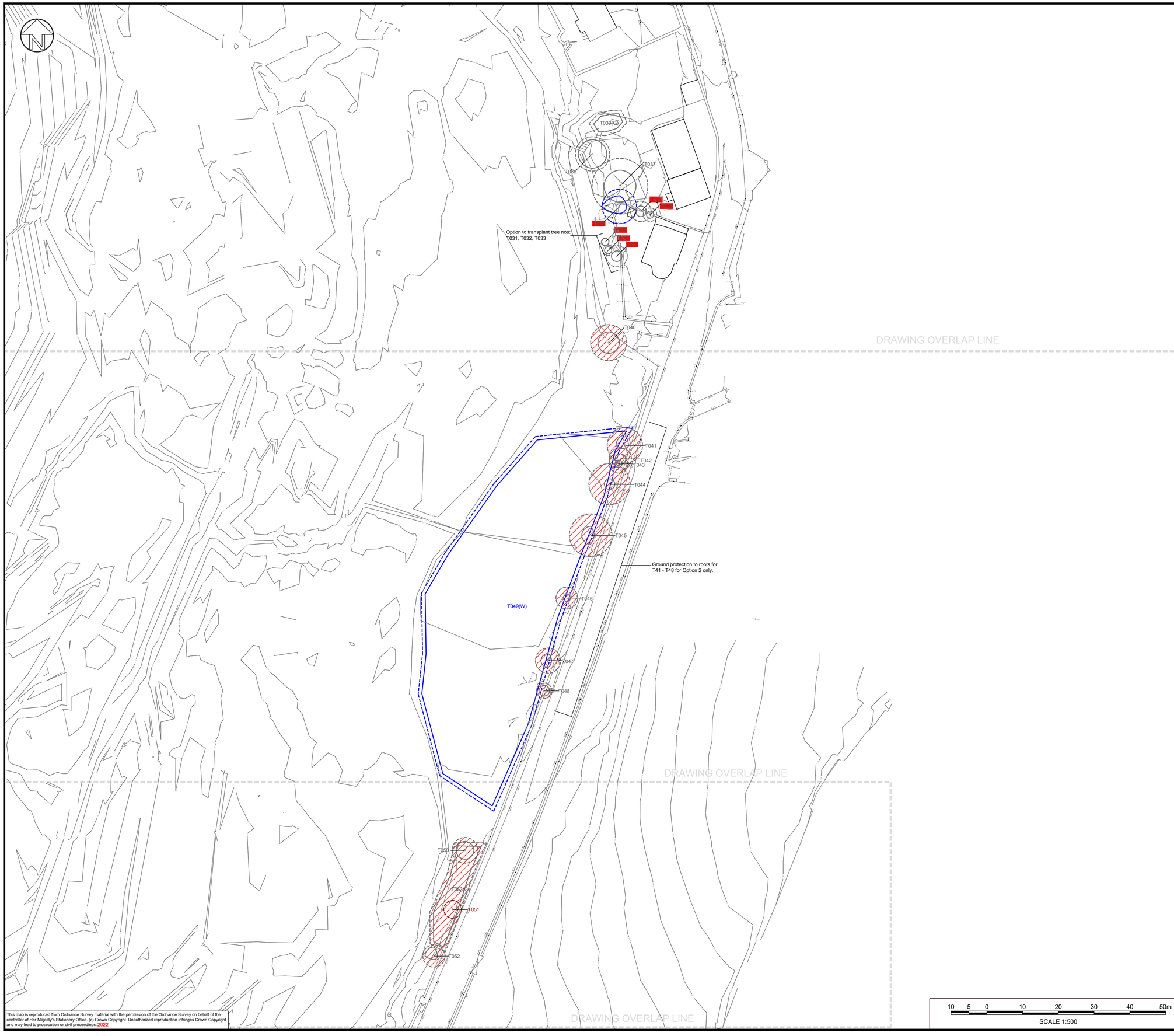

10 5 0 10 20 30 40 50m

SCALE 1:500

No.	Construction Risk	Maintenance Risk	Demolition Risk
1			
2			

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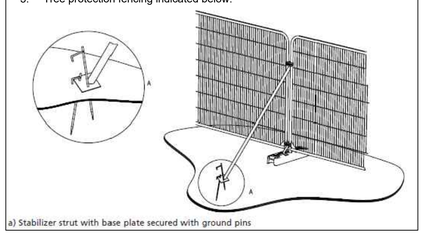

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Project

CASTLECONNELL FRS

Title

Tree Impacts and Protection Plan: Option 2&3
2 of 5

for

Client

Limerick City and County Council

Drawn:	L TAYLOR	08/11/22	Designed:	S TESTER	08/11/22
Checked:	S TESTER	14/11/22	Approved:	S WATKINS	14/11/22
Project Reference:	2022s1238		Scale:	AS SHOWN @ A1	

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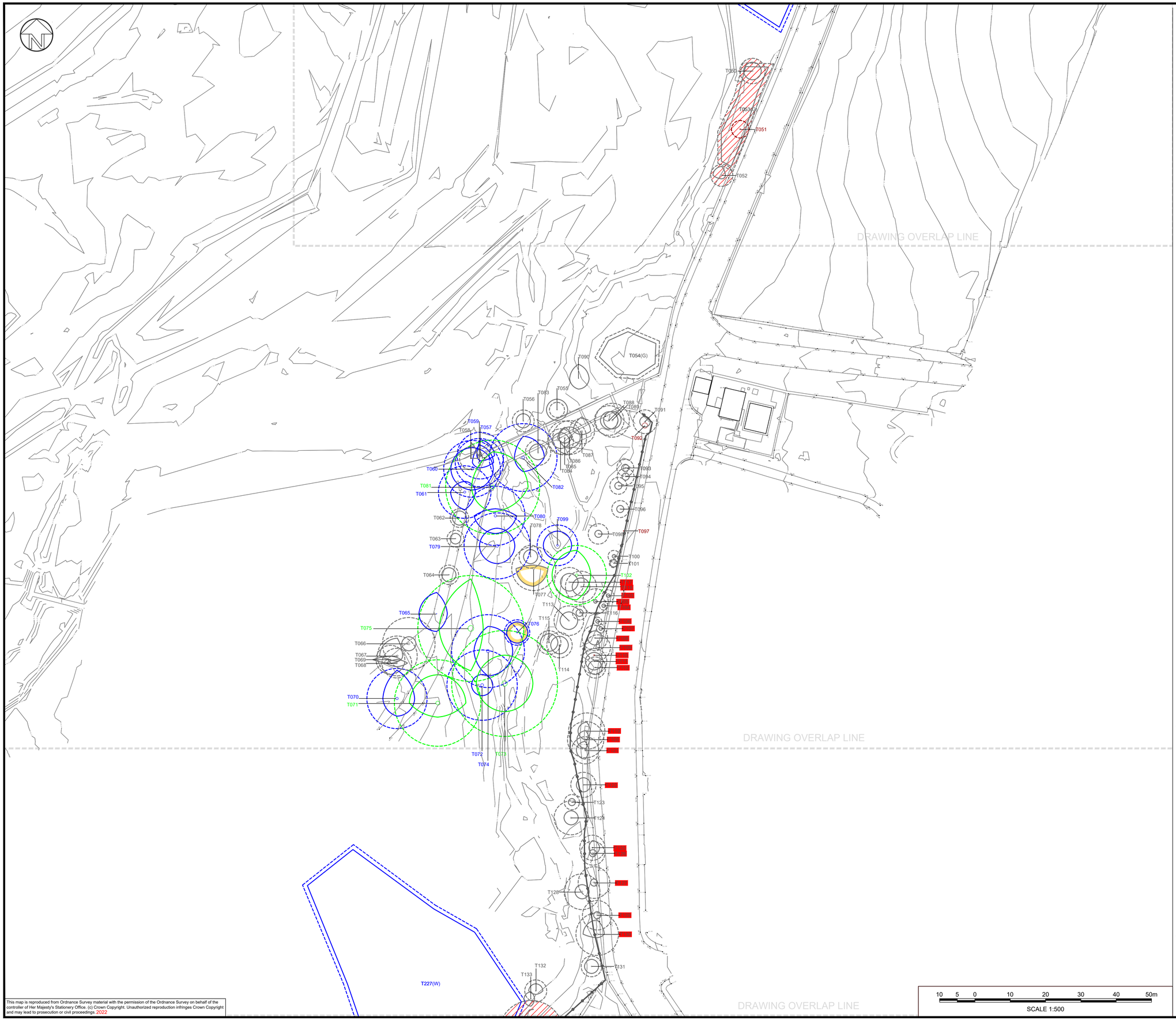

10 5 0 10 20 30 40 50m

SCALE 1:500

No.	Construction Risk	Maintenance Risk	Demolition Risk
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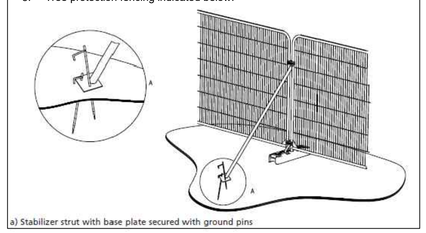

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Project

CASTLECONNELL FRS

Title

Tree Impacts and Protection Plan: Option 2&3
3 of 5
for

Client

Limerick City and County Council

Drawn: L TAYLOR 08/11/22	Designed: S TESTER 08/11/22		
Checked: S TESTER 14/11/22	Approved: S WATKINS 15/11/22		
Project Reference: 2022s1238	Scale: AS SHOWN @ A1		
Drawing Number:	Status:	Revision:	Sheet Size:
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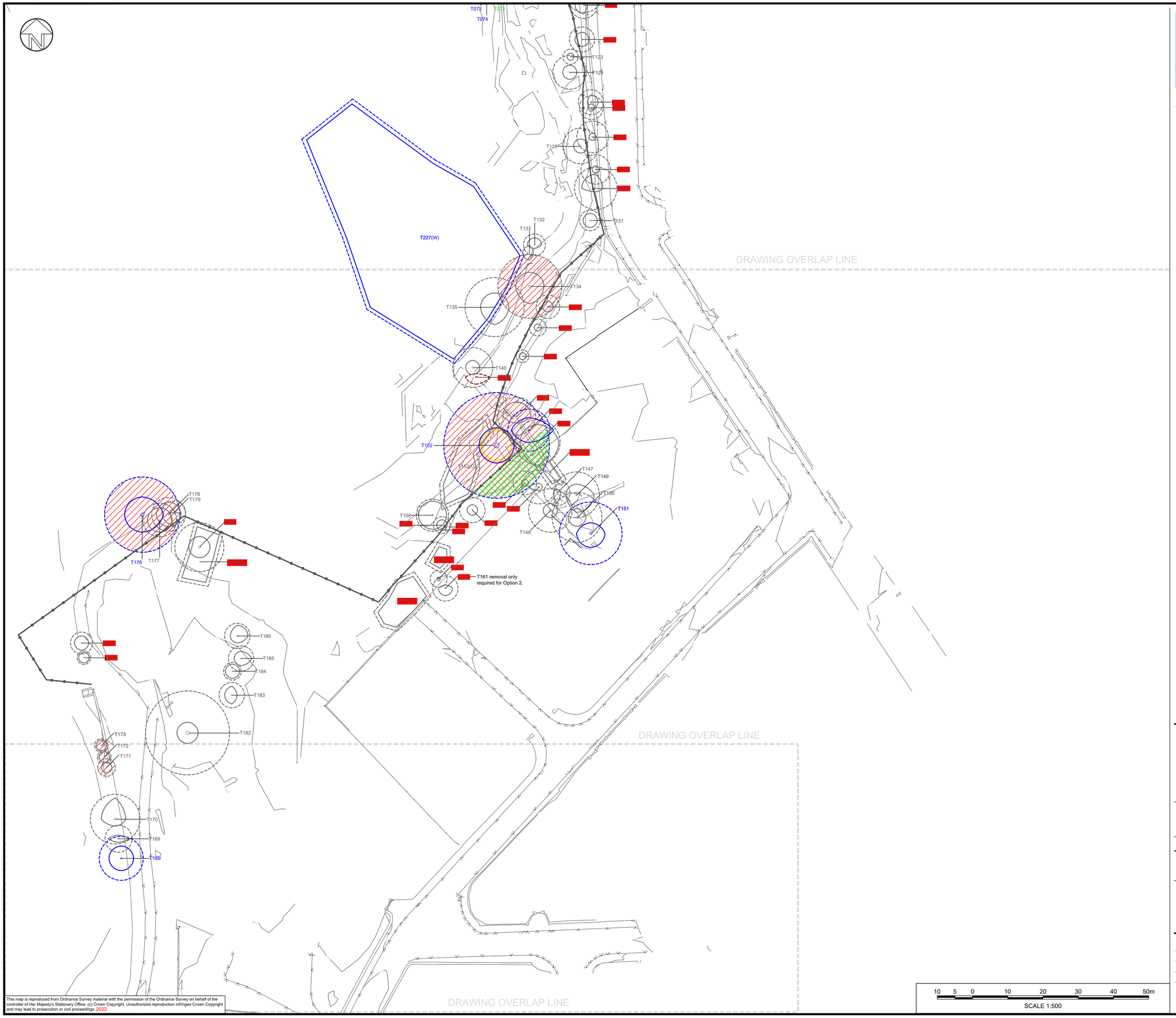

10 5 0 10 20 30 40 50m

SCALE 1:500

No.	Construction Risk	Maintenance Risk	Demolition Risk
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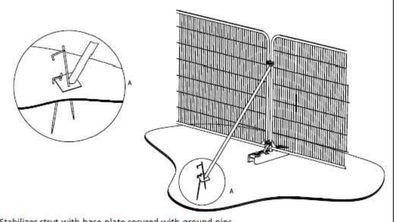

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Project

CASTLECONNELL FRS

Title

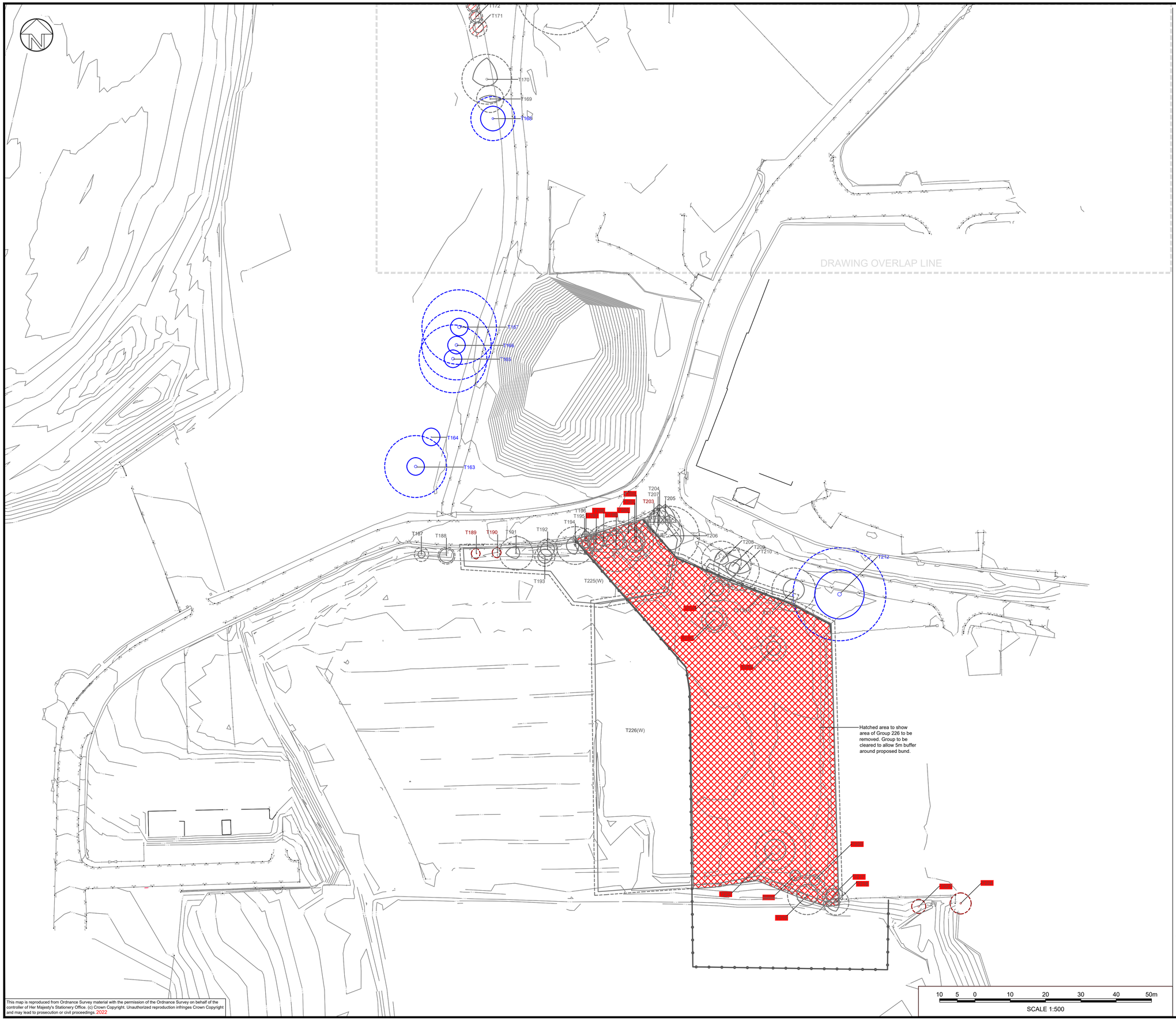
Tree Impacts and Protection Plan: Option 2&3
4 of 5

for

Client

Limerick City and County Council

Drawn:	L TAYLOR	08/11/22	Designed:	S TESTER	08/11/22
Checked:	S TESTER	14/11/22	Approved:	S WATKINS	15/11/22
Project Reference:	2022s1238		Scale:	AS SHOWN @ A1	
Drawing Number:	19104-JBAU-XX-XX-DR-X-03009		Status: S3	Revision: P01.01	Sheet Size: A1



No.	Construction Risk	Maintenance Risk	Demolition Risk
1			
2			

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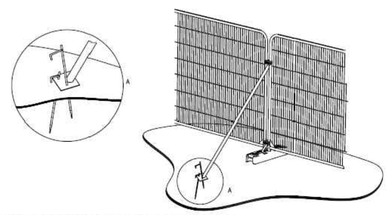

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Project

CASTLECONNELL FRS

Title

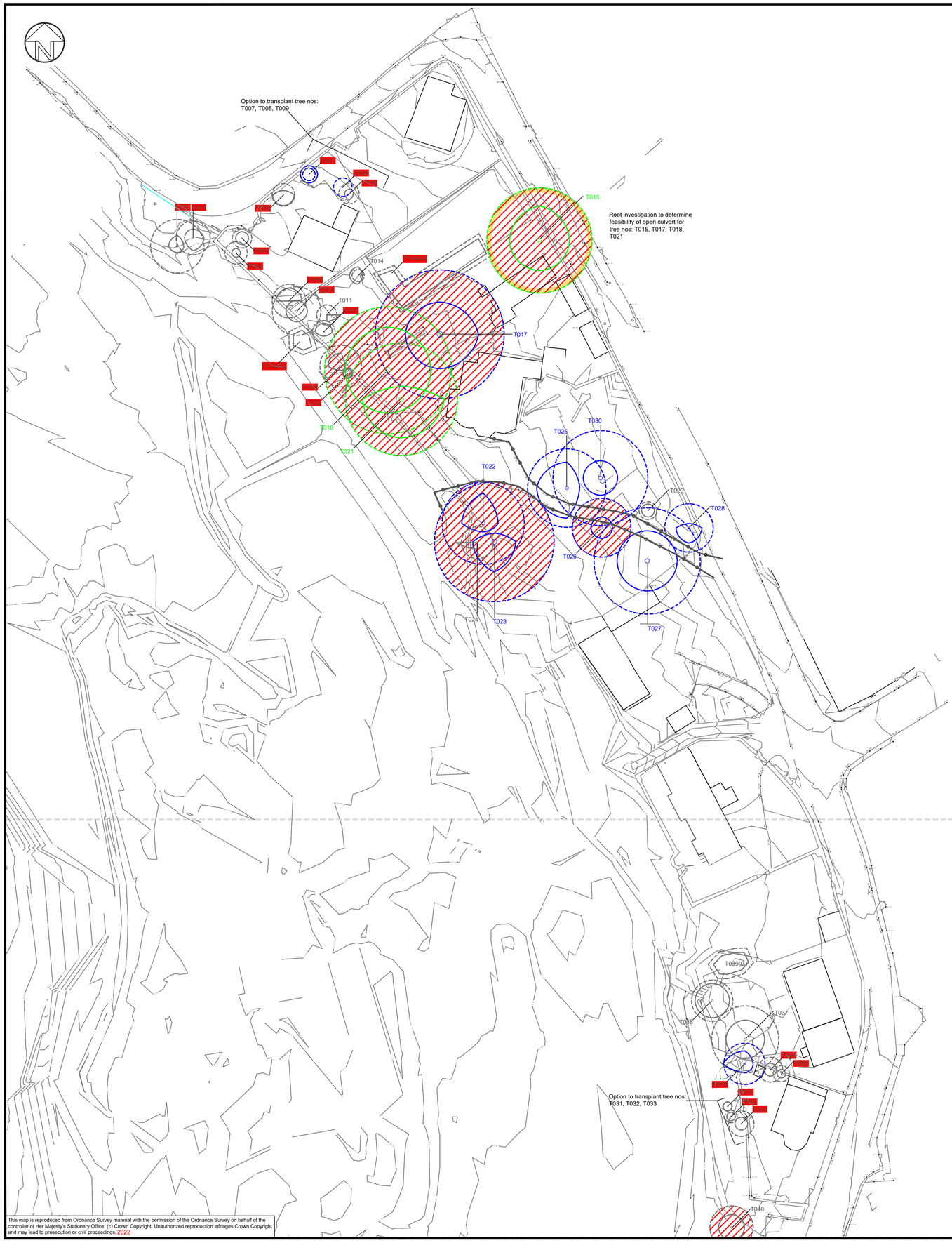
Tree Impacts and Protection Plan: Option 2&3
5 of 5

for

Client

Limerick City and County Council

Drawn: L TAYLOR 08/11/22	Designed: S TESTER 08/11/22		
Checked: S TESTER 14/11/22	Approved: S WATKINS 15/11/22		
Project Reference: 2022s1238	Scale: AS SHOWN @ A1		
Drawing Number:	Status:	Revision:	Sheet Size:
19104-JBAU-XX-XX-DR-X-03010	S3	P01.01	A1



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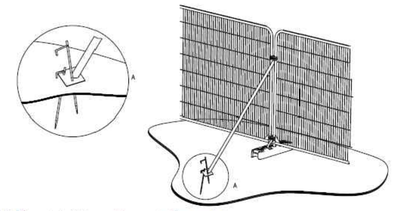

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Project

CASTLECONNELL FRS

Title

Tree Impacts and Protection Plan: Option 1
1 of 5

for

Client

Limerick City and County Council

Drawn:	L TAYLOR	08/11/22	Designed:	S TESTER	08/11/22
Checked:	S TESTER	14/11/22	Approved:	S WATKINS	15/11/22
Project Reference:	2022s1238		Scale:	AS SHOWN @ A1	

Drawing Number:	Status:	Revision:	Sheet Size:
19104-JBAU-XX-XX-DR-X-03011	S3	P01.01	A1

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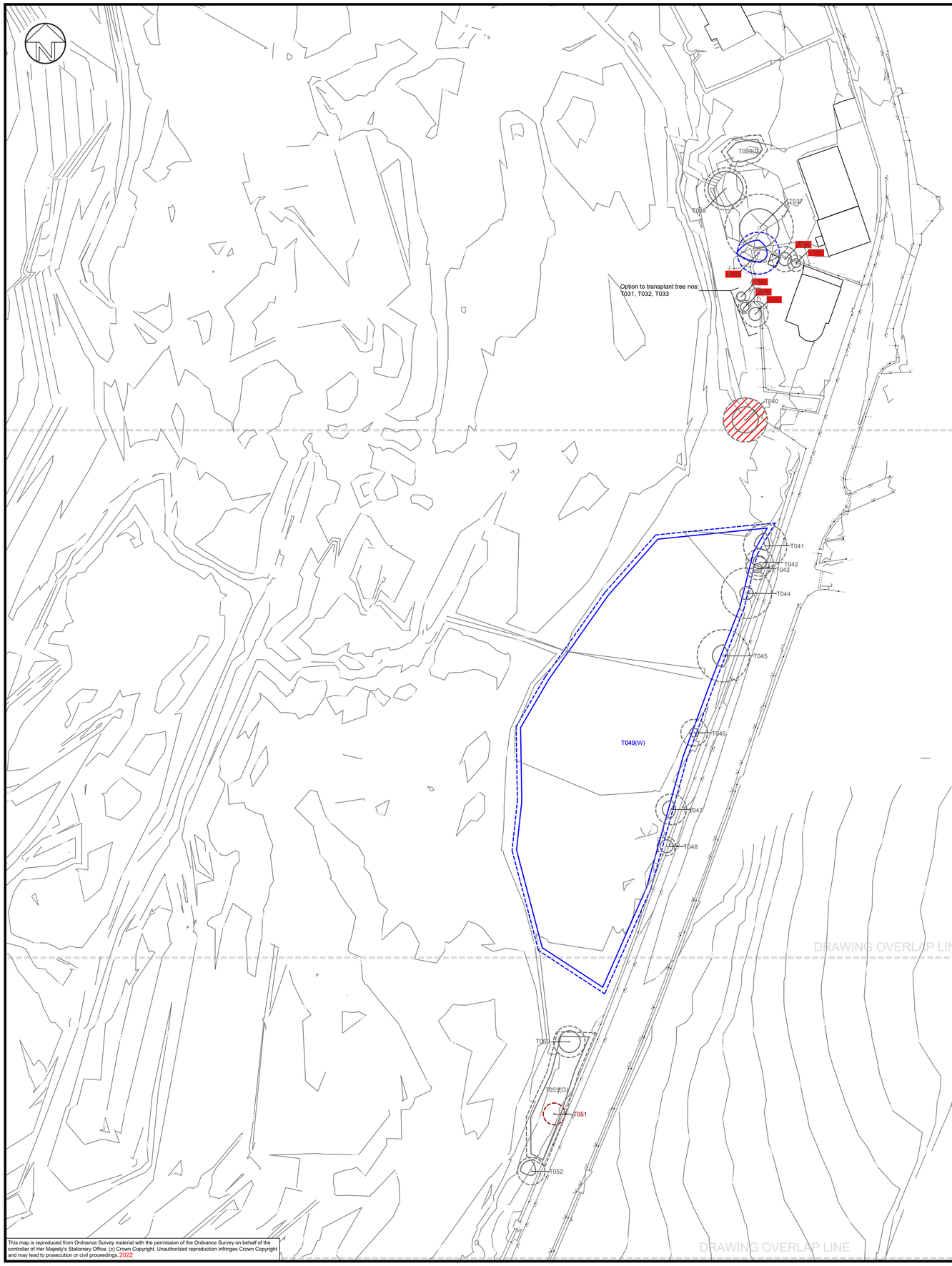
SCALE 1:500



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10 5 0 10 20 30 40 50m

SCALE 1:500

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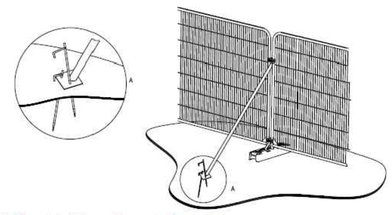

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Title

Tree Impacts and Protection Plan: Option 1
2 of 5

for

Client

Limerick City and County Council

Drawn: L TAYLOR 08/11/22	Designed: S TESTER 08/11/22		
Checked: S TESTER 14/11/22	Approved: S WATKINS 15/11/22		
Project Reference: 2022s1238	Scale: AS SHOWN @ A1		
Drawing Number: 19104-JBAU-XX-XX-DR-X-03012	Status: S3	Revision: P01.01	Sheet Size: A1

DRAWING OVERLAP LINE

DRAWING OVERLAP LINE

DRAWING OVERLAP LINE

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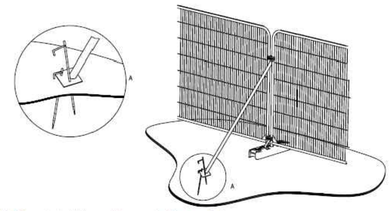

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Tree Impacts and Protection Plan: Option 1
3 of 5

for

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Drawing Number:	Status:	Revision:	Sheet Size:
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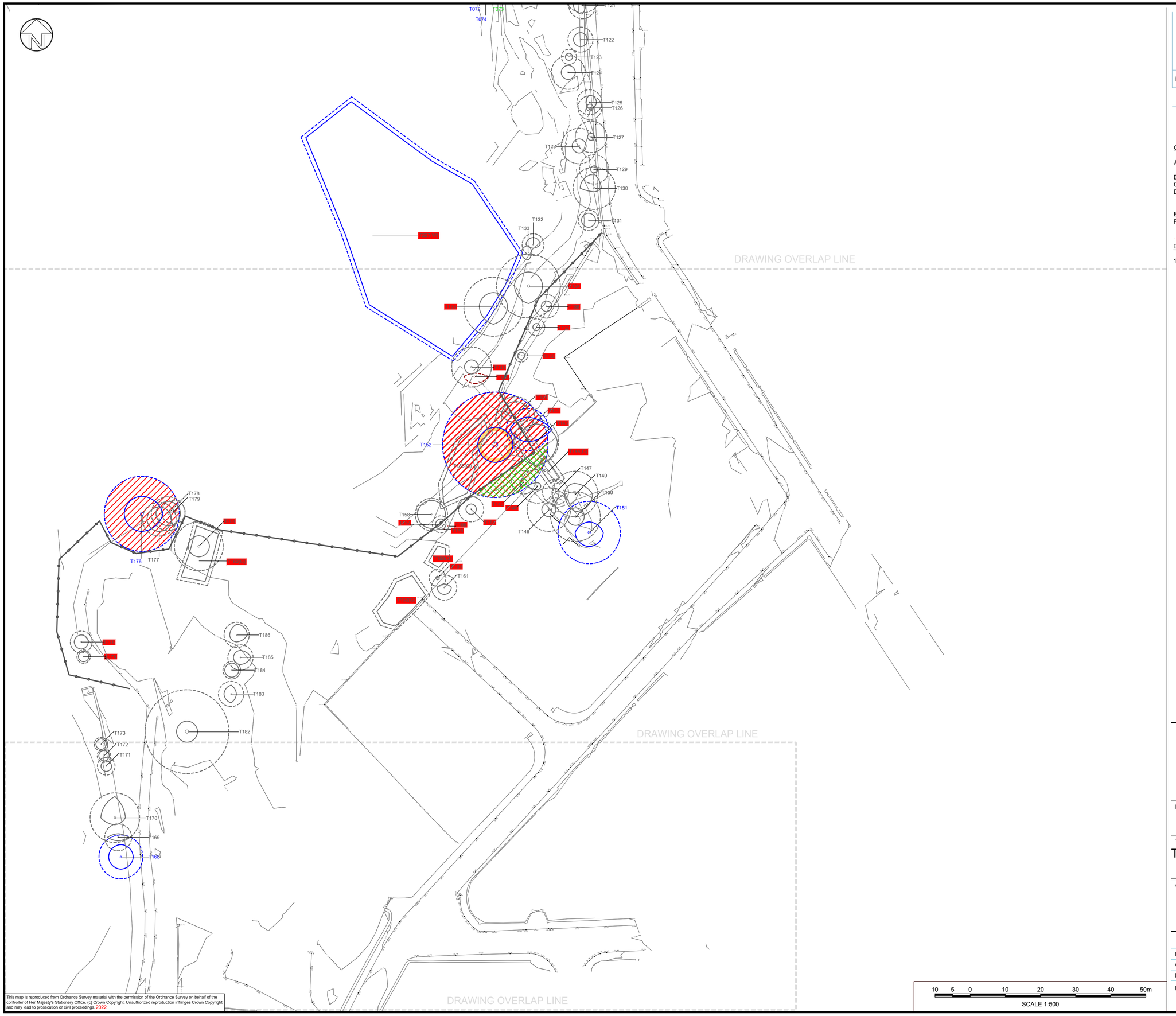
SCALE 1:500



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NOTES

1. New temporary ground protection should be capable of supporting any traffic entering or using the site without being distorted or causing compaction of underlying soil.
2. The ground protection might comprise one of the following:
a. For pedestrian movements only, a single thickness of scaffold boards placed on top of a driven scaffold frame, so as to form a suspended walkway, or on top of a compression-resistant layer (e.g. 100mm depth of woodchip), laid on to a geotextile membrane.
b. For pedestrian-operated plant up to a gross weight of 2t, proprietary, inter-linked ground protection boards placed on top of a compression resistant layer (e.g. 150mm depth of woodchip), laid on to a geotextile membrane.
c. For wheeled or tracked construction traffic exceeding 2t gross weight, an alternative system (e.g. proprietary systems or pre-cast reinforced concrete slabs) to an engineering specification designed in conjunction with arboricultural advice, to accomodate the likely loading to which it will be subjected.

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Tree Impacts and Protection Plan: Option 1
4 of 5

for

Client

Limerick City and County Council

Drawn:	L TAYLOR 08/11/22	Designed:	S TESTER 8/11/22
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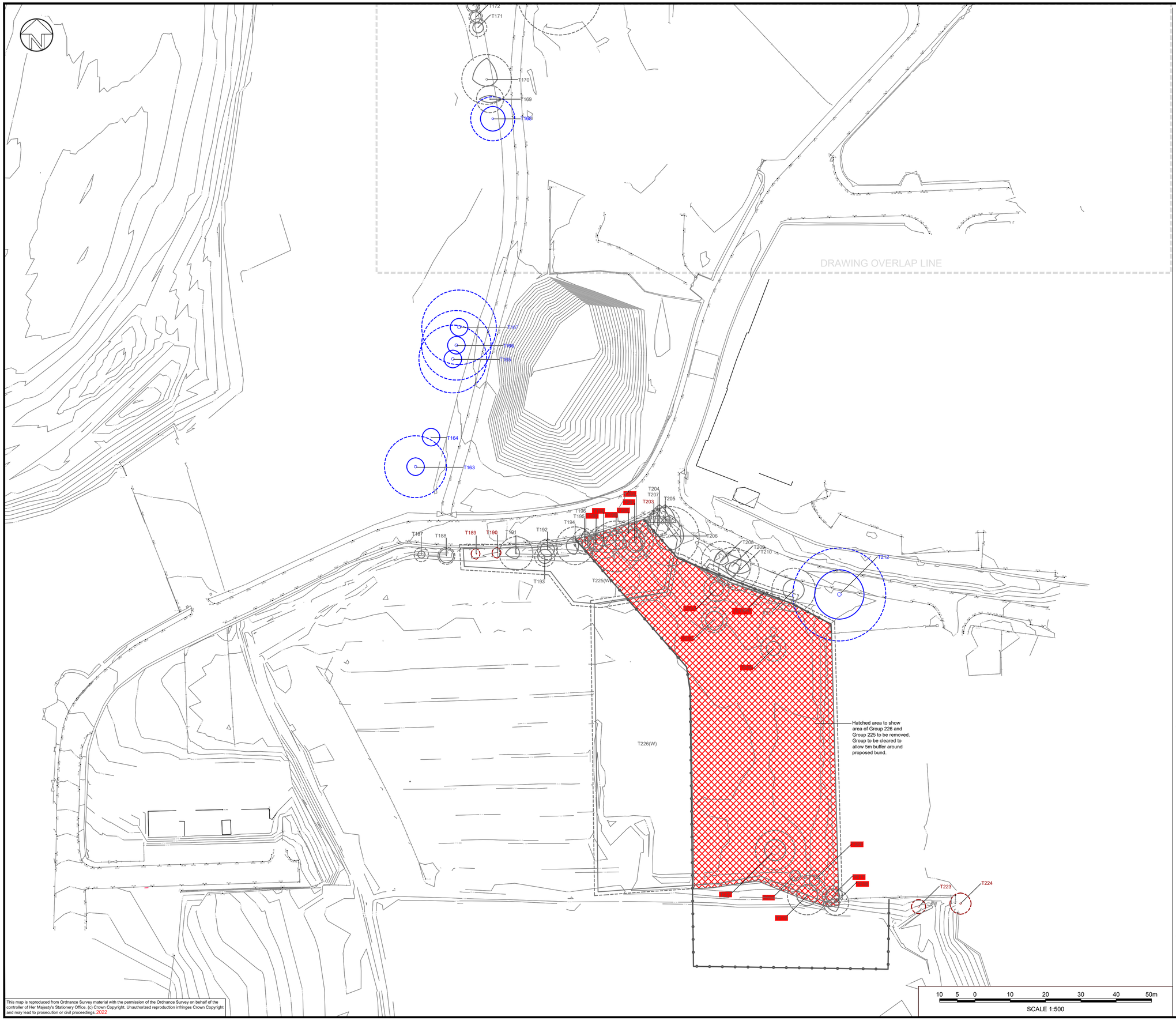

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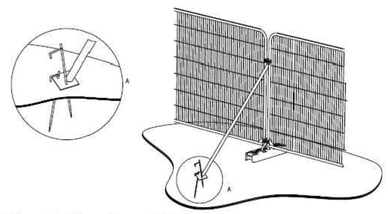

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5 of 5
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19104-JBAU-XX-XX-DR-X-03015	S3	P01.01	A1

9 Land and Soil Appendices

No appendices.

10 Water – Surface and Groundwater Appendices

No appendices.

11 Material Assets Appendices

11.1 Volume of Demolition Works

Area of works	Stone walls	Concrete	Paving / Road works	Total Volume (m3)
Northern properties	159	27	33	**219**
Cedarwood Culvert	0	5	0	**5**
Mall House	115	4	0	**119**
Mall Road North	304	46	152	**502**
Island House	0		20	**20**
Scanlon Park Junction	0	5	0	**5**
Mall Road South	212	32	106	**350**
Maher's Pub	106	0	53	**159**
Medowbrook Estate	93	0	0	**93**
Stormont House	0	0	47	**47**
Coolbane Woods Junction	0	10	0	**10**
Coolbane Woods Embankment	0	0	0	**0**
Ancillary Works (Pipe diversion etc.)	0	0	120	**120**
Total Volume (m3)	**989**	**129**	**531**	**1649**

11.2 Area for earthworks

Area of works	Total Area (m2)
Northern properties	**2200**
Cedarwood Culvert	**110**
Cedarwood Stream	**1595**
Mall House	**693**
Mall Road North	**1644.5**
Island House	**660**
Scanlon Park Junction	**0**
Mall Road South	**1144**
Maher's Pub	**528**
Medowbrook Estate	**462**
Stormont House	**4356**
Coolbane Woods Junction	**0**
Coolbane Woods Embankment	**6512**
Ancillary Works (Utility diversion etc.)	**2450**
Total Volume (m3)	**22354.5**

11.3 Volumes of material moved

Volume of material moved	Excavate and spoil material	Backfill spoiled material	Remove spoiled material from site	Temporary platform material imported and removed	Import Embankment Clay	Import material for roadworks	Total Volume moved (m3)
Northern properties	1322	1151	171	1100	0	83	**3827**
Cedarwood Culvert	52	36	16	0	0	11	**115**
Cedarwood stream	0	0	0	0	0	0	**0**
Mall House	909	687	222	0	0	13	**1831**
Mall Road North	3289	658	2631	0	0	1582	**8160**
Island House	164		164	0	0	172	**500**
Scanlon Park Junction	0		0	0	0	0	**0**
Mall Road South	2288	458	1830	0	0	1100	**5676**
Maher's Pub	1144	778	366	0	0	132	**2420**
Meadowbrook Estate	1001	801	200	0	0	0	**2002**
Stormont House	3894	902	2992	0	4481	1155	**13424**
Coolbane Woods Junction	0	0	0	0	0	0	**0**
Coolbane Woods Embankment	16403	3704	12699	0	19587	0	**52393**
Ancillary Works	2664	2640	24	0	0	0	**5328**
Total Volume (m3)	**33130**	**11815**	**21315**	**1100**	**24068**	**4248**	**95676**

11.4 Total building volumes

Area of works	Concrete	Steel Sheet Piles	Stone Cladding	Paving	Backfilling	Layer works for roadworks	Asphalt Road Surfacing	Imported Clay for Embankments	Total Volume (m3)
Northern properties	208	17	80	22	885	66	0	0	**1278**
Cedarwood Culvert	15				28	9			**52**
Cedarwood Stream	0	0	0	0	0	0	0	0	**0**
Mall House	187	0	44	0	528	0	0	0	**759**
Mall Road North	624	0	141	0	506	1265	98	0	**2634**
Island House	99	0	0	0	0	137	0	0	**236**
Scanlon Park Junction	5	0	0	0	0	0	75	0	**80**
Mall Road South	434	0	32	0	352	880	68	0	**1766**
Maher's Pub	193	0	16	36	599	106	0	0	**950**
Meadowbrook Estate	193	2	24	0	616	0	0	0	**835**
Stormont House	149	0	22	0	360	924	0	3584	**5039**
Coolbane Woods Junction	13	0	0	0	0	0	42	0	**55**
Coolbane Woods Embankment	0	0	0	0	2849	0	0	15670	**18519**
Ancillary Works (Diversions etc.)	24	0	4	0	37	1994	172	0	**2231**
Total Volume (m3)	**2144**	**19**	**363**	**58**	**6760**	**5381**	**455**	**19254**	**34434**

11.5 Estimated HGV movements

Embankments works only	Estimated one-way HGV trips / hour
Bulk excavations and removal of material (outward trip)	4 - 6
Import Clay, fill and compact clay embankments (inward trip)	4 - 6
Total	**8 - 12**
Embankment and structural works	**Estimated one-way HGV trips / hour**
Embankments:	
Bulk excavations and removal of material (outward trip) and	4 - 6
Import Clay, fill and compact clay embankments (inward trip)	4 - 6
Structures:	
Trench excavations and removal of material in restricted area	2 - 4
Concrete delivery	2 - 3
Total	**12 - 19**

11.6 Construction vehicles on site

Machinery	Structures team	Embankment team	Site yard	Total (if all active)
Excavators	1	2	1	4
JCB / multi-purpose plant / mini digger	2	1		3
Dumper Trucks	2	2		4
Scrapers / bulldozers	0	2		2
Crane	1	0		1
Pump	1	0		1
Compact Roller	1	2		3
Site vehicles	4	4		8

11.7 Estimated length of construction

Area of works	Time in Months
Northern properties	4
Cedarwood Stream	1
Mall House	1
Mall Road North	3
Island House	1
Scanlon Park Junction	0.5
Mall Road South	3
Maher's Pub	1
Meadowbrook Estate Wall	1
Stormont House Embankment	2
Stormont House	1
Coolbane Woods Junction	0.5
Coolbane Woods Embankment	5
Total	**24**

12 Cultural Heritage Appendices

12.1 Legislation, Standards and Guidelines

12.1.1 List of Legislation, Standards and Guidelines

The following legislation, standards and guidelines were consulted to inform the ongoing archaeological assessment for the project

Conventions, Charters, Treaties and Declarations

- International Charter for the Conservation and Restoration of Monuments and Sites (Venice Charter1964);
- European Convention on the Protection of the Archaeological Heritage (London Convention1969);
- UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage (The World Heritage Convention 1972);
- ICOMOS Florence Charter on Historic Gardens (Florence Charter 1982);
- European Convention for the Protection of the Architectural Heritage (Granada Convention, 1985);
- ICOMOS Charter for the Conservation of Historic Towns and Urban Areas (Washington Charter, 1987);
- European Convention on the Protection of the Archaeological Heritage (Valetta Convention, 1992);
- ICOMOS Charter on the Built Vernacular Heritage,1999;
- European Landscape Convention (Florence Convention, 2000);
- Framework Convention on the Value of Cultural Heritage for Society (Faro Convention, 2005);
- UNESCO Convention on the Protection of the Underwater Cultural Heritage (2001);
- UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage (Paris Convention, 2003);
- ICOMOS Declaration on the Conservation of the Setting of Heritage Structures, Sites and Areas (Xi'an Declaration, 2005);
- The Australia ICOMOS Charter for Places of Cultural Significance (Burra Charter, 2013);
- Principles for the Conservation of Industrial Heritage Sites, Structures, Areas and Landscapes (The Dublin Principles 2011).

Legislation, Government Policies, Regulations, Guidelines and Codes of Practice

- Roads Act 1993 and EIA Regulations (as amended);
- Planning and Development Act 2000 (as amended);
- The Historic and Archaeological Heritage and Miscellaneous Provisions Act 2023 was enacted in October 2023
- National Monuments Acts 1930 to 2014;
- National Cultural Institutions Act 1997;
- Heritage Act 1995;
- Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 2000;
- Framework and Principles for the Protection of the Archaeological Heritage (1999);
- National Policy on Town Defences (2008);
- National Policy on Architecture (2022);
- Code of Practice between the National Roads Authority (NRA) and the Minister for Arts, Heritage and the Gaeltacht, (2000);
- EPA, 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);
- NRA, Guidelines for the Assessment of Architectural Heritage Impact of National Road Schemes (2006);
- NRA, Guidelines for the Assessment of Archaeological Heritage Impact of National Road Schemes (2006);
- NRA, Guidelines for the Testing and Mitigation of the Wetland Archaeological Heritage for National Road Schemes (2006);
- The Heritage Council, Proposals for Irelands Landscapes (2010);
- Historic Scotland, Managing Change in the Historic Environment (2010);

- ICOMOS, Guidance on Heritage Impact Assessments for Cultural World Heritage Properties (2011);
- Department of Arts, Heritage and the Gaeltacht, Architectural Heritage Protection – Guidelines for Planning Authorities (2011);
- Historic England, Historic Environment Good Practice Advice in Planning, Note 3: The Setting of Heritage Assets (2015);
- Code of Practice for Archaeology agreed between the Minister for Arts, Heritage, Regional, Rural and Gaeltacht Affairs and Transport Infrastructure Ireland (2017);
- Historic England, Land Contamination and Archaeology Good Practice Guidance, (2017);
- EPA, Guidelines on the information to be contained in Environmental Impact Assessment Reports (2022);
- TII, Cultural Heritage Impact Assessment (CHIA) of TII Projects – Overarching Technical Document (Draft 2022);
- TII Cultural Heritage Impact Assessment (CHIA) of Proposed TII Projects – Standard (Draft 2022)

Other Key Plans and Policies

- National Development Plan 2018–27;
- Project Ireland 2040;
- National Landscape Strategy for Ireland 2015–25;
- Heritage Ireland 2030 – A Framework for Heritage (2022);
- Action Plan for Rural Development – Realising our Rural Potential (2017);
- Built & Archaeological Heritage Climate Change Sectoral Adaptation Plan (2019)

12.1.2 National Monuments (Amendment) Act (1930-2014)

The Historic and Archaeological Heritage and Miscellaneous Provisions Act 2023 was enacted in October 2023 and this this Act is now law. The Minister for Housing, Local Government and Heritage commenced certain provisions in May 2024 (S.I. No. 252/2024); however, until the Act is fully commenced, the National Monuments Acts have therefore not yet been repealed and remain in force.

The national monuments acts are summarised as follows:

All archaeological sites have the full protection of the national monuments legislation (Principal Act 1930; Amendments 1954, 1987, 1994, 2004 and 2014). In the 1987 Amendment of Section 2 of the Principal Act (1930), the definition of a national monument is specified as:

any artificial or partly artificial building, structure or erection or group of such buildings, structures or erections;

any artificial cave, stone or natural product, whether forming part of the ground, that has been artificially carved, sculptured or worked upon or which (where it does not form part of the place where it is) appears to have been purposely put or arranged in position;

any, or any part of any, prehistoric or ancient tomb, grave or burial deposit, or

(ii) ritual, industrial or habitation site

and

any place comprising the remains or traces of any such building, structure or erection, any cave, stone or natural product or any such tomb, grave, burial deposit or ritual, industrial or habitation site...

Under Section 14 of the Principal Act (1930):

It shall be unlawful...

to demolish or remove wholly or in part or to disfigure, deface, alter, or in any manner injure or interfere with any such national monument without or otherwise than in accordance with the consent hereinafter mentioned (a licence issued by the Office of Public Works National Monuments Branch),

or

to excavate, dig, plough or otherwise disturb the ground within, around, or in the proximity to any such national monument without or otherwise than in accordance...

Under Amendment to Section 23 of the Principal Act (1930),

A person who finds an archaeological object shall, within four days after the finding, make a report of it to a member of the Garda Síochána...or the Director of the National Museum...

The latter is of relevance to any finds made during a watching brief.

In the 1994 Amendment of Section 12 of the Principal Act (1930), all the sites and 'places' recorded by the Sites and Monuments Record of the Office of Public Works are provided with a new status in law. This new status provides a level of protection to the listed sites that is equivalent to that accorded to 'registered' sites [Section 8(1), National Monuments Amendment Act 1954] as follows.

The Commissioners shall establish and maintain a record of monuments and places where they believe there are monuments and the record shall be comprised of a list of monuments and such places and a map or maps showing each monument and such place in respect of each county in the State.

The Commissioners shall cause to be exhibited in a prescribed manner in each county the list and map or maps of the county drawn up and publish in a prescribed manner information about when and where the lists and maps may be consulted.

In addition, when the owner or occupier (not being the Commissioners) of a monument or place which has been recorded, or any person proposes to carry out, or to cause or permit the carrying out of, any work at or in relation to such monument or place, he shall give notice in writing of his proposal to carry out the work to the Commissioners and shall not, except in the case of urgent necessity and with the consent of the Commissioners, commence the work for a period of two months after having given the notice.

Under the National Monuments Amendment Act (2004), the Minister of Environment, Heritage and Local Government will issue directions relating to archaeological works and will be advised by the National Monuments Section and the National Museum of Ireland. The Act sets out the circumstances whereby the Minister of Environment, Heritage and Local Government may grant consent (i.e. In respect of a national monument of which the Minister or a local authority are the owners or the guardians or in respect of which a preservation order is in force) or issue directions (i.e. in relation to approved road developments—being road development approved under either or both sections 49 and 51 of the Roads Act 1993).

14A. (1) The consent of the Minister under section 14 of this Act and any further consent or licence under any other provision of the National Monuments Acts 1930 to 2004 shall not be required where the works involved are connected with an approved road development.

14A. (2) Any works of an archaeological nature that are carried out in respect of an approved road development shall be carried out in accordance with the directions of the Minister, which directions shall be issued following consultation by the minister with the Director of the National Museum of Ireland.

14A (4) Where a national monument has been discovered to which subsection (3) of this section relates, then the road authority carrying out the road development shall report the discovery to the Minister subject to subsection (7) of this section, and pending any directions by the minister under paragraph (d) of this subsection, no works which would interfere with the monument shall be carried out, except works urgently required to secure its preservation carried out in accordance with such measures as may be specified by the Minister

The Minister will consult with the Director of the National Museum of Ireland for a period not longer than 14 days before issuing further directions in relation to the national monument.

The Minister will not be restricted to archaeological considerations alone, but will also consider the wider public interest.

12.2 Local Authority Policies in Relation to Cultural Heritage

12.2.1 County Limerick Policies in the County Development Plan (2022-2028) in Relation to Cultural Heritage

Historical Landscapes Objectives

EH O32 Historical Landscapes It is an objective of the Council to, during the lifetime of the Draft Plan, develop an historical landscape assessment process, which will identify key historical landscapes within Limerick.

EH O33 Castlepark It is an objective of the Council to ensure that the parkland characteristics and mature trees in the area surrounding Castle Park House which is zoned for Enterprise and Employment shall be retained as part of any new development.

Historical Landscapes Policy

EH P9 It is a policy of the Council to protect and maintain surviving remnants of Historic Gardens, Designed Landscapes and surrounding Parklands including form and patterns of hard and soft landscaping and all mature trees and vegetation as highlighted in the DEHLG 'Survey Of Historic Gardens & Designed Landscapes' Inventory.

Archaeological Heritage Objectives

EH O34 Special Control Areas It is an objective of the Council to protect and maintain the integrity of the Special Control Areas. Continue to zone important archaeological areas as appropriate as Special Control Areas where no development is permitted, other than possibly sensitively designed access.

EH O35 Special Control Areas Mungret It is an objective of the Council to protect and maintain the integrity of the Special Control Areas at Mungret Monastic Complex incorporating all national monuments and protected views including: (1) View from Mungret College northeast to the Monastic Complex and; (2) Views northwest across the Monastic Complex. Development within this area will be prohibited with the exception of leisure facilities and moderate extensions to existing dwellings, which will not adversely impact on the character or setting of the complex. The Council will facilitate the provision of interpretative panels and directional signage for Mungret Monastic Complex and park, will be considered in consultation with local community groups.

EH O36 Preservation of the Archaeological Heritage It is an objective of the Council to seek the preservation of all known sites and features of historical and archaeological interest. This is to include all the sites listed in the Record of Monuments and Places as established under Section 12 of the National Monuments (Amendment) Act 1994. The preferred option is preservation in situ, or at a minimum preservation by record.

EH O37 Preservation of unrecorded/newly discovered Archaeological Heritage It is an objective of the Council to protect and preserve the preservation in situ (or at a minimum by record) of all sites and features of historical and archaeological interest, discovered subsequent to the publication of the Record of Monuments and Places.

EH O38 Preservation of the Underwater Archaeological Heritage It is an objective of the Council to seek the preservation (in situ, or at a minimum, preservation by record) of all known and all previously unrecorded sites and features of historical and archaeological record in wetland, riverine, lacustrine, estuarine and or marine environments. Objective EH O38 Protection of the setting of Archaeological Monuments It is an objective of the Council to ensure that no development shall have a negative impact on the character or setting of an archaeological monument.

EH O39 Protection of the setting of Archaeological Monuments It is an objective of the Council to ensure that no development shall have a negative impact on the character or setting of an archaeological monument.

EH O40 Proper procedures during the planning process It is an objective of the Council to: a) Ensure early engagement at preplanning stage in undertaken with the Local Authority Archaeologist to promote the 'preservation in situ' of archaeological remains and settings in development. b) Adopt a policy of archaeological monitoring on developments where the scale and nature of such developments may, in the opinion of the Planning Authority, have a negative impact on previously unknown archaeological features/artefacts. c) Require the preparation of an Archaeological Heritage Assessment in cases where it is deemed that Archaeological Heritage would be affected by a proposed development (due to their location, size or nature). The report shall be prepared by a suitably qualified archaeologist on the archaeological implications, if any, of the proposed development either prior to a decision on a planning application or prior to commencement of development on site.

EH O41 Archaeological Monuments in Local Authority ownership/guardianship It is an objective of the Council to preserve and enhance as appropriate and as funding allows monuments vested in the Local Authority.

EH O42 Town Defences and Layout It is an objective of the Council to protect town defences and plot layout, carry out the objectives of the Conservation and Management Plans for Limerick City and Kilmallock and support the work of the Irish Walled Towns Network. Review the potential for surviving medieval and historic fabric within the standing buildings in our medieval urban cores.

EH O43 Industrial Archaeology It is an objective of the Council to: a) Seek the preservation of buildings and infrastructure associated with former industrial sites; b) Ensure detailed recording of these remains; promote knowledge and interpretation of these sites among the general public; c) Support the work of the Interreg Atlantic Coast Area project, (MMIAH) The recovery and valorisation of Maritime Military and Industrial Heritage.

EH O44 Lough Gur It is an objective of the Council to protect the unique archaeological landscape at Lough Gur and to support the archaeological objectives in the Lough Gur Environment and Management Study 2009.

EH O45 Raise public awareness and encourage active participation It is an objective of the Council to generally raise public awareness of the archaeological and historic heritage and to assist and encourage active participation by the public, following consultation with National Monuments Service, in the conservation, consolidation and presentation of landmark sites, where this is appropriate and subject to available resources.

EH O46 Heritage Plan 2017-2030 It is an objective of the Council to support the archaeological objectives in the Heritage Plan.

EH O47 Increase access to Archaeological Monuments It is an objective of the Council to facilitate public access to National Monuments in State or Local Authority care.

EH O48 Assessment and Recognition of Archaeological Landscapes It is an objective of the Council to designate archaeological landscapes as part of an ongoing appraisal for Historic Landscape Characterisation of Limerick.

EH O49 Climate Change Sectoral Adaptation Plan for Built and Archaeological Heritage It is an objective of the Council to support the Climate Change Sectoral Adaptation Plan for Built and Archaeological Heritage 2019, as published by the Department of Culture, Heritage and the Gaeltacht and any subsequent guidance or plans for dealing with climate change and archaeological heritage. The Council shall seek to:

- Promote awareness and the appropriate adaptation of Ireland's built and archaeological heritage to deal with the effects of climate change;
- Identify the built and archaeological heritage in Local Authority ownership and areas at risk from climate change including, but not necessarily restricted to, the Record of Monuments and Places, Protected Structures and Architectural Conservation Areas designated in the Development Plan;

- Undertake climate change vulnerability assessments for the historic structures and sites in its area, subject to resources and funding;
- Develop disaster risk reduction policies addressing direct and indirect risks to the built and archaeological heritage in its area;
- Develop resilience and adaptation strategies for the built and archaeological heritage in its area;
- Develop the skills capacity within the Local Authority to address adaptation/ mitigation/emergency management issues affecting historic structures and sites in order to avoid inadvertent loss or damage in the course of climate change adaptation or mitigation works.

Architectural Heritage Objectives

EH O50 Work to Protected Structures It is an objective of the Council to:

a) Protect structures included on the RPS from any works that would negatively impact their special character and appearance.

b) Ensure that any development proposals to Protected Structures, their curtilage and setting, shall have regard to the 'Architectural Heritage Protection Guidelines for Planning Authorities' published by the Department of the Arts, Heritage and the Gaeltacht.

c) Ensure that all works are carried out under the supervision of a qualified professional with specialised conservation expertise.

d) Ensure that any development, modification, alteration, or extension affecting a Protected Structure and/ or its setting, is sensitively sited and designed and is appropriate in terms of the proposed scale, mass, height, density, layout and materials.

e) Ensure that the form and structural integrity of the Protected Structure is retained in any redevelopment and that the relationship between the Protected Structure and any complex of adjoining buildings, designed landscape features, or views and vistas from within the grounds of the structure are respected.

f) Respect the special interest of the interior, including its plan form, hierarchy of spaces, architectural detail, fixtures and fittings and materials.

g) Support the re-introduction of traditional features on protected structures where there is evidence that such features (e.g., window styles, finishes etc.) previously existed.

h) Ensure that new and adapted uses are compatible with the character and special interest of the Protected Structure.

i) Protect the curtilage of protected structures and to refuse planning permission for inappropriate development within the curtilage and attendant grounds, that would adversely impact on the special character of the Protected Structure.

j) Protect and retain important elements of built heritage including historic gardens, stone walls, entrance gates and piers and any other associated curtilage features.

k) Ensure historic landscapes and gardens associated with Protected Structures are protected from inappropriate development.

EH O51 Energy Efficiency of Protected Structures It is an objective of the Council to have regard to the Department of Environment, Heritage and Local Government's publication on Energy Efficiency in Traditional Buildings (2010) and the Irish Standard IS EN 16883:2017 Conservation of Cultural Heritage – Guidelines for Improving the Energy Performance of Historic Buildings (2017) and any future advisory documents in assessing proposed works on Protected Structures.

EH O52 National Inventory of Architectural Heritage (NIAH) It is an objective of the Council to review and update the RPS on foot of any Ministerial recommendations including the NIAH and any future updates. The Ministerial Recommendations, made under Section 53 of the Planning Act, will be taken into account when the Planning Authority is considering proposals for development that would affect the historic or architectural interest of these structures.

EH O53 Architectural Conservation Areas It is an objective of the Council to:

a) Protect the character and special interest of an area, which has been designated as an Architectural Conservation Area (ACA) as set out in Volume 3.

b) Ensure that all development proposals within an ACA be appropriate to the character of the area having regard to the Character briefs for each area.

c) Ensure that any new development or alteration of a building within an ACA or immediately adjoining an ACA, is appropriate in terms of the proposed design, including scale, height, mass, density, building lines and materials.

d) Seek a high quality, sensitive design for any new development(s) that are complementary and/or sympathetic to their context and scale, whilst simultaneously encouraging contemporary design which is in harmony with the area. Direction can also be taken from using traditional forms that are then expressed in a contemporary manner, rather than a replica of a historic building style.

e) Seek the retention of all features that contribute to the character of an ACA, including boundary walls, railings, soft landscaping, traditional paving and street furniture. f) Seek to safeguard the Georgian heritage of Limerick.

EH O54 Shopfronts within an ACA It is an objective of the Council to:

a) Ensure that all original and traditional shopfronts, which contribute positively to the appearance and character of a streetscape, within an ACA are retained and restored.

b) Ensure that new shopfronts are well designed, through the sympathetic use of scale, proportion and materials

12.2.2 Castleconnell Local Area Plan Policies in Relation to Cultural Heritage (2023-2029)

Protected Structure Objectives

It is an objective of the Council to:

Objective CH 07: Resist the demolition of Protected Structures, in whole or in part, the removal or modification of features of architectural importance, and design element that would adversely affect the character or setting of a Protected Structure, unless exceptional circumstances can be clearly demonstrated by a suitably qualified professional.

Architectural Conservation Areas Objectives

It is the objective of the Council to:

Objective CH 08:

a) Protect, conserve and where appropriate, enhance the ACAs as identified in Map 4. b) Proposals for development within the ACA's shall;

b) Reflect and respect the scale and form of existing structures within the ACAs in proportioning, overall scale and use of materials and finishes, particularly with reference to the street frontages and seek to contribute to or enhance the character and streetscape of the ACA's;

Seek to retain/incorporate/replicate exterior features which contribute or enhance the character and streetscape of the ACA's such as shop fronts, sash windows, gutters and down pipes, decorative plasterwork etc;

Ensure priority is given to the pedestrian, to inclusive access, and to facilitating the improvement of the quality of the public realm: the latter will include for consideration of the planting of trees in the wider public open spaces, benches for sitting and the articulation of uses through appropriate paving.

Archaeological Heritage Objective

It is an objective of the Council to:

Objective CH09:

a) Seek the preservation (in situ, or at a minimum, preservation by record) of all known sites and features of historical and archaeological interest, including wreck, sites and objects underwater. This is to include all the sites listed in the Record of Monuments and Places as established under Section 12 of the National Monuments (Amendment) Act 1994. In securing such preservation, the Council will have regard to the advice and recommendations of the National Monuments Service, Department of Housing, Local Government and Heritage, the National Museum of Ireland and the Local Authority Archaeologist.

b) Protect and preserve (in situ, or at a minimum, preservation by record) all sites and features of historical interest discovered subsequent to the publication of the Record of Monuments and Places.

c) Ensure that any proposed development shall not have a negative impact on the character or setting of an archaeological monument. In assessing proposals for development the Council will take account of the Archaeological potential of rivers and other waterways.

d) Ensure that the area of a monument and the associated buffer area shall not be included as part of the open space requirement demanded of a specific development, but should be additional to the required open spaces, and if appropriate, where such a monument lies within a development, a conservation and/or management plan for that monument shall be submitted as part of the landscape plan for that development.

e) Protect and preserve the industrial, military, maritime, riverine and post-medieval archaeological heritage of the plan area. Proposals for refurbishment, works to or redevelopment of these sites should be subject to a full architectural and archaeological assessment, including where appropriate underwater archaeological impact assessment

12.3 Glossary of Impacts and Assessment Methodology

12.3.1 Glossary of Impacts

Types of Impacts

Potential impacts on the receiving cultural heritage[1] environment can be described as direct physical impacts, indirect physical impacts, and impacts on setting (i.e., the surroundings in which a cultural heritage asset can be experienced; Historic England 2017).

Direct physical impacts are those development activities that directly cause damage to the fabric of a cultural heritage asset. Typically, these activities are related to construction works (e.g., they could include excavation of foundations, earthmoving / site preparation creation of access roads, cycle paths, and the excavation of service trenches).

Indirect physical impacts are those processes, triggered by development activity, that lead to the degradation of cultural heritage assets.

Impacts on the setting of cultural heritage assets describe how the presence of a development changes the surroundings of an asset in such a way that it affects (positively or negatively) the heritage significance of that asset. Visual impacts are most commonly encountered. Such impacts may be encountered at all stages in the life cycle of a development, but they are only likely to be considered significant during the prolonged operational life of the development.

Types of impact (now referred to as effects), as defined by the EPA Guidelines on Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022):

Cumulative Impact – The addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant, effects.

Do Nothing Impact – The environment as it would be in the future should the subject project not be carried out.

Indeterminable Impact – When the full consequences of a change in the environment cannot be described.

Irreversible Impact – When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.

Residual Impact – The degree of environmental change that will occur after the proposed mitigation measures have taken effect.

'*Worst case' Impact* – The effects arising from a project in the case where mitigation measures substantially fail; and

Indirect or Secondary Impacts – Effects on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.

[1] Cultural Heritage includes archaeology, architectural heritage, and folklore and history

Quality of Impacts

Impacts on the cultural heritage environment are assessed in terms of their quality, i.e., positive, negative, neutral:

- Negative Impact: A change that will detract from or permanently remove a cultural heritage asset from the landscape;
- Neutral Impact: A change that does not affect cultural heritage; and
- Positive Impact: A change that improves or enhances the setting of a cultural heritage asset.

Duration of Impacts

The duration of an impact can be as follows:

- Temporary Impact: Impact lasting for one year or less;
- Short-term Impact: Impact lasting one to seven years;
- Medium-term Impact: Impact lasting seven to fifteen years;
- Long-term Impact: Impact lasting fifteen to sixty years; and
- Permanent Impact: Impact lasting over sixty years.

12.3.2 Assessment Methodology

This assessment methodology has regard to the EPA assessment criteria (EPA 2022) and to the National Roads Authority (NRA) Guidelines for the Assessment of Archaeological Heritage Impact of National Road Schemes (hereafter referred to as the NRA Guidelines) (NRA 2005).

Cultural heritage sites are a non-renewable resource and such assets are generally considered to be location sensitive. In this context, any change to their environment, such as construction activity and ground disturbance works, could adversely affect these sites.

Significance / Sensitivity Criteria

In accordance with EPA Guidelines (EPA 2022), the context, character, significance and sensitivity of each cultural heritage asset requires evaluation and the significance of the impact is then determined by considering the significance / sensitivity of the asset and the predicted magnitude of the impact.

The significance / sensitivity can be ascertained by looking at the following criteria: the existing status (level of protection), condition or preservation, documentation or historical significance, group value, rarity, visibility in the landscape, fragility or vulnerability, and amenity value (Table 1). While these criteria contribute to the significance of a feature they should not be treated as definitive. These criteria are indicators which contribute to a wider judgement based on the individual circumstances of these cultural heritage assets.

Table 12.1: Explanation of Cultural Heritage Asset Assessment Criteria

Criteria	Explanation
Existing Status	The level of protection associated with a cultural heritage asset is an important consideration.
Condition / Preservation / Integrity	The survival of a cultural heritage asset's archaeological potential both above and below ground is an important consideration and should be assessed in relation to its present condition and surviving features. Well-preserved sites should be highlighted, this assessment can only be based on a field inspection.
Documentation / Data	The significance of a cultural heritage asset may be enhanced by the existence of records of previous investigations or contemporary documentation supported by written evidence or historic maps. Sites with a definite historical association or an example of a notable event or person should be highlighted.
Group Value / Character	The value of a single a cultural heritage asset may be greatly enhanced by its association with related contemporary monuments or with monuments from different periods indicating an extended time presence in any specific area. In some cases it may be preferable to protect the complete group, including

	associated and adjacent land, rather than to protect isolated monuments within that group.
Rarity / Character	The rarity of some a cultural heritage asset types can be a central factor affecting response strategies for development, whatever the condition of the individual feature. It is important to recognise sites that have a limited distribution.
Visibility in the landscape/ Character / Integrity	Cultural heritage assets that are highly visible in the landscape have a heightened physical presence. The inter-visibility between monuments may also be explored in this category.
Fragility / Vulnerability / Integrity	It is important to assess the level of threat to a cultural heritage asset from erosion, natural degradation, agricultural activity, land clearance, neglect, careless treatment or development.
Amenity Value / Character	Regard should be taken of the existing and potential amenity value of a cultural heritage asset.
Existing Status	The level of protection associated with a cultural heritage asset is an important consideration.
Condition / Preservation / Integrity	The survival of a cultural heritage asset's archaeological potential both above and below ground is an important consideration and should be assessed in relation to its present condition and surviving features. Well-preserved sites should be highlighted, this assessment can only be based on a field inspection.

An evaluation of the significance / sensitivity of cultural heritage assets is based on their designation and on the extent to which these assets contribute to the cultural heritage environment, though their individual or group qualities, either directly or potentially. Table 2 presents the scale of significance / sensitivity together with criteria. It has been compiled by Courtney Deery Heritage Consultancy Ltd, based on standard authorities and guidelines as listed at the end of this appendix. Undesignated cultural heritage sites can be assigned a low, medium or high sensitivity value, taking into consideration the criteria cited in Table 12.1 (e.g., condition, character, integrity or preservation, data, group value, rarity, visibility in the landscape, fragility or vulnerability, and amenity value).

Table 12.2: Significance / Sensitivity Criteria

Sensitivity / Significance	**Criteria**
Very high	Sites of international significance: World Heritage Sites and sites on the UNESCO World Heritage Tentative List. NIAH sites (assessed by the NIAH to be of international importance).
High	National Monuments. Recorded Monuments (RMP sites & SMR sites scheduled for inclusion in the next revision of the RMP), where these are considered to be of national importance. Protected Structures (assessed by the NIAH to be of national importance. Undesignated cultural heritage sites considered to be of national importance.
Medium	Recorded Monuments (RMP sites & SMR sites scheduled for inclusion in the next revision of the RMP), not considered to be of national importance. Protected Structures / NIAH sites (assessed by the NIAH to be of regional importance).

	Newly identified archaeological sites, confirmed through archaeological investigation, to be added to the SMR. Undesignated cultural heritage sites considered to be of regional importance.
Low	Sites listed in the County or City Industrial Heritage Records, Record of Protected Structures (RPS) and National Inventory of Architectural Heritage (NIAH) Building Survey for which there are no upstanding remains. NIAH sites (assessed by the NIAH to be of local importance) Undisturbed greenfield areas and riverine environs, which have an inherent archaeological potential. Undesignated cultural heritage sites considered to be of local importance.
Negligible	Assets with very little or no surviving cultural heritage interest.
Unknown	The importance of the asset has not yet been ascertained (e.g., a LiDAR feature that may or may not be archaeological). In such cases, the significance of effect will be 'Indeterminable'.

Table 12.3: Description of Criteria (site types and protection)

Criteria	Description
World Heritage Properties	World Heritage Properties as designated by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and properties on the Tentative List.
National Monuments	The National Monuments Act (1930, Section 2) defines a 'National Monument' as 'a monument or the remains of a monument the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto'. The National Monuments legislation legally protects access to and the visual amenity associated with National Monuments and requires consent from the Minister for invasive works in their vicinity.
Recorded Monuments	The primary source of information for archaeology is the Record of Monuments and Places (RMP) maintained by the Department of Housing, Local Government and Heritage (DHLGH). The RMP documents known upstanding archaeological monuments, their original location (in cases of destroyed monuments) and the position of possible sites in rural areas identified as cropmarks on vertical aerial photographs dating to before 1700 AD (with some later ones also being included). It is based on a comprehensive range of published and publicly available documentary and cartographic sources. For the purpose of the assessment, the Sites and Monument Record (SMR) data and mapping as updated by the Archaeological Survey of Ireland (www.archaeology.ie) was also examined.
Protected Structures	A 'Protected Structure' is a structure that a planning authority considers to be of special interest from an architectural, historical, archaeological, artistic, cultural, scientific, social, or technical point of view and is included in its Record of Protected Structures (RPS). It may be a building or part of a building which is of significance because of its architectural or artistic quality, or its setting, or because of its association with commercial, cultural, economic, industrial, military, political, social, or religious history.
Architectural Conservation Areas	An Architectural Conservation Area (ACA) is a place, area, group of structures or townscapes that is of special interest and that has been afforded statutory protection by the planning authority in accordance with Section 81 of the Planning & Development Act.
NIAH	The National Inventory of Architectural Heritage (NIAH) is a state initiative established on a statutory basis, to identify, record, and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently as an aid in the protection and conservation of the built heritage. NIAH surveys provide the basis for the recommendations of the Minister for Housing, Local Government and

	Heritage to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS).
Undesignated Sites	Newly identified archaeological sites that have been confirmed through archaeological investigation (monitoring, testing, excavation, geophysical survey) are considered to be of medium importance. Such sites are undesignated as they have yet to be added to the SMR.
	Potential or undesignated cultural heritage sites identified through aerial photography, historic mapping, stray finds are considered to be of low sensitivity, as they have yet to be ground-truthed through archaeological investigation. Similarly, undisturbed greenfield areas and riverine environs, which have an inherent but as yet unproven archaeological potential are considered to be of low sensitivity.
	Zones of archaeological potential (ZAP) can be defined as areas within the urban and rural landscape that possess the potential to contain archaeological remains due to the settlement history of a place and or to the presence of topographical features such as rivers, lakes and high, defendable ground
	Sites / features recorded in county / city industrial heritage surveys, where these are not designated assets.

Magnitude of Impact

When assessing the impact magnitude, the following criteria need to be considered:

- Extent – size, scale and spatial distributions of the impact;
- Duration – period of time over which the impact will occur;
- Frequency – how often the impact will occur; and
- Context – how will the extent, duration and frequency contrast with the accepted baseline conditions (see Table 1).

Table 12.4: Magnitude of Impact Criteria

Impact Magnitude	Criteria
Very Significant	An impact which by its character, magnitude, duration or intensity significantly alters the majority of a sensitive aspect of the environment, for example in this case a monument
High	These effects arise where a cultural heritage asset is completely and irreversibly destroyed by a proposed development. A change such that the value of the asset is totally altered or destroyed, leading to a complete loss of character, integrity and data about the site.
Medium	An effect which, by its magnitude, duration or intensity alters an important / significant aspect of the environment. An impact like this would be where a cultural heritage asset would be impacted upon leading to a significant loss of character, integrity and data about the site. Or an effect which by its magnitude results in the partial loss of a historic structure (including fabric loss or alteration) or grounds including the part removal of buildings or features or part removal of demesne land (e.g., severance, visual intrusion or degradation of setting and amenity). A permanent positive effect that enhances or restores the character and / or setting of an upstanding cultural heritage site in a clearly noticeable manner.
Low	A low impact arises where a change to the site is proposed which though noticeable is not such that the cultural heritage character / integrity of the site is significantly compromised, and where there is no significant loss of data about the site.

	A positive impact that results in partial enhancement of the character and / or setting of an upstanding cultural heritage site in the medium to long-term.
Negligible	An effect which causes very minor changes in the character of the environment and does not directly impact a cultural heritage asset, or affect the appreciation or significance of the asset. There would be very minor changes to the character and integrity of the asset and no loss of data about the site.
Not Significant	An impact which causes noticeable changes in the character of the environment but without noticeable consequences.

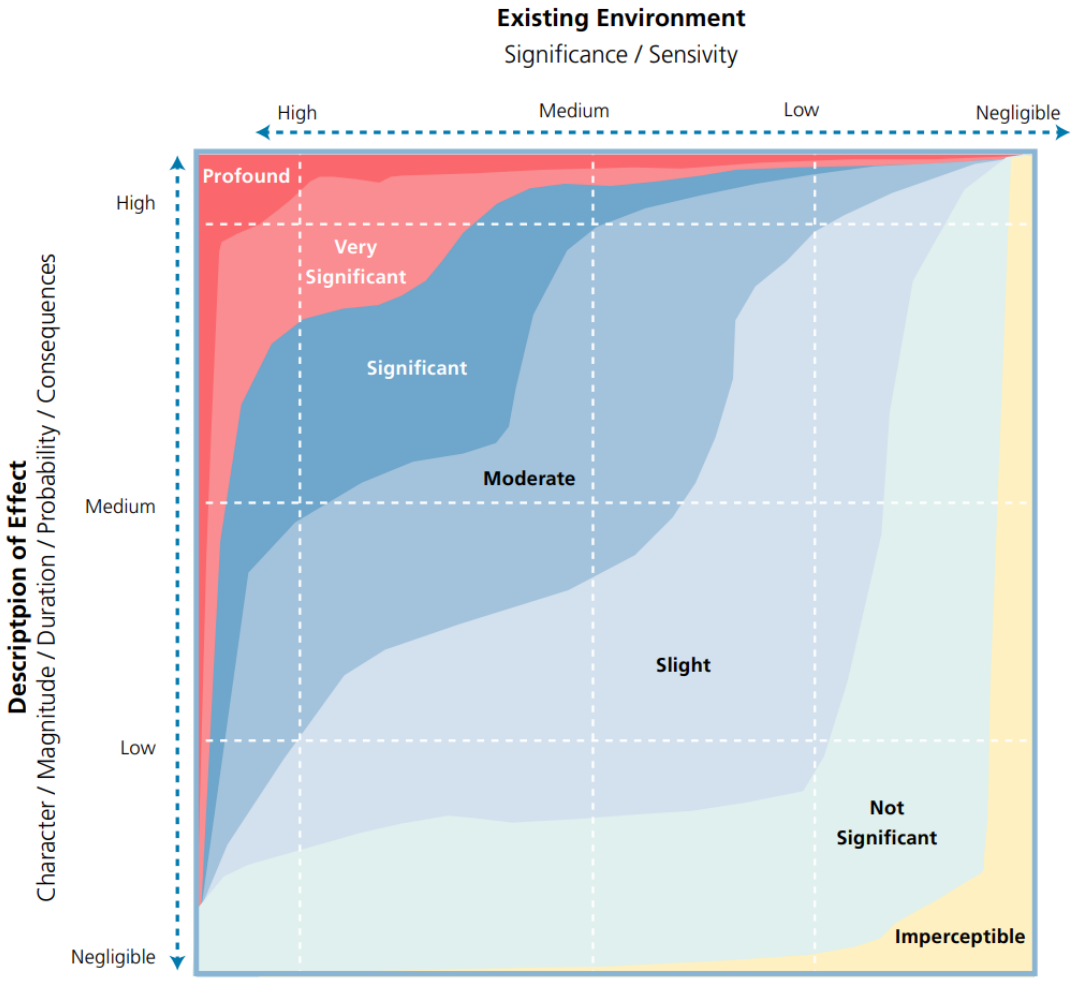


Figure 12.1: Chart showing typical classifications of the Significance of Effect, from the EPA Guidelines on Information to be Contained in EIAR (EPA 2022, Figure 3.4)

The likely significance of impacts is determined by considering the baseline rating or sensitivity value of the asset upon which the impact has an impact and the magnitude of the impact (Image 12.1). The impact significance is defined as Imperceptible, Not Significant, Slight, Moderate, Significant, Very Significant, or Profound (Table 5).

Table 12.5: Defining Significance of Effects

Impact	Definition
Imperceptible	An effect capable of measurement but without noticeable consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight	An effect which causes minor changes in the character of the environment and does not affect a cultural heritage asset in a moderate or significant manner.

Moderate	A moderate effect arises where a change to the site is proposed which though noticeable, does not lead to a significant loss of character, integrity and data about the cultural heritage asset.
Significant	An effect which, by its magnitude, duration or intensity, alters an important aspect of the environment. An impact like this would be where part or all of a site would be permanently impacted upon, leading to a significant loss of character, integrity and data about the cultural heritage asset.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
Profound	Applies where mitigation would be unlikely to remove adverse effects. Reserved for adverse, negative effects only. These effects arise where a cultural heritage asset is completely and irreversibly destroyed by a proposed development.

12.4 Inventory of Cultural Heritage Sites within FRS Measure

12.4.1 Introduction

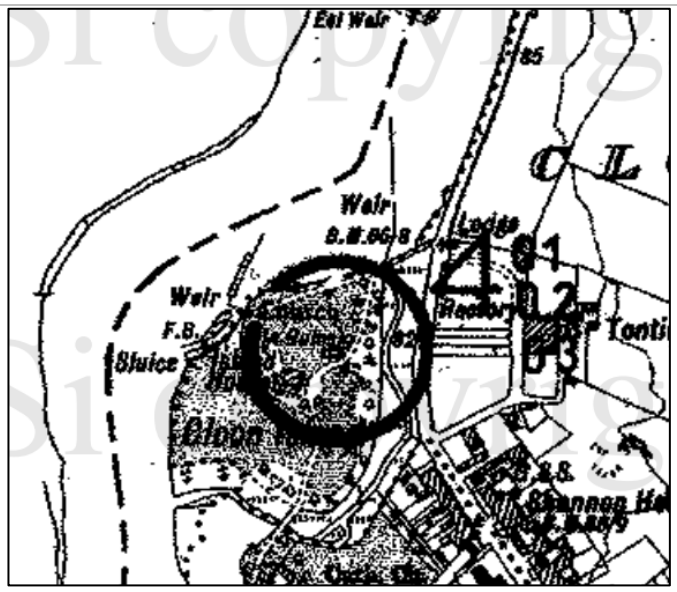
The following is an inventory of Cultural Heritage Sites located within an FRS Measure:

- Archaeological Heritage Sites (RMP sites)
- Areas of Archaeological Potential (AP)
- Architectural Conservation Areas (ACA) and Architectural Heritage Sites (RPS sites)
- Undesignated Built and Cultural Heritage Features (CH)

12.4.2 Archaeological Heritage Sites

The following RMP sites are located within an FRS Measure

Reference no.	**LI001-004001**
Legal Status	RMP
Other Designations	RPS 1084
Location	Cloon and Commons
Site Type	Church
ITM	566005, 662803
Description	Pre-Norman church ruins stand on the grounds of Cloon Island House (RPS no.: 1085), located 20m to the south-west. Two early Christian cross-slabs (LI001-004002-/003) are incorporated into the west gable of this church. Building annotated 'Friary' on 1840 ed. OS 6-inch map, and stands on top of 'Cloon Island', overlooking the River Shannon from SW-W-N with the village of Castleconnell to the south-east. The presence of two early Christian cross-slabs, the church of uncertain provenance along with the Cloon Island place-name may suggest that this was the site of an early Christian monastery rather than a Franciscan foundation. Alternatively, 'Cloon Island' may have been the site of an Early Christian monastery which in the 13th century became a Franciscan foundation. The Anglo-Norman castle (LI001-003) of Castleconnell stands 300m to the south and the medieval parish church (LI001-002001) lies 830m to the south. Friary building described by Westropp (1904-5, 436) as a 'so-called "friary", of unknown identity, on an islet in the Shannon'. No church is depicted on the Down Survey map of Stradbally parish, and it is not mentioned in the terrier of the map where it is described as 'an Island in ye Shannon' (NLI, MS 718). According to Ferrar's History of Limerick, the friary on Cloon Island was 'founded in 1291 by a Bourke or de Burgo, baron of Castle Connell' (Ferrar 1787, 193). In 1837 the site was described as following; 'on the island opposite Tontine, which was formerly called Inis-cluan; it consists of the remains of a friary, founded in 1291 by Reginald de Burgh, for Franciscans, and has lately been converted into out-houses to a handsome newly erected cottage [Island Ho.]' (Lewis 1837, Vol. 1, 293). In 1840 this building was described in Ordnance Survey Letters for Stradbally parish as following; 'It is said that this island [Cloon Island] was artificially made. A Franciscan Friary was founded on it in 1291, and its remains have been converted into a coach house and offices to a newly erected house [Island Ho.], 2 story high, 50 ft. [16m] long and 45 ft. [15m] broad. It is said that persons were buried on the island in former times; but there is now no trace of a burial ground' (OSL Stradbally Parish). Church building described by Macalister (1949, 98) as 'a small, plain ruined church on this island'. The church and its island setting was recently described by Okasha and Forsyth (2001, 187-8) as following; 'Cloon island is a former island in the channels of the River Shannon, 7km downstream of Killaloe. The site now covers approximately nine acres, but the water is considerably lower than previously, due to a hydro-electric scheme extraction. The ruined church may date from the twelfth century. In addition to the inscribed stone [LI001-004002-], evidence of an early medieval foundation is provided by an uninscribed cross-slab [LI001-004003-] incised with a Latin cross with expanded terminals, enclosed in a rectangular

	frame. Between the church and the house [Cloon House] there is a cross-base [LI001-004005-], with a T-shaped slot, of unknown date.' The official Zone of Notification as it appears in the published Record of Monuments and Places (Dúchas The Heritage Service 1997) is slightly larger than on the digital Historic Environment Viewer (HEV) available as www.archaeology.ie. See image below.
Sources	www.osi.ie; www.archaeology.ie; Dúchas The Heritage Service 1997[2]; Westropp 1904-05[3]; Ferrar 1787[4]; Lewis 1837[5]; Macalister 1949[6]; Okasha & Forsyth 2001[7]
Images	 *Zone of Notification on published Record of Monuments and Places (Dúchas The Heritage Service)*
Approx Distance from FRS Measure	The proposed Mall Road South flood measure extends into the ZoN of the RMP site. This is examined further below in AP4, there will be no direct impact on the church site.

Reference no.	**LI001-004002**
Legal Status	RMP
Other Designations	N/A
Location	Cloon and Commons
Site Type	Cross-inscribed stone

[2] Dúchas The Heritage Service 1997. 'Record of Monuments and Places: County Limerick'. Department of Arts, Heritage, Gaeltacht and the Islands.

[3] Westropp, T.J. 1904-05. 'A survey of the ancient churches of Co. Limerick'. *Proceedings of the Royal Irish Academy.*

[4] Ferrar, J. 1787. 'An Essay on Castle Connell Spa, On Water in General and Cold Bathing, in *The History of Limerick: Ecclesiastical, Civil and Military, From the Earliest Records to the Year 1787.*

[5] Lewis, S. (1837) *A Topographical History of Ireland*. London: Lewis & Co.

[6] Macalister, R.A.S. 1949. *Corpus Inscriptionum Insularum Celticarum*. Dublin: Irish Manuscripts Commission.

[7] Okasha, E. & Forsyth, K. 2001. *Early Christian inscriptions of Munster: a corpus of the inscribed stones.* Cork University Press.

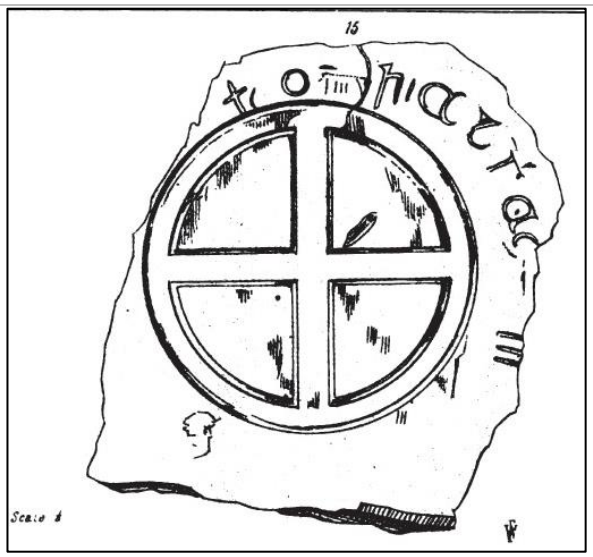
ITM	565998, 662802
Description	One of two cross-slabs (LI001-004003) incorporated into a church (LI001-004001) on the grounds of Cloon Island House which stands 20m to the south-west. Cross-slab (a) described by Crawford (1912, 240) as following; 'Built into the west wall of the ruined church [LI001-004001-] on the island close to Castleconnell and Doonass. (a) A slab about 2 ft [0.6m] by 1 ft. 10 in. (0.55m), carved with a plain encircled Greek cross of two lines. Round the top is a defaced inscription, with small initial cross'. This slab was drawn by William Wakeman for Dr Petrie in 1840 and described as following; 'The inscription on this stone is so much destroyed that only a few letters can be read. There are some indistinct markings on the right-hand side of the stone that look like part of an Ogham inscription. The stone is built into the interior face of the north wall of a very ancient church [LI001-004001] upon an island in the Shannon, near Doonass' (Stokes 1872 Vol. 2, 13). The slab was described by Macalister (1949, 98) as 'an approximately circular disc of stone built into the outer face of the west wall of a small, plain ruined church on this island'. Macalister (ibid.) recorded the following reading of the Latin inscription as 'LOBED FECET CRUCE[M]'. Stone slab with Latin inscription of possible 8th century date which was recently described by Okasha and Forsyth (2001, 185-7) as following; 'The stone [dims. 0.34m x 0.35m] is built into the exterior face of the west wall of Cloon church [LI001-004001]. Its edges are rough and rather damaged, but it appears to be substantially intact both the stone and the carving are badly weathered. The face of the stone contains an outline equal-armed cross set inside two concentric circles. The arms of the cross open into the circular frame formed by the two circles. The text fills the available space and may be complete. It is incised in two curved lines around the perimeter of the circle with the bottoms of the letters to the circle. The inner line begins at about the ten o'clock position and continues to the five o'clock position. The outer line begins at the two o'clock position and continues until the three o'clock position. The stone and the carving are badly weathered, and the letters are highly deteriorated. The text is now very worn and too indistinct to read with any confidence. The present authors could find no evidence on the stone to justify this [Macalister's] reading and, indeed, the extant remains seem to rule it out'. Okasha and Forsyth could only identify a few letters and they recorded the inscription as now visible as '[.--][B][.][ND][--][L] | A[.][--]A'. This ruined medieval church is in the grounds of a private house at Cloon Island, Castleconnell. The stone is set 81cm from the ground and 69cm to the right (that is, the south) of the doorway and is obscured from view by a large shrub. The stone has been known since 1840 when W.F. Wakeman drew it for Petrie who stated that this stone was `built into the interior face of the north wall of a very ancient church upon an island in the Shannon, near Doonass'. Petrie may have made an error in describing which wall it was built into, an easy mistake if he had not himself seen the stone. Alternatively, the stone might have been moved from the north to the west wall at some time between 1840 and 1912 when Crawford described it in its present position.'
Sources	www.osi.ie; www.archaeology.ie; Crawford 1912[8]; Stokes 1872[9]; Macalister 1949[10]; Okasha & Forsyth[11].

[8] Crawford, H.S. 1912. 'A descriptive list of early cross-slabs and pillars'. *Journal of the Royal Society of Antiquaries of Ireland,* Volume 42, pp. 217-44

[9] Stokes, M. 1872. *Christian inscriptions in the Irish language, chiefly collected and drawn by George Petrie L.L.D.* Dublin: The Royal Historical and Archaeological Society of Ireland.

[10] Macalister, R.A.S. 1949. *Corpus Inscriptionum Insularum Celticarum*. Dublin: Irish Manuscripts Commission.

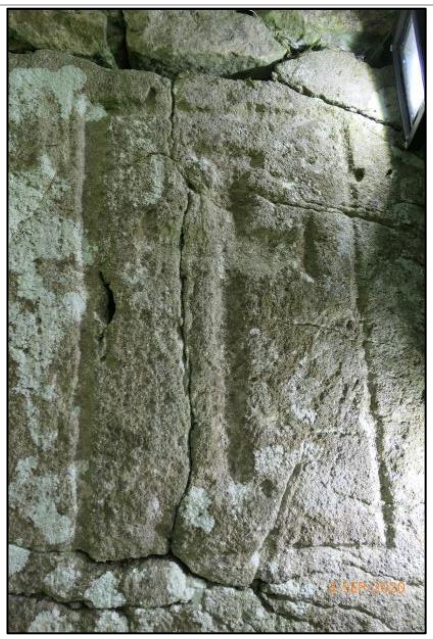
[11] Okasha, E. & Forsyth, K. 2001. *Early Christian inscriptions of Munster: a corpus of the inscribed stones.* Cork University Press.

Images	 *Drawing of cross-inscribed slab (Stokes 1872 from www.archaeology.ie)*
Approx Distance from FRS Measure	Approx. 45m from the proposed Mall Road South flood measure.

Reference no.	**LI001-004003**
Legal Status	RMP
Other Designations	N/A
Location	Cloon and Commons
Site Type	Cross-slab
ITM	565998, 662803
Description	One of two cross-slabs (LI001-004002) incorporated into a church (LI001-004001) on the grounds of Cloon Island House which stands 20m to the south-west. Cross-slab (b) described by Crawford (1912, 240) as following; 'Built into the west wall of the ruined church [LI001-004001-] on the island close to Castleconnell and Doonass. (b) A slab carved with a Latin cross potent in a plain rectangular frame'. Recently described by Okasha and Forsyth (2001, 187-8) as following; 'Cloon island is a former island in the channels of the River Shannon, 7km downstream of Killaloe. The site now covers approximately nine acres, but the water is considerably lower than previously, due to a hydro-electric scheme extraction. The ruined church [LI001-004001] may date from the twelfth century. In addition to the inscribed stone [LI001-004002], evidence of an early medieval foundation is provided by an uninscribed cross-slab (H. 65 cm, W. 80 cm) incised with a Latin cross with expanded terminals, enclosed in a rectangular frame. Between the church and the house [Cloon House] there is a cross-base [LI001-004005], with a T-shaped slot, of unknown date.'
Sources	www.osi.ie; www.archaeology.ie; Crawford 1912[12]; Okasha & Forsyth 2001[13]

[12] Crawford, H.S. 1912. 'A descriptive list of early cross-slabs and pillars'. *Journal of the Royal Society of Antiquaries of Ireland,* Volume 42, pp. 217-44

[13] Okasha, E. & Forsyth, K. 2001. *Early Christian inscriptions of Munster: a corpus of the inscribed stones.* Cork University Press.

Images	 *Cross slab (www.archaeology.ie)*
Approx Distance from FRS Measure	Approx. 45m from the proposed Mall Road South flood measure.

Reference no.	**LI001-004004**
Legal Status	SMR. Not scheduled for inclusion in the next revision of the RMP
Other Designations	N/A
Location	Cloon and Commons
Site Type	Holy well
ITM	565973, 662784
Description	According to the Ordnance Survey Letters, 'Cloon House' may have been built on the site of a holy well. In 1840 the Ordnance Survey Letters for Stradbally parish recorded the following local tradition about Cloon House; 'It is said to have been built by a man named Burke, who became insane and died as the result of stopping a blessed well, which had formerly been where Cloon House now stands, and the waters of which had cured the blind and the lame. The house is said to be still haunted by some invisible being. As regards the well, it is said that, after being stopped by Burke, it burst forth on the edge of the Shannon, through which it flows without mingling, so that its water can be taken out of the river without any mixture with the river water' (OSL Stradbally Parish).
Sources	www.osi.ie; www.archaeology.ie
Images	N/a
Approx Distance from FRS Measure	Approx. 75m from the proposed Mall Road South measure.

Reference no.	**LI001-004005**
Legal Status	SMR. Scheduled for inclusion in the next revision of the RMP
Other Designations	N/A

Location	Cloon and Commons
Site Type	Cross
ITM	565984, 662804
Description	A possible cross-base was recently recorded by Okasha and Forsyth (2001, 187-8) and described as following; 'Cloon island is a former island in the channels of the River Shannon, 7km downstream of Killaloe. The site now covers approximately nine acres, but the water is considerably lower than previously, due to a hydro-electric scheme extraction. The ruined church may date from the twelfth century. In addition to the inscribed stone [LI001-004002], evidence of an early medieval foundation is provided by an uninscribed cross-slab (H. 65 cm, W. 80 cm) incised with a Latin cross with expanded terminals, enclosed in a rectangular frame [LI001-004003-]. Between the church [LI001-004001-] and the house [Cloon House] there is a cross-base, with a T-shaped slot, of unknown date'.
Sources	www.osi.ie; www.archaeology.ie; Okasha & Forsyth[14]
Approx Distance from FRS Measure	Approx. 55m from the Mall Road South measure.

Reference no.	**LI001-003**
Legal Status	RMP
Other Designations	RPS 1099; MMIAH-LK-04-Mil-R-01
Location	Coolbane
Site Type	Castle – Anglo-Norman masonry castle
ITM	565965, 662480
Description	Castle Connell stands on the summit of an isolated rock close by the town and within a short distance of the River Shannon. In 1199 King John granted five knight's fees to William de Burgh, including this parish, with a condition that he should erect a castle thereon (Lenihan 1866, 727). The castle was described by Westropp (1906-7, 83-5) as following; 'There was a residence (or fort) called Caslaun Uí Chonaing in 1174, where Dermot and Mahon O'Brien were blinded by their relative King Donald. In 1200 Cathal Crovderg O'Conor and the Connaughtmen burned the bawn (Ann.F.M.). The next year W. de Burgo was granted Castle Canick. "If he fortify the castle," adds King John, "and we desire to have it, we will give him an exchange" (Ware). 1242 R. de Burgo held the manor of Castro Conign, worth £57 10s. 11½d. (C.S.P.I.). 1245 Phil de Inteberg, Constable of Limerick, is ordered to deliver up Castle Coning (C.S.P.I.). 1261 It was destroyed by the Irish under King Conor na Siudaine O'Brien. 1272 and 1274 The manor of Castro Konyng, with C[astle]. Amory, Tristellaueran, &c, held by Walter de Burgo (Pipe R.). 1274 The King granted the C[astle]. to Theo le Butler. 1275 to T. de Clare. 1279 Butler was paid £100 for its loss (Close R.). 1285-7 de Burgo, the Earl of Ulster, and the men of Castroconyng harboured Terdeluath O'Brien (Prince of Thomond) before his raid on de Clare's lands at Cahirconlish and Grean (Plea R., and see Wars of Torlough). Walter de Burgo enlarged and strengthened it before 1299. In 1315 Castrum Congher wasted by the Bruces. (Wars of Torlough). 1317 Orders to Ric, Earl of Ulster, as to Castroconyn, &c. (R. Mem., m. 14). 1355 Ric. Bourke of Castro Conning licensed to treat with the Irish. From the Book of the Ui Mhaoilchonaires we learn its owners during the usually blank period of the later fourteenth and the fifteenth centuries. Walter Duff, son of Richard, made a partition of his lands (about 1400-1410); to his eldest son Richard, he gave

[14] Okasha, E. & Forsyth, K. 2001. *Early Christian inscriptions of Munster: a corpus of the inscribed stones.* Cork University Press.

Tiobraid Aronn (Tipperary), Caislean Ui Chonaing, and Cathair-Cinnleis; William, son of this Richard, held it circa 1450; his son Edm., circa 1490, and grandson William. The latter was knighted 1535, Pardon was granted to him in 1558; and, with his son Tybott, 1564 (Fiants Mary 274, Eliz, 902), he is described as W. Bourke mac Edm. of Kislaneyconnell, and created Baron Bourke of Castelconyll for his services against James of Desmond, 1580. Of his sons, Theobald fell in battle, 1578 three others were Barons in succession. In 1583 he held the "Castel et vill de Castleconell and fishing quarters" (Inq. Exch. Eliz. 9), called "Castel et vill de Ekonnell in Peroch. de Kestermoy" (Des. R., .37). The Lords of Castleconnell play a large part in the local history thenceforward. William fought in the civil war, sat in the Parliament of Kilkenny, and went over sea to Charles II. in the Netherlands, " trailing a pike in the Duke of York's Regiment." The C[astle]. surrendered to the Commonwealth, 1651; for it and the weir and courts see C.S. xxi., p. 4, & B. D., 107. In 1690 it was surrendered by Captain Barnwell to King William. On the retreat of the latter, the Irish occupied it till August 29th 1691, when, after two days' siege, the garrison capitulated to the Prince of Hesse. Ginckell had the C[astle]. blown up soon afterward. William, the eighth Baron, fought for King James at Aughrim, and retired to France (Paper by James Grene Barry, R.S. A.I., vol. xix.,p. 192, and numerous other works). 1725 Transferred by W. Ford to Ralph Westrop of Carduggan, County Cork (Dub. Reg.).

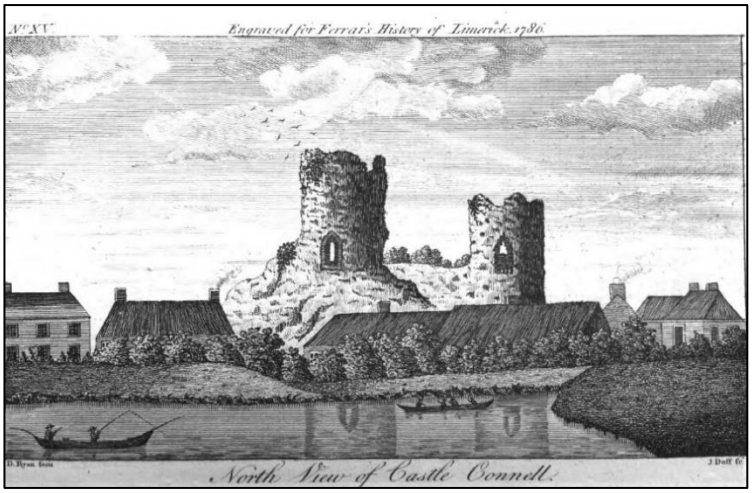
Fabric. - It stands on a steep flat-topped rock beside the Shannon. It is said to have had towers at each angle; traces remain to the south-west and north-west, with fragments of curtain walls and well-built arches. The court measures 160 feet [49m] by 100 feet [30m]. Local tradition attributes it to the O'Briens and its destruction to Cromwell [OSL Stradbally Parish]'.

The castle was described by Dowd (1896, 270) as measuring 'about one hundred and sixty feet [49m] long by one hundred [30m] wide, and it probably had round towers at each of the four corners of the rectangular area it enclosed. Of these only two can now be identified, and their resemblance to the towers of King John's Castle at Limerick is striking'.

The castle was described by Salter (2004, 72) as standing on 'a 6m high vertical-sided rock near the Shannon are overgrown fragments of a 13th century de Burgh castle with a court measuring 48m by 30m with at least one circular tower. This building or its predecessor was destroyed in 1261 by Conor O'Brien'.

The destruction of the castle in 1691 was described by Ferrar (1787, 470) as following; 'The castle had a strong garrison of King James's forces, and General Ginkle sent 700 men from Limerick, under the command of the Prince of Hesse, when the garrison surrendered after a siege of two days. Ginkle considering it a strong hold, ordered it to be dismantled and blown up; the explosion was so great, that it shook the houses in Limerick and broke several windows. The castle was so spacious, and the ascent by steps so easy, notwithstanding its being built on a very high rock, that a troop of horse has been drawn up in the hall'.

Depicted as a large castellated structure overlooking the west bank of the River Shannon with medieval church (LI001-002001) to south and a causeway or togher running through the bog to the east-northeast on the 17th century Down Survey map of Stradbally parish. This medieval roadway is annotated 'A Causyway' on the 17th century Down Survey map of Clanwilliam Barony. The terrier of the Down Survey parish map recorded that in 1640 the castle of Castleconnell belonged to William Lord Bourk, Baron of Castleconnell.

Sources	www.osi.ie; www.archaeology.ie; Westropp 1906-07[15]; Dowd 1896[16]; Salter 2004[17]; Ferrar 1787[18]
Images	An 18th century image of the castle (see below) shows several structures between the castle and the river.  *18th century engraving of Castle Connell (Ferrar 1787)* The First Edition 6-inch OS map (below) also shows long burgage-type plots immediately east of the castle where the road is now located. Sub-surface remains of these features may survive in this area in addition to earlier features associated with the castle and with a possible pre-Norman fortification. During the latter half of the 19th century, the layout of the approach road into the core of Castleconnell from was altered. Prior to the mid-18th century, the village had a linear plan form, consisting of two main streets: one running from northwest to southeast, and another running from east to west. The original east-west street approaching the town from the west, ran between Stormont House and Castle Connell caste as shown on the first edition OS Map; the castle being south of this street.

[15] Westropp, T.J. 1906-07. 'The ancient castles of the county of Limerick'. *Proceedings of the Royal Irish Academy* 26, pp. 54-264.

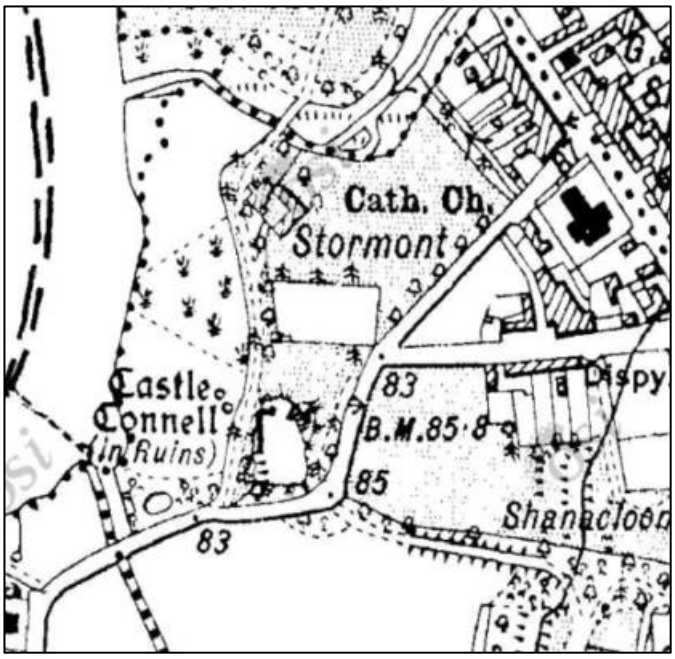
[16] Dowd, J. 1896. *Round about the County of Limerick.* Limerick: G. McKern & Sons.

[17] Salter, M. 2004. *The Castles of North Munster*. Worcestershire: Folly Publications.

[18] Ferrar, J. 1787. 'An Essay on Castle Connell Spa, On Water in General and Cold Bathing, in *The History of Limerick: Ecclesiastical, Civil and Military, From the Earliest Records to the Year 1787.*

First Edition 6-inch OS Map 1844- note the road to the north of the castle

In the late 19th century, the east-west road was rerouted to the south of the castle and as a result, the ruins were incorporated into the grounds of Stormont House (as shown in the revised OS Map below). A new northeast to southwest connection to the east of the Stormont House led to the formation of a new triangular area focal point in the village around a new catholic church (built in 1863). The old road that ran to the west of the castle became part of the new access road into Stormont House and its former gate lodge became redundant.



Revised OS Map Edition 1909 – note the new road running east and south of the castle

	 *Castle Connell and rock outcrop (Google Street View)*
Approx Distance from FRS Measure	The Stormont House measure lies within the ZoN of Castle Connell. It is proposed to construct low-level flood walls to tie into the rock outcrop where the castle is constructed and inside the existing late 19th century castellated wall aligning the entrance to the property (CH11, See 12.5.5 below) within the ZoN of the castle. The driveway to Stormont House will be raised. Ground reduction and the use of heavy machinery within the ZoN has the potential to impact subsurface remains that might exist around the base of the castle. Assessed as part of area of archaeological potential AP6 (See 12.5.3 below).

12.4.3 Areas of Archaeological Potential (AP)

Reference no.	**AP1**
Legal Status	N/A
Other Designations	N/A
Location	Lacka
Site Type	Riverine potential
ITM	566088, 663334
Description	Archaeological potential associated with riverine environment at Rivergrove B&B and Grange House. Such environments may include features such as *fulachta fiadh*, fording points, evidence of settlement, evidence of milling or fishing weirs, and preserved organic material. Although the existing townland boundary follows the modern shoreline, historic mapping shows that the original townland boundary follows an older shoreline where the river wall is currently located. It is proposed to construct a flood wall on this line. This area is also within the grounds of Grange House where features related to the historic house such as footpaths or landscape features may survive beneath the surface. Ground reduction and the use of heavy machinery has the potential to impact subsurface remains.
Sources	www.osi.ie
Images	 *Rivergrove B&B and Grange House areas on First Edition 6-inch OS map, 1844 (www.osi.ie)*  *View south showing the area between the wall and the river*

Approx Distance from FRS Measure	0m. Archaeological potential associated with riverine environment at the proposed Rivergrove B&B and Grange House flood relief measure.

Reference no.	**AP2**
Legal Status	N/A
Other Designations	N/A
Location	Cloon and Commons
Site Type	Riverine potential
ITM	566171, 663145
Description	Archaeological potential associated with riverine environment at Mall House. Such environments may include features such as *fulachta fiadh*, fording points, evidence of settlement, evidence of milling or fishing weirs, and preserved organic material. Although the existing townland boundary follows the modern shoreline, historic mapping shows that the original townland boundary follows an older shoreline where the river wall is currently located. It is proposed to construct a flood wall on this line. Ground reduction and the use of heavy machinery has the potential to impact subsurface remains.
Sources	www.osi.ie
Images	 *Mall House area on First Edition 6-inch OS map, 1844, and 25-inch map, 1901 (www.osi.ie)*
Approx Distance from FRS Measure	Archaeological potential associated with riverine environment at Mall House. 0m from the proposed Mall House flood relief measure.

Reference no.	**AP3**
Legal Status	N/A
Other Designations	N/A
Location	Cloon and Commons
Site Type	Riverine potential
ITM	566147, 663038
Description	Archaeological potential associated with riverine environment at Mall Road North. Such environments may include features such as *fulachta fiadh*, fording points, evidence of settlement, evidence of milling or fishing weirs, and preserved organic material. Although the existing townland boundary follows the modern shoreline, historic mapping shows that the original townland boundary follows an older shoreline where the existing wall is currently located. It is proposed to remove this wall

	and to construct a new wall 1m inside of the old wall. Ground reduction and the use of heavy machinery has the potential to impact subsurface remains.
Sources	www.osi.ie
Images	 *Mall Road North area on First Edition 6-inch OS map, 1844 (www.osi.ie)*
Approx Distance from FRS Measure	Archaeological potential associated with riverine environment at Mall Road North. 0m from the proposed Mall Road North flood relief measure.

Reference no.	**AP4**
Legal Status	N/A
Other Designations	N/A
Location	Cloon and Commons; Coolbane
Site Type	Riverine potential
ITM	566094, 660891
Description	Archaeological potential associated with riverine environment at Mall Road South. This includes the ecclesiastical site on Cloon Island (RMP LI001-004001; see above). Such environments may additionally include features such as *fulachta fiadh*, fording points, evidence of settlement, evidence of milling or fishing weirs, and preserved organic material. Although the existing townland boundary follows the modern shoreline, historic mapping shows that the original townland boundary follows an older shoreline where the river wall is currently located on The Mall. It is proposed to construct a flood wall on this line. It is also possible that features related to the friary (LI001-004) may extend beyond the designated Zone of Notification. This area is within the grounds of Island House where features related to the historic house such as footpaths, culverts or landscape features may survive beneath the surface. Ground reduction and the use of heavy machinery has the potential to impact subsurface remains.
Sources	www.osi.ie

Images	 *Mall Road South area on First Edition 6-inch OS map, 1844 (www.osi.ie)*
Approx Distance from FRS Measure	Archaeological potential associated with riverine environment at Mall Road South. 0m from the proposed Mall Road South flood relief measure.

Reference no.	**AP5**
Legal Status	N/A
Other Designations	N/A
Location	Coolbane
Site Type	Riverine potential
ITM	566059, 662664
Description	Archaeological potential associated with riverine environment at Maher's Pub and Meadowbrook. Such environments may include features such as *fulachta fiadh*, fording points, evidence of settlement, evidence of milling or fishing weirs, and preserved organic material. It is possible that features related to the castle (LI001-003) and the ecclesiastical site (LI001-004001) may extend beyond the designated Zones of Notification. Ground reduction and the use of heavy machinery has the potential to impact subsurface remains.
Sources	www.osi.ie

Images	 *Maher's Pub and Meadowbrook area on First Edition 6-inch OS map, 1844 (www.osi.ie)*
Approx Distance from FRS Measure	Riverine archaeological potential, 0m from the proposed Maher's Pub and Meadowbrook flood relief measure

Reference no.	**AP6**
Legal Status	N/A
Other Designations	N/A
Location	Coolbane
Site Type	Riverine potential
ITM	565935, 662633
Description	Archaeological potential associated with riverine environment at Stormont House and Coolbane Woods which includes Castle Connell (LI001-003). Additionally, such environments may include features such as *fulachta fiadh*, fording points, evidence of settlement, evidence of milling or fishing weirs, and preserved organic material. Peat levels have also been identified in the Coolbane Woods area. It is possible that features related to the castle (LI001-003) may extend beyond the designated Zone of Notification. The First Edition 6-inch OS map also shows long burgage-type plots immediately east of the castle where the road is now located. Sub-surface remains of these features may survive in this area in addition to earlier features associated with the castle and with a possible pre-Norman fortification. An 18th century image of the castle shows several structures between the castle and the river. This area is also within the grounds of Stormont House where features related to the historic house such as footpaths, culverts or landscape features may survive beneath the surface. It is proposed to construct low-level flood walls to tie into the rock outcrop where the castle is constructed and inside the existing castellated wall (CH11, see 12.5.5) within the ZoN of the castle. The driveway to Stormont House will be raised; this is in the vicinity of the structures depicted below. Ground reduction and the use of heavy machinery within the ZoN has the potential to impact subsurface remains.
Sources	www.osi.ie

Images	 *Stormont House and Coolbane Woods area on First Edition 6-inch OS map, 1844 (www.osi.ie)*
Approx Distance from FRS Measure	Archaeological potential associated with riverine environment at Stormont House and Coolbane Woods. 0m from the proposed Stormont House and Coolbane Woods flood relief measure.

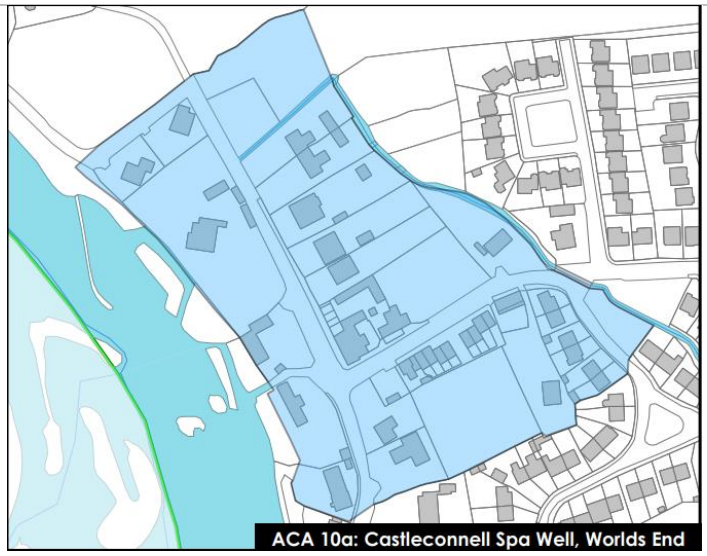
Reference no.	**AP7**
Legal Status	N/A
Other Designations	N/A
Location	Lacka / Cloon and Commons
Site Type	Riverine potential
ITM	566325, 663292
Description	Archaeological potential associated with riverine environment along the Cedarwood Stream. Such environments may include features such as *fulachta fiadh*, fording points, evidence of settlement, evidence of milling or fishing weirs, and preserved organic material. Ground reduction and the use of heavy machinery has the potential to impact subsurface remains.
Sources	www.osi.ie

Images	 *Cedarwood Stream on First Edition 6-inch OS map, 1844 (www.osi.ie)*
Approx Distance from FRS Measure	0m, from the proposed Cedarwood Stream flood relief measure.

12.4.4 Architectural Conservation Areas and Architectural Heritage Sites (Protected Structures)

12.4.4.1 Architectural Conservation Areas (ACA)

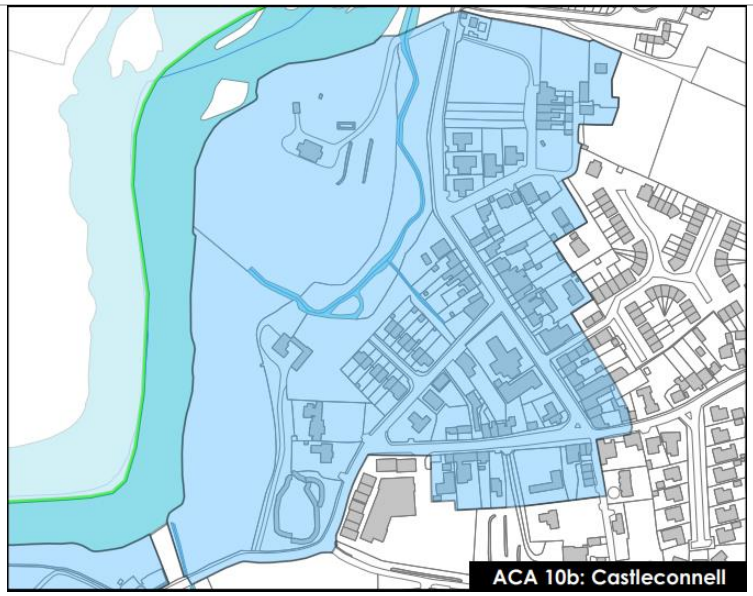
Reference no.	**ACA1**
Legal Status	ACA
Other Designations	N/A
Location	Lacka, Cloon and Commons
Site Type	Architectural Conservation Area
ITM	566088, 663334
Description	The Spa-well and Worldsend ACA was a significant area of economic and social activity which developed in the early 19th century. The spa-well, still extant, was the focus of activity and during the early part of the 19th century a building knows as the Assembly Rooms was built between it and the River Shannon. Late 18th century and 19th century affluence is evident in this area, reflected by the construction of large country homes of Georgian classical architecture such as Lacka House and Grange House. Around this location were a number of landmark buildings such as a Hotel and the Police Barracks and also the high amenity area of Worlds End. Significant buildings in this area, include Lacka House, two semi-detached houses to its southeast and their neighbouring building; Grange House and the complex of structures associated with the chalybeate well to its south, the former Charco's Public House on the junction and, to its east, Meskell's Shop and its associated residence. The northeastern side of the ACA is dominated by high rubble stone boundary walls giving it a distinctive character. Views of the River Shannon from within the ACA are blocked by the walls of private dwellings, the only comprehensive view is at the northern boundary of the ACA at the end of the local road to Worlds End/Lacka House or via an access road to the river to the south of Spa House. The riverside dwellings which are behind high stone walls have private views of the river.

Sources	www.osi.ie; Limerick City & County Council 2022a[19]; 2022b[20]
Images	 *Spa-well and Worlds End ACA (Limerick City & County Council 2022b)*
Approx Distance from FRS Measure	The Rivergrove B&B and Grange House flood relief measure is located within the ACA. Proposed flood defences are predominantly to the rear of properties and the high stone walls and mature vegetation which make up the character of this area screen most of the potential visual impact of the flood relief measure. The only alteration to the streetscape will be the provision of a new entrance and wall at Rivergrove B&B. The majority of the change will occur within the grounds of Grange House and to the Cedarwood Stream to the rear of Coole and Glenbrook.

Reference no.	**ACA2**
Legal Status	ACA
Other Designations	N/A
Location	Cloon and Commons, Coolbane, Coolreiry
Site Type	Architectural Conservation Area
ITM	566070, 662669
Description	There are a variety of typologies to be found in the Village Core ACA. During the latter half of the 19th century, the layout of the approach road into the core of Castleconnell from the south was altered. The primary effect of these modifications was to bring the ruins of Castle Connell, from which the village takes its name, into the grounds of Stormont, one of the many houses constructed along the banks of the River Shannon. The second effect of this road alteration was the formation of a triangular space which was to become the core of the village, the location of several amenities, and the focal point of economic and civic activities. The eastern side of the triangle became the location for the Roman Catholic Church and the national school, with its attached teacher's residence. To the eastern and southern side of the triangle, structures were demolished and replaced with new buildings, or altered and put to new use. Within this area there are buildings considered to have stature, such as Island House and the church, or to have a distinct character, such as The Tontines, and

[19] Limerick City & County Council 2022a. 'Castleconnell Local Area Plan 2023-2029'. Limerick: Limerick City & County Council.

[20] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

	historical importance, such as the former Shannon Hotel. There are more modest structures, such as the terraced cottages along the southern side of the triangle. The building lines found in Castleconnell are similar to those found in many Irish towns and villages. Each individual building, tended to have its own distinct plot of land. The buildings tended to be constructed in terraces, though this was not adhered to in all instances. While many of the buildings within the centre of Castleconnell's historic core, address the footpaths directly, many are characterised by a distinct set-back which can be demarked by a small front garden, or a yard undifferentiated from the path through the use of a boundary wall. Island House and Stormont House have private unobstructed views of the river Shannon. However whilst there are no views of Island House there is an open view of Stormont House from the southern end of the ACA. Rubble stone walls that line the streets of the town provide a distinctive character, most of these walls were built in the mid-late 19th century when the roads in the town were reconfigured or when the east bank of the river was walled.
Sources	www.osi.ie; Limerick City & County Council 2022a[21]; 2022b[22]
Images	 *Village Core ACA (Limerick City & County Council 2022b)*
Approx Distance from FRS Measure	The proposed Mall Road South, Maher's and Meadowbrook and Stormont House flood measure is within the ACA. It is proposed to replace a section of river wall (CH8) and create a new footpath where historic kerbstones are located (CH9) along the Mall Road South ACA, which is part of the character of this ACA. It is also proposed to raise the Mall Road / Scanlon Park junction and the driveway to Island House (RPS 1085), and to install a flood wall to the rear of Maher's and Meadowbrook. A low wall will be placed in front of the crenelated wall in the grounds of Stormont House (CH11).

[21] Limerick City & County Council 2022a. 'Castleconnell Local Area Plan 2023-2029'. Limerick: Limerick City & County Council.

[22] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

12.4.4.2 Architectural Heritage Sites (Record of Protected Structures)

Reference no.	**RPS 1074**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21900111
Location	Lacka
Site Type	House
ITM	566165, 663359
Description	Coole: Semi-detached five-bay two-storey house, built c. 1830. Pitched slate roof with cast-iron ridge cresting's and rendered chimneystacks. Roughcast rendered walls and render plinth course. Square-headed openings, some having six-over-six pane timber sliding sash windows and painted concrete sills. Round-headed opening with spoked cast-iron fanlight over timber panelled door having sidelights with cast-iron panels and timber risers. Rendered steps to entrance. This house is one of a pair of semi-detached houses which front onto the ACA. The modest grandeur of these houses is accentuated by the continuous line of cast-iron ridge cresting's and façades of balanced proportions. Despite undergoing renovations, this house retains its architectural detailing. The Cedarwood Stream is located in the rear garden of the property, it is integrated into the garden landscape, surrounded by plants and trees, with a bridge crossing the river. The existing culvert/bridge crossing comprises a large cast concrete pipe with masonry parapets and a deck. While not of any great age, it is a decorative feature which contributes to the current setting of Coole. It is proposed to replace this feature. The culvert (CH14, see Section 12.5.5) is located on the site of an original culvert depicted on the First Edition 6-inch map of 1844. High stone walls and mature vegetation will screen potential visual impacts from flood relief measures from the ACA to the west.
Sources	www.osi.ie; Limerick City & County Council 2022b[23]; www.buildingsofireland.ie
Images	 *Coole*
Approx Distance from FRS Measure	The proposed Cedarwood Stream measure is located in the rear garden of this property (22m from the house). The existing culvert will be replaced.

[23] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

Reference no.	**RPS 1076**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21807038
Location	Lacka
Site Type	House
ITM	566162, 663334
Description	Glenbrook: Detached three-bay two-storey house, built c. 1830, having bay windows to ground floor. Hipped slate roof with rendered chimneystacks and overhanging eaves having timber brackets. Roughcast rendered walls with render plinth course. Square-headed openings to first floor having concrete sills, six-over-six pane timber sliding sash windows and timber shutters. Square-headed openings to bay windows with six-over-six pane timber sliding sash windows and flanking four-over-four pane timber sliding sash windows. Round-headed opening having spoked fanlight over double-leaf timber panelled doors. Brick steps to entrance. Pair of square-profile rendered piers to south-west with double-leaf cast-iron gates and rendered walls having cast-iron railings. An attractive, well proportioned house, which is identified by distinctive features such as the overhanging eaves which enhance the architectural value of the composition. Well maintained, the house presents an early aspect with much of the original form intact, together with a number of important salient features and materials. The Cedarwood Stream is located in the rear garden of the property, it is integrated into the garden landscape, surrounded by plants and trees, with a footbridge crossing the river. A portion of the stream in this location is lined with stone and a modern concrete footbridge crosses the watercourse. The footbridge will not be impacted, but some of the stone lining downstream of this features will be impacted by the widening of the stream. High stone walls and mature vegetation will screen any potential visual impact from flood relief measures from the ACA.
Sources	www.osi.ie; Limerick City & County Council 2022b[24]; www.buildingsofireland.ie
Images	 *Glenbrook*

[24] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

	 *Stone lining Cedarwood Stream*
Approx Distance from FRS Measure	The proposed Cedarwood Stream measure is located in the rear garden of this property (22m from the house).

Reference no.	**RPS 1075**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21807037
Location	Lacka
Site Type	House
ITM	566102, 663321
Description	Grange House: Detached three-bay two-storey double-pile house, built in 1828, having bows to front (south) elevation end bays and canted three-bay single-storey entrance bay. Lean-to conservatory to west elevation and lean-to extensions to rear (north) elevation. Pitched slate roofs with rendered chimneystacks, render eaves course and cast-iron rainwater goods. Rendered parapet having cornice to front elevation. Roughcast rendered walls, render balustrades to entrance bay and render plinth course. Square-headed openings to bows, those to first floor with painted sills and tripartite six-over-six pane timber sliding sash windows having flanking two-over-two pane timber sliding sash windows. Those to ground floor with nine-over-six pane timber sliding sash windows and flanking three-over-two pane timber sliding sash windows. Square-headed opening to centre-bay first floor having six-over-six pane timber sliding sash window. Square-headed opening to west elevation, first floor with double-leaf glazed doors and cast-iron balcony. Square-headed opening to entrance bay having glazed overlight over half-glazed timber panelled door with flanking sidelights. Three-bay two-storey outbuilding with lean-to to north, having pitched slate roof and rubble limestone walls with cast-iron ties. Square-headed openings to first floor having timber lintels, concrete sills and timber casement windows. Elliptical-headed carriage arches with brick voussoirs and timber battened double-leaf doors. Pair of square-profile roughly dressed limestone piers to south-east cut limestone caps and double-leaf cast-iron gates. The full-height bows add interest and individuality to the façade of this house. The tripartite diminishing windows and central doorcase show the influence of classical architecture. The house forms an interesting part of the architectural heritage of the local area. The northern end of the property has been subdivided and modern dwellings have been constructed in what was part of the gardens associated with the

	house. These properties however have retained the original high boundary walls that defined the original land holding (CH1). The house is surrounded by high stone walls to the west and south, there are no public views into the property from the ACA with the exception of passing glimpses down the curving entrance avenue to the south. The house has a riverine setting, it is orientated onto the river taking in panoramic views of the River Shannon both upstream and downstream, a low rubble stone river wall facilitates this view (CH2). There is a narrow gate in the wall that provides access to the river. The outbuildings (including a former mill site) are located to the rear (west) of the property. Part of the stone lined Cedarwood Stream culvert (which powered the mill) has been opened and a low rubblestone wall built around it provides a water feature within the garden. The garden has mature beech trees in it that contributes to setting.
Sources	www.osi.ie; Limerick City & County Council 2022b[25]; www.buildingsofireland.ie
Images	 *Grange House (www.buildingsofireland.ie) front façade*  *Approach drive to the property*

[25] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

Low wall and open views of the river from the front of the house

Open culvert (CH3) within the garden and mature trees

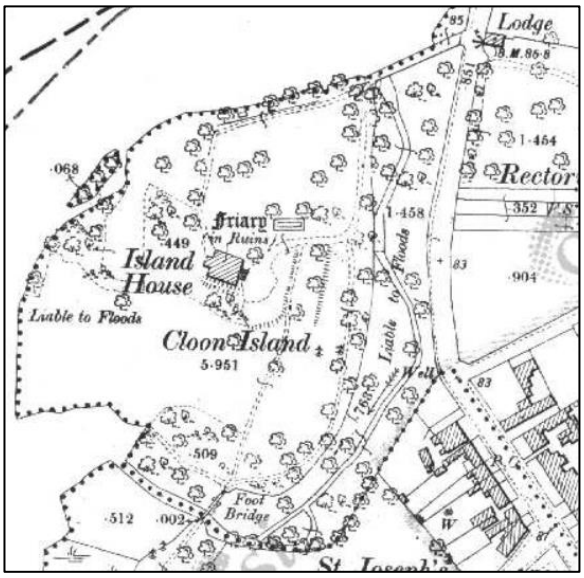
View of river side of the river wall from the rivers edge

Approx Distance from FRS Measure	The proposed Grange House flood relief measures include: the replacement of the existing river wall of this property with a new flood wall, the realignment of the Cedarwood Stream culvert, with a portion which is currently an open feature (CH3, see Section 12.5.5 below) to be preserved. A new foul rising main to public foul sewer will replace the existing outfall to the stream. While there will be no impact to the house itself, the demolition of the existing river

	wall, replacement of the culvert and other works within the grounds will alter the setting of the house, whose aspect is towards the river.

Reference no.	**RPS 1085**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21807009
Location	Cloon and Commons
Site Type	House
ITM	565973, 662780
Description	Island House: Detached three-bay two-storey over basement villa style house, built c. 1840. Comprising pedimented fluted Doric portico to front (east) elevation and gable-fronted breakfront to rear (west) elevation with flanking full-height conservatories. Hipped slate roof having overhanging eaves with timber brackets, rendered chimneystacks and cast-iron rainwater goods. Lined-and-ruled rendered walls having render quoins. Square-headed openings to ground floor with painted stone sills and six-over-six pane timber sliding sash windows. Square-headed openings to basement having bipartite one-over-one pane timber sliding sash windows. Portico comprising fluted Doric style columns supporting rendered entablature with triglyphs and metopes. Square-headed opening having double-leaf half-glazed timber panelled doors. Flight of limestone steps to entrance. Square-headed openings to rear elevation, ground and first floors with render surrounds and double-leaf half-glazed timber panelled doors. Flight of stairs having metal railings to first floor door. Pair of square-profile rendered piers to east with double-leaf cast-iron gates and rubble stone walls terminating in second pair of square-profile piers. This well composed house retains many features that attest to its high-quality design and execution. Historically, the house was the seat of Sir Richard de Burgho, Bt. According to Samuel Lewis's 'Topographical Dictionary', the house was erected in 1815 by Sir John Allen de Burgho (Burke). Small in scale, the building is nonetheless highly decorative incorporating an imposing fluted Doric portico, which gives the façade an air of grandeur. Situated on Cloon Island on the River Shannon, the house plays a significant role in the land and riverscape of Castleconnell. The house has some archaeological significance being adjacent to a medieval chapel, which was possibly founded in 1291 by Reginald de Burgh. The chapel is integrated into the garden of the property The house faces towards the east taking in private panoramic views of the river – both upstream and downstream. There are no views into the property from the ACA. The island is surrounded by mature trees. The property is accessed by a 19th century rubblestone causeway that crosses the Cloon Stream from the Mall Road (see below). While the house itself will not be impacted by the flood relief measure, there will be alterations to the entrance into grounds of Island House. This will include raising the driveway to the house and alterations to the causeway, a protected structure in its own right (RPS 5056).
Sources	www.osi.ie; Limerick City & County Council 2022b[26]; www.buildingsofireland.ie

[26] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

Images	 *Island House (www.buildingsofireland.ie)*  *Island House and grounds on 25-inch OS map, 1901 (www.osi.ie)*
Approx Distance from FRS Measure	The entrance to the property is part of the proposed Mall Road South flood relief measure.

Reference no.	**RPS 5056**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21807010; MMIAH-LK-04-Mar-E-03
Location	Cloon and Commons
Site Type	Bridge
ITM	566068, 662885
Description	Single-arch sandstone road bridge across the River Shannon/Cloon Stream, built c. 1815. Crenelated rubble parapet walls with render copings. Cut sandstone voussoirs to round-headed arches. Rendered U-cutwaters to north elevation. This solidly constructed causeway provides access to Cloon Island and Island House. Its robust form is distinguished by the crenelated parapet walls, which add an element of drama to an otherwise functional structure. The entrance gates however is a modern addition.

Sources	www.osi.ie; Limerick City & County Council 2019[27]; 2022b[28]; www.buildingsofireland.ie
	 *View down the access drive into the island*  *The causeway bridge and sluice gates*
Approx Distance from FRS Measure Potential Impact	Part of the proposed Mall Road South flood relief measure. The surface of the deck will be raised by 0.2m along with the entrance from the road and the driveway; this will comprise the replacement of the existing infill with foamed concrete. Additionally, a handrail will be added inside both crenelated parapets. Masonry joints will be repointed with lime mortar.

Reference no.	**NIAH 21807034**
Legal Status	None; Regional rating
Other Designations	N/A
Location	Cloon and Commons
Site Type	House

[27] Limerick City & County Council 2019. 'Evolutionary Study Report on the Maritime, Military and Industrial Heritage of Limerick City and County'. Limerick: Limerick City & County Council.

[28] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

ITM	566177, 663153
Description	Mall House: Detached two-bay two-storey house, built c. 1890, having recent gabled canopy to front (east) elevation, two-bay two-storey extension with bow to south elevation, single-storey lean-to to north, single-bay two-storey extension and three-bay single-storey lean-to to rear (west) elevation. Pitched slate roof having rendered chimneystacks. Hipped artificial slate roof to extension. Lined-and-ruled rendered walls with render quoins. Square-headed openings having limestone sills and six-over-six pane timber sliding sash windows. Timber external shutters to window openings, front elevation. Square-headed opening with half-glazed timber panelled door having limestone threshold. Pair of square-profile rubble limestone piers to east with single-leaf timber battened gate and rubble limestone boundary walls. A well-proportioned, middle size house that retains most of its original form and massing, despite additions and alterations. The house is representative of the continuing popularity of classically inspired modest domestic architecture. The house fronts onto the road, it has a modern wall. To the rear of the property there is a rubble stone wall (CH5), there are views of the river. Shannon both upstream and downstream and form part of the riverine setting. There is a road between this wall and the river which provides access into a later property.
Sources	www.osi.ie; Limerick City & County Council 2022b[29]; www.buildingsofireland.ie
Images	 *Mall House*
Approx Distance from FRS Measure Potential Impact	Proposed flood relief works will not impact the house itself, but flood walls will be constructed to the west and north of the property. This will require the demolition of a river wall to the rear of the property along the former townland boundary (CH5, see Section 12.5.5). This will have an impact on the property, although this will be minimal as the wall will measure only 0.8m-1m in height and will be cladded on both sides.

Reference no.	**RPS 1086**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21807004

[29] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

Location	Coolbane
Site Type	House
ITM	566095, 662687
Description	Island View House: Terraced five-bay two-storey house, built c. 1800. Pitched slate roof with rendered chimneystacks, overhanging eaves and timber brackets. Rendered walls having render quoins. Square-headed openings with render surrounds, painted stone sills and one-over-one pane timber sliding sash windows. Round-headed opening having render surround and glazed overlight over square-headed timber panelled door. Limestone steps to entrance. Pair of square-profile chamfered rendered piers to north-east with render caps and later nineteenth-century single-leaf cast-iron gate. Rendered boundary walls having decorative cast-iron railings terminating in second pair of piers. This well-proportioned house makes a strong impact in the streetscape. Well maintained, the house retains much of its original form and early fabric. It has also later nineteenth-century detailing such as the bracketed eaves and the cast-iron gate. Of particular interest are the various rendered dressings, including decorative surrounds to the window and door openings. Properties along this section of The Mall have long gardens to the rear defined by stone walls. The Cloon River runs to the south of the property, it is defined by mature trees and hedgerow but is not integrated into the setting of the property. There are the ruins of a former structure (CH10) at the end of the garden.
Sources	www.osi.ie; Limerick City & County Council 2022b[30]; www.buildingsofireland.ie
Images	 *Island View House (www.buildingsofireland.ie)*
Approx Distance from FRS Measure	The Mahers Pub/Meadowbrook Estate flood relief measure Runs to the rear of the property. It is proposed to construct a flood wall at the end of the garden of Island View House.

12.4.5 Undesignated Built and Cultural Heritage Features

Reference no.	**BH1**
Legal Status	None
Other Designations	None
Location	Coolbane
Site Type	House

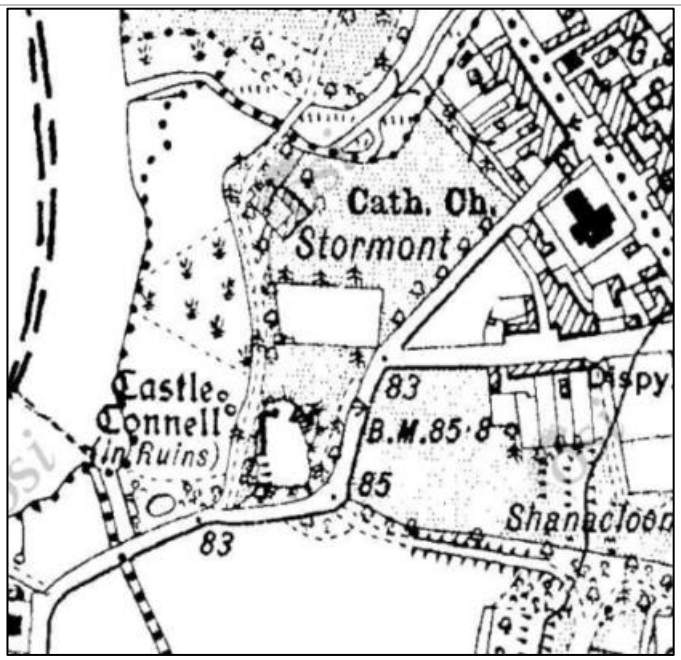
[30] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

ITM	565949, 662615
Description	Stormont House: The undesignated Stormont House was constructed for the Ingham family, a Welsh coal-mining family in the early to mid-19th century. The original structure was three storeys, but the top storey and roof were removed c. 1970 due to the poor condition and it currently has a flat roof. It maintains the footprint of the original structure, with the original stables and outbuildings forming a courtyard on the east of the house. The two-storey three bay wide and three bay deep structure is of south-westerly aspect facing the river and accessed by a staircase to the living quarters on the first floor. Recent refurbishment has included timber frame sash windows. The property is orientated to the west and has a generous and unimpeded view of the River Shannon. The house and its curving driveway and gates are an important part of the character of the ACA, it is one of the few riverside properties with views into it. Just inside the property's entrance gates are the ruins of Castle Connell, a recent addition. The property was far smaller in extent than it is now, as depicted on the first edition OS Map (see images below). It had a considerably shorter driveway, with a gate lodge (now in ruins) at the entrance gate and a walled garden to the west of this. Castle Connell was located on the opposite side of the road. In the latter part of the 19th century, a road that ran north of the castle was redirected to the south of the castle, and as a result, the castle and its lands were subsumed into Stormont House, as depicted in the updated OS Map. The former road west of the castle formed part of a new driveway into the property, rendering the site's previous gate lodge obsolete. The lands were subdivided on the eastern side of the entrance drive and gate lodge where new dwellings have been constructed within the former walled garden area
Sources	www.osi.ie; www.myhome.ie; O'Brien 2022[31]
Images	 *Stormont House and crenelated wall (www.myhome.ie)*

[31] O' Brien, Y. 2022. 'Cultural Heritage Options Assessment Report. Castleconnell Flood Relief Scheme, Co. Limerick'. Unpublished report: Courtney Deery Heritage Consultancy Ltd.

View of the Access Road into the property

First Edition 6-inch OS Map 1844- note the road to the north of the castle

	 *Revised OS Map Edition 1909 – note the new road running east and south of the castle*
Approx Distance from FRS Measure	Part of the proposed Stormont House flood measure. It is proposed to raise the driveway of the house and to construct a new low level flood wall inside the existing crenelated wall and an embankment to the north of the structure.

Reference no.	**CH1**
Legal Status	N/A
Other Designations	N/A
Location	Lacka
Site Type	Boundary wall
ITM	566051, 663365
Description	The boundary wall of Rivergrove B&B is part of the original boundary wall of Grange House (RPS 1075). It comprises of roughly coursed stone measuring approximately 2 in height with the top course comprising stones on their sides. Approximately 19m of wall survives at this location, with breaches having been made previously to access Rivergrove B&B and the adjoining property. Although no longer associated with Grange House which is not visible from this location, this wall forms part of the character of the Spa-well and Worldsend ACA, being one of a number of stone walls which flank the road at this location. It is proposed to create a c. 6.5m breach in this wall to accommodate a new entrance to Rivergrove B&B. A new river wall will also remove a surviving corner section of the river wall.
Sources	www.osi.ie

Images

Location of Rivergrove B & B within the ACA

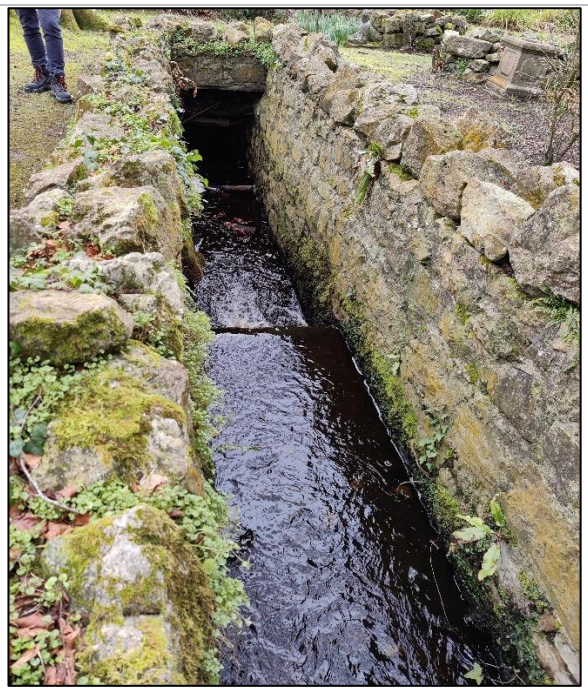
Location of Rivergrove B&B within Grange House original extent before it was sub-divided

Stone wall where new entrance to Rivergrove B&B will be located

	 *River wall to be replaced the wall is of modern construction while the corner is of rubble stone and part of the former Grange House property boundary*
Approx Distance from FRS Measure	Part of the proposed Grange House flood measure, within the garden of Grange House (RPS 1075).

Reference no.	CH2
Legal Status	N/A
Other Designations	N/A
Location	Lacka
Site Type	River wall
ITM	566051, 663365
Description	A river wall along the bank of the River Shannon is part of the original boundary of Grange House. It follows the old river bank and the original course of the Lacka townland boundary. The ground is terraced at this location so that the wall appears higher on the river side than on the landward side where it measures approximately 0.4m high and is constructed from roughly course limestone. It is proposed to demolish this wall and replace it with a flood wall.
Sources	www.osi.ie; Google Street View
Images	 *Stone wall to be replaced at Grange House*

Approx Distance from FRS Measure	Part of the proposed Grange House flood measure, within Grange House (RPS 1075).

Reference no.	**CH3**
Legal Status	N/A
Other Designations	N/A
Location	Lacka
Site Type	Culvert
ITM	566096, 663340
Description	Cedarwood Stream culvert located in the grounds of Grove House (RPS 1075). Part of the stream runs along the north wall of a former mill building. It continues in an underground culvert west, with a short section of the culvert presented as an open decorative feature. This segment is lined with stone and designed with a cascading feature. East of the property, the stream is culverted under the road where it is covered on the footpath with an iron plate. The open section of the Cedarwood Stream adjacent to the Mill Building will remain open, and a new culvert will be provided from the downstream point of this open section to the Shannon. This includes removal of the open feature in the garden, which will be replaced by the culvert.
Sources	www.osi.ie
Images	 *Open feature of Cedarwood Stream culvert*
Approx Distance from FRS Measure	Part of the proposed Grange House flood measure, within the garden of Grange House (RPS 1075).

Reference no.	**CH5**
Legal Status	N/A
Other Designations	N/A
Location	Cloon and Commons

Site Type	River wall
ITM	566163, 663146
Description	A river wall extends along the west side of Mall House. This follows the old river bank and the course of the former Cloon and Commons townland boundary. The ground is terraced at this location so that the wall appears higher on the river side than on the landward side where it measures approximately 0.5m high. It is proposed to demolish this wall and replace it with a flood wall.
Sources	www.osi.ie
Images	 *River wall*
Approx Distance from FRS Measure	Part of the proposed Mall House flood measure. See Mall House (NIAH 21807034)

Reference no.	**CH6**
Legal Status	N/A
Other Designations	N/A
Location	Cloon and Commons
Site Type	River wall
ITM	566097, 662915
Description	A stone wall extends along the west side of The Mall (north of Island House) which follows the old river bank and the original course of the Cloon and Commons townland boundary. On the east side it measures approximately 1m high, with a drop on the river (west) side of the wall where it measures up to 2m high. It is of coursed stone on the north end and of random rubble construction elsewhere with evidence of rebuilding on the south end.
Sources	www.osi.ie

Images	 *Stone wall with rebuilding evident*  *Stone wall with rebuilding evident*
Approx Distance from FRS Measure	Part of the proposed Mall Road North flood measure.

Reference no.	**CH8**
Legal Status	N/A
Other Designations	N/A
Location	Cloon and Commons
Site Type	Stone wall
ITM	566073, 662794
Description	Within the Village Core ACA, a stone wall extends along the west side of The Mall (south of Island House) which follows the old river bank and the original course of the Cloon and Commons townland boundary. It measures approximately 0.6-1m high comprises a combination of roughly coursed and random rubble construction. A memorial plaque to Tom O'Shea is inserted into the wall on the south end. It is proposed to remove this entire section of wall and to construct a new flood wall.
Sources	www.osi.ie

Images	 *Stone wall*  *Memorial plaque*
Approx Distance from FRS Measure	Part of the proposed Mall Road South flood measure.

Reference no.	**CH9**
Legal Status	N/A
Other Designations	N/A
Location	Cloon and Commons
Site Type	Kerbstones
ITM	566073, 662794
Description	Within the Village Core ACA, a line of limestone kerbstones extends for a distance of approximately 76m on the west side of The Mall (north of Maher's Pub).
Sources	www.osi.ie

Images	 *Kerb stones*
Approx Distance from FRS Measure	Part of the proposed Mall Road South flood measure.

Reference no.	**CH10**
Legal Status	N/A
Other Designations	N/A
Location	Coolbane
Site Type	Stone wall
ITM	566067, 662670
Description	To the rear of Island View House and Maher's Pub a section of stone wall marks the Island House property boundary. This wall appears to be the remains of a structure which is depicted on the First Edition 6-inch OS map at the end of the long garden associated with Island View House.
Sources	www.osi.ie
Images	 *CH10 on First Edition 6-inch OS map*

	 *Stone wall*
Approx Distance from FRS Measure	The Mahers Pub/Meadowbrook Estate flood relief measure Runs to the rear of the property. Associated with Island View House (RPS 1086).

Reference no.	**CH11**
Legal Status	N/A
Other Designations	N/A
Location	Coolbane
Site Type	Crenelated wall
ITM	565934, 662593
Description	A rubble-built crenelated wall follows the west side of the entrance avenue of Stormont House. While the house has undergone significant alterations, leading to its undesignated status, this landscape feature is of significance as an historic landscaping feature of the grounds of the historic house. It forms part of the aesthetic of the property and was probably created as part of 19th century landscaping at the time of the realignment of the road which incorporated the castle into the grounds of the house. The castle probably provided inspiration for the crenelation and stone from the ruins of the castle is also likely to have been used in its construction.
Sources	www.osi.ie

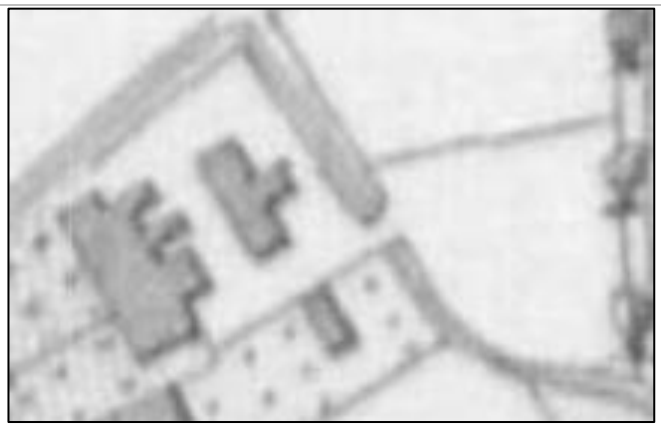
Images	 *Crenelated wall*  *Crenelated wall*
Approx Distance from FRS Measure	Part of the proposed Stormont House flood measure. See Stormont House (BH1)

Reference no.	**CH12**
Legal Status	N/A
Other Designations	N/A
Location	Coolbane
Site Type	Stone walls
ITM	565980, 662446
Description	A rubble-built stone wall runs for approximately 108m along the north and west side of Chapel Hill, adjacent to Castle Connell (RMP LI001-003). At the Coolbane Woods junction where road raising is proposed, this wall measures approximately 1m in height. It is proposed to raise the road at this junction, which will reduce the amount of visible wall in this area.
Sources	www.osi.ie

Images	See CH13 below.
Approx Distance from FRS Measure	The road will be raised at this junction as part of the proposed Coolbane Woods measure.

Reference no.	**CH13**
Legal Status	N/A
Other Designations	N/A
Location	Coolbane
Site Type	Stone walls
ITM	565973, 662434
Description	A rubble-built stone wall runs for approximately 204m along the south side of Chapel Hill. At the Coolbane Woods junction where road raising is proposed, this wall measures approximately 1m in height and includes a rebuilt section which is braced by a concrete abutment on the south side.
Sources	www.osi.ie
Images	 *Stone wall*  *Stone wall with rebuilt section evident*

Approx Distance from FRS Measure	The road will be raised at this junction as part of the proposed Coolbane Woods measure.

Reference no.	**CH14**
Legal Status	N/A
Other Designations	N/A
Location	Lacka
Site Type	Culvert
ITM	566200, 663372
Description	A culvert over the Cedarwood Stream to the rear of Coole (RPS 1074). This is a modern feature but is in the same location as a culvert depicted on the First Edition 6-inch OS map of 1844. The existing culvert comprises a large cast concrete pipe with masonry parapets and a flat deck. While not of any great age, it is a decorative feature which contributes to the setting of Coole.
Sources	www.osi.ie
Images	 *Original culvert depicted on First Edition 6-inch OS map, 1844 (www.osi.ie)*  *Culvert*
Approx Distance from FRS Measure	It is proposed to replace this culvert with a larger box culvert with new headwall and reinstatement of the stream crossing. The replacement of the culvert is part of the proposed Cedarwood Stream flood measure. The wade survey (Appendix 12.8) confirmed that this culvert and banks have been replaced by a concrete pipe structure. Also assessed as part of Coole House (RPS 1074).

Reference no.	**CH15**
Legal Status	Associated with RMP site LI001-004002, Castle Connell
Other Designations	N/A
Location	Coolbane
Site Type	Large block of masonry from Castle Connell
ITM	565985, 662440
Description	A large fragment of Castle Connel located on the opposite side of the road to the castle in Coolbane Woods. Located south of the Coolbane Woods junction, it is thought to have fallen from the castle tower 1691 destruction of the castle. It is overgrown with vegetation and is immediately behind the road wall. This is one of a number of large fragments around the base of the castle. It was separated from the castle grounds when a new road was routed around the southern side of the castle.
Sources	www.osi.ie
Images	 *View towards the dislodged fabric from Castle Connell*
Approx Distance from FRS Measure	CH15 is located immediately outside of the proposed Coolbane Woods flood relief measure. There is a potential that contractors accessing Coolbane Woods may not be aware of its location, and it might be subject to inadvertent damage during construction. It is proposed to raise this road in this location as much as 0.3m at the Coolbane Road junction where low stone walls (CH13) surround the castle and line both sides of the road

12.5 Inventory of Cultural Heritage Sites within 100m of the FRS measure not subject to impact

12.5.1 Architectural Heritage Sites

Reference no.	**RPS 1072**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21900109
Location	Lacka
Site Type	House
ITM	566007, 663456
Description	Lacka House: Detached five-bay two-storey house, built c. 1830. Pitched roof. Square-headed window opening with replacement six-over-six windows. Lacka House is an important house architecturally and historically within Castleconnell. High stone walls and mature vegetation will screen any potential visual impact.
Sources	www.osi.ie; Limerick City & County Council 2022b[32]; www.buildingsofireland.ie
Images	 *Lacka House (Limerick City & County Council 2022b)*
Approx Distance	Approx. 93m from the Rivergrove B&B flood relief measure

Reference no.	**RPS 1073**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21900110
Location	Lacka
Site Type	House
ITM	566156, 663372
Description	Brooklands: Semi-detached five-bay two-storey house, built c. 1830, comprising two-bay two-storey extension to east, single-bay single-storey lean-to and single-bay single-storey addition to south. Pitched slate roof with cast-iron ridge crestings and rendered chimneystacks. Roughcast rendered walls and render plinth course. Square-headed openings having six-over-six pane timber sliding sash windows and painted concrete sills. Square-headed opening to first floor with tripartite six-over-six pane timber sliding sash window having flanking two-over-two pane windows. Round-headed opening with spoked cast-iron fanlight

[32] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

	over timber panelled door having sidelights with cast-iron panels and timber risers. Rendered steps with cast-iron bootscraper to entrance. This house is one of a pair of houses, whose modest grandeur is accentuated by the continuous line of cast-iron ridge crestings and façades of balanced proportions. This building is the most intact of the pair, retaining its timber sash windows, ornate fanlight and sidelights which help to preserve the original character of the site. High stone walls and mature vegetation will screen any potential visual impact.
Sources	www.osi.ie; Limerick City & County Council 2022b[33]; www.buildingsofireland.ie
Images	 *Brooklands*
Approx Distance from FRS Measure	Approx. 29m from the proposed Cedarwood Stream flood measure.

Reference no.	**RPS 1079**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21807040
Location	Lacka
Site Type	House
ITM	566211, 663271
Description	Meskalls: Semi-detached pair of houses, built c. 1810, comprising four-bay two-storey house to east and three-bay two-storey house to west, having timber shopfront to ground floor. Pitched slate roof with rendered chimneystacks, cast-iron rainwater goods and render eaves course. Roughcast rendered walls. Square-headed openings with concrete sills and one-over-one pane timber sliding sash windows. Square-headed opening to east house having render surround and glazed overlight over timber panelled door. Shopfront to west house comprising pilasters supporting fascia with raised lettering and cornice. Square-headed display window with bipartite fixed window, timber sill and panelled riser. Square-headed opening having glazed overlight over double-leaf half-glazed timber panelled doors. Geometric tiles to threshold. Pair of square-

[33] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

	profile piers to east house with single-leaf cast-iron gate, rendered boundary walls having cast-iron railings terminating in second pair of piers. This house is an attractive and well-proportioned composition that retains most of its original form. The house is distinguished by the simple timber shopfront, which attests to high quality local craftsmanship. The house is an important component of the streetscape, forming a pleasing roadside feature with decorative render boundary walls and cast-iron railings. High stone walls and mature vegetation will screen any potential visual impact.
Sources	www.osi.ie; Limerick City & County Council 2022b[34]; www.buildingsofireland.ie
Images	 *Meskalls (www.buildingsofireland.ie)*
Approx Distance from FRS Measure	Approx. 100m from the proposed Cedarwood Stream measure.

Reference no.	**RPS 1080**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21807008
Location	Cloon and Commons
Site Type	House
ITM	566176, 662828
Description	No. 4 The Tontines: End-of-terrace four-bay three-storey over basement house, built in 1812, having porch to front (west) elevation. Pitched slate roof with overhanging eaves, timber brackets, rendered chimneystacks and cast-iron rainwater goods. Roughcast walls having render plinth course. Square-headed openings to second floor with six-over-three pane timber sliding sash windows. Limestone sills throughout. Square-headed openings to first and ground floors having six-over-six pane timber sliding sash windows. Square-headed openings to basement with fixed windows. Wrought-iron balconies to first floor. Porch comprising rendered walls and fixed windows. Square-headed opening having glazed overlight over double-leaf half-glazed timber panelled doors. Round-headed opening having cobweb fanlight over timber panelled door with flanking render Ionic style engaged columns. Concrete steps to entrance. Cast-iron piers to south with double-leaf cast-iron gates and railings set in rubble limestone walls.

[34] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

	This house may originally have been two houses that were joined. According to Samuel Lewis's 'Topographical Dictionary', the Tontine terrace was built in 1812 by the late W. Gabbett, Esq., from a fund raised by subscription. An elegantly proportioned and substantial Georgian style house, which retains its original form and character, together with important salient features and materials. Set back slightly from the line of the road, this house, which is part of a terrace, forms an attractive, sophisticated feature within the Castleconnell streetscape. The early surviving wrought-iron balcony and limestone dressings contribute to the historic character of the piece. Tontines were an investment plan in which participants buy shares in a common fund and receive an annuity that increases every time a participant dies, with the entire fund going to the final survivor or to those who survive after a specified time. High stone walls and mature vegetation will screen any potential visual impact.
Sources	www.osi.ie; Limerick City & County Council 2022b[35]; www.buildingsofireland.ie
Images	 *No. 4 The Tontines (www.buildingsofireland.ie)*
Approx Distance from FRS Measure	Approx. 78m, from the proposed Mall Road south measure

Reference no.	**RPS 1081**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21807007
Location	Cloon and Commons
Site Type	House
ITM	566177, 662817
Description	No. 3 The Tontines: Terraced two-bay three-storey house over basement, built in 1812. Pitched slate roof having overhanging eaves with timber brackets, rendered chimneystack and cast-iron rainwater goods. Roughcast rendered walls having render plinth course. Square-headed openings with replacement timber casement windows. Limestone sills throughout. Square-headed openings to basement with fixed windows. Round-headed opening having cobweb fanlight over timber panelled door. Limestone steps to entrance. According to Samuel Lewis's 'Topographical Dictionary', the Tontine terrace was built in 1812 by the late W. Gabbett, Esq., from a fund raised by subscription. An elegantly proportioned and substantial Georgian style house, which retains its

[35] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

	original form and character, together with important salient features and materials. Set back slightly from the line of the road, this house, which is part of a terrace, forms an attractive, sophisticated feature within the Castleconnell streetscape. Tontines were an investment plan in which participants buy shares in a common fund and receive an annuity that increases every time a participant dies, with the entire fund going to the final survivor or to those who survive after a specified time. High stone walls and mature vegetation will screen any potential visual impact.
Sources	www.osi.ie; Limerick City & County Council 2022b[36]; www.buildingsofireland.ie
Images	 *No. 3 The Tontines (www.buildingsofireland.ie)*
Approx Distance from FRS Measure	Approx. 86m from the proposed Mall Road south measure.

Reference no.	**RPS 1082**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21807006
Location	Cloon and Commons
Site Type	House
ITM	566176, 662810
Description	No. 2 The Tontines: Terraced two-bay three-storey house over basement, built in 1812. Pitched slate roof having overhanging eaves with timber brackets, rendered chimneystack and cast-iron rainwater goods. Roughcast rendered walls. Square-headed openings to second floor with replacement timber casement windows. Limestone sills throughout. Square-headed openings to first and ground floors having six-over-six pane timber sliding sash windows. Square-headed openings to basement with fixed windows. Wrought-iron balconies to first floor. Round-headed opening having cobweb fanlight over timber panelled door with flanking render Doric style engaged columns. Limestone steps to entrance. According to Samuel Lewis's 'Topographical Dictionary', the Tontine terrace was built in 1812 by the late W. Gabbett, Esq., from a fund raised by subscription. An elegantly proportioned and substantial Georgian style house, which retains its original form and character, together with important salient features and

[36] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

	materials. Set back slightly from the line of the road, this house, which is part of a terrace, forms an attractive, sophisticated feature within the Castleconnell streetscape. The early surviving wrought-iron balcony and limestone dressings contribute to the historic character of the piece. Tontines were an investment plan in which participants buy shares in a common fund and receive an annuity that increases every time a participant dies, with the entire fund going to the final survivor or to those who survive after a specified time. High stone walls and mature vegetation will screen any potential visual impact.
Sources	www.osi.ie; Limerick City & County Council 2022b[37]; www.buildingsofireland.ie
Images	 *No. 2 The Tontines (www.buildingsofireland.ie)*
Approx Distance from FRS Measure	Approx. 87m from the proposed Mall Road south measure.

Reference no.	**RPS 1083**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21807005
Location	Cloon and Commons
Site Type	House
ITM	566176, 662803
Description	No. 1 The Tontines: End-of-terrace two-bay three-storey house over basement, built in 1812. Pitched slate roof having overhanging eaves with timber brackets, rendered chimneystack and cast-iron rainwater goods. Roughcast rendered walls having limestone plinth course. Square-headed openings to second floor with six-over-three pane timber sliding sash windows. Limestone sills throughout. Square-headed openings to first and ground floors having six-over-six pane timber sliding sash windows. Square-headed opening to basement with fixed window. Wrought-iron balcony to first floor. Round-headed opening having cobweb fanlight over half-glazed timber panelled door with flanking render Ionic style engaged columns. Limestone steps to entrance. According to Samuel Lewis's 'Topographical Dictionary', the Tontine terrace was built in 1812 by the late W. Gabbett, Esq., from a fund raised by subscription. An elegantly proportioned and substantial Georgian style house, which retains its original form and character, together with important salient features and materials. Set back slightly from the line of the road, this house, which is part of

[37] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

	a terrace, forms an attractive, sophisticated feature within the Castleconnell streetscape. The early surviving wrought-iron balcony and limestone dressings contribute to the historic character of the piece. Tontines were an investment plan in which participants buy shares in a common fund and receive an annuity that increases every time a participant dies, with the entire fund going to the final survivor or to those who survive after a specified time. High stone walls and mature vegetation will screen any potential visual impact.
Sources	www.osi.ie; Limerick City & County Council 2022b[38]; www.buildingsofireland.ie
Images	 *No. 1 The Tontines (www.buildingsofireland.ie)*
Approx Distance from FRS Measure	Approx. 88m from the proposed Mall Road south measure.

Reference no.	**RPS 1087**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21807011
Location	Coolbane
Site Type	House
ITM	566137, 662683
Description	Terraced three-bay two storey house with pitched-slate roof and overhanging eaves. Square-headed openings with entablatures and consoles over one-over-one pane timber sliding sash windows. Round-headed opening having render surround and glazed overlight over square-headed door. Rendered boundary walls having decorative cast-iron railings. Surrounding structures, high stone walls and mature vegetation will screen any potential visual impact.
Sources	www.osi.ie; Limerick City & County Council 2022b[39]; Google Street View

[38] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

[39] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

Images	 *Arlington (Google Street View)*
Approx Distance from FRS Measure	Approx. 63m from the Mahers Pub/Meadowbrook Estate flood relief measure

Reference no.	RPS 1088
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21807012
Location	Coolbane
Site Type	House
ITM	566149, 662670
Description	Shannon Inn: Terraced five-bay two-storey house, built c. 1800, having render shopfront to front (south-west) elevation. Pitched slate roof with rendered chimneystacks, overhanging eaves having timber brackets and cast-iron rainwater goods. Lined-and-ruled rendered walls with render plinth course and recent bronze plaque. Square-headed openings having painted stone sills, render surrounds with entablatures and consoles over one-over-one pane timber sliding sash windows. Shopfront comprising render pilasters supporting fascia and cornice over square-headed openings having Doric style pilasters supporting fascia with render cornice. Square-headed display windows having timber mullions and flanking pilasters. Square-headed opening with glazed overlight over double-leaf timber panelled doors. Pair of rendered chamfered square-profile piers to south-west having render caps and single-leaf cast-iron gate. Rendered boundary walls with cast-iron railings terminating in ornate cast-iron pier having single-leaf gate. This modest house, built as part of a terrace, is characterised by its subtle classically inspired façade and regular fenestration rhythm. Retaining salient features such as the render window surrounds, sash windows and ornate shopfront. The house is of further historical significance, being the site where Denis O'Donovan and two others were killed by Crown Forces, an event which had a significant impact of the peace negotiations, and ultimately the Treaty of 1921. Plaque to interior reads: 'This is the house where Mr Denis O'Donovan, proprietor of the Shannon Hotel, along with two others was fatally shot by crown forces on 17th April 1921. This incident so outraged public opinion in Ireland and England that it was a turning point in the peace negotiations, eventually leading to the Treaty of 1921. This plaque was unveiled by his grandson Desmond O'Malley, T.D. on 16/4/1997.' Surrounding structures, high stone walls and mature vegetation will screen any potential visual impact.

Sources	www.osi.ie; Limerick City & County Council 2022b[40]; www.buildingsofireland.ie
Images	 *Shannon Inn (www.buildingsofireland.ie)*
Approx Distance from FRS Measure	Approx. 65m from the Mahers Pub/Meadowbrook Estate flood relief measure

Reference no.	**RPS 1089**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21807013
Location	Coolbane
Site Type	House
ITM	566155, 662659
Description	Sunnyside: Terraced two-bay two-storey house, built c. 1800. Pitched slate roof with rendered chimneystacks and overhanging eaves having timber brackets. Lined-and-ruled rendered walls. Square-headed openings with painted stone sills, render surrounds, entablatures and consoles over replacement uPVC windows. Square-headed opening having flanking render pilasters and entablature with scrolled consoles over glazed overlight and replacement uPVC door. Pair of rendered square-profile piers to south-west having render caps and single-leaf cast-iron gate. Rendered boundary wall with cast-iron railings terminating in square-profile pier. This modest house, built as part of a terrace is characterised by its regular fenestration rhythm. Retaining salient features such as the render window surrounds, cast-iron gates and railings, the house makes a positive contribution to the architectural heritage of the area. Surrounding structures, high stone walls and mature vegetation will screen any potential visual impact.
Sources	www.osi.ie; Limerick City & County Council 2022b[41]; www.buildingsofireland.ie

[40] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

[41] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

Images	 *Sunnyside (www.buildingsofireland.ie)*
Approx Distance from FRS Measure	Approx. 81m from the Mahers Pub/Meadowbrook Estate flood relief measure

Reference no.	**RPS 1091**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21807001
Location	Coolbane
Site Type	House
ITM	566106, 662599
Description	Castle View House / Bradshaw's Pub: Detached three-bay two-storey house, built c. 1870, having late nineteenth-century shopfront to front (north) elevation and extensions to rear (south) elevation. Pitched slate roof with overhanging eaves having timber brackets, rendered chimneystacks, render copings and cast-iron rainwater goods. Rendered walls with render plinth course. Square-headed openings having painted concrete sills and one-over-one pane timber sliding sash windows. Round-headed opening having spoked fanlight over timber panelled door. Shopfront comprising render pilasters supporting fascia and cornice. Square-headed display opening with fixed glazed window. Square-headed opening having glazed fanlight over half-glazed timber panelled door. A well-proportioned middle-size house retaining its original form and fabric, and which contributes to the streetscape of Castleconnell. The simple shopfront contributes to the architectural design significance of the building. Surrounding structures, high stone walls and mature vegetation will screen any potential visual impact.
Sources	www.osi.ie; Limerick City & County Council 2022b[42]; www.buildingsofireland.ie

[42] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

Images	 *Castle View House / Bradshaw's Pub (www.buildingsofireland.ie)*
Approx Distance from FRS Measure	Approx. 66m from the Mahers Pub/Meadowbrook Estate flood relief measure

Reference no.	**RPS 5057**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21807035
Location	Cloon and Commons
Site Type	Post box
ITM	566179, 663219
Description	Wall-mounted cast-iron post box, c. 1890, with inscribed VR raised lettering, and raised crown motif. Set in rubble limestone wall. Manufacturer's name on base: 'W.T. Allen & Co. London.' An important feature in the streetscape, this post box represents an early surviving example of mass-produced cast-iron ware. The raised elements serve to enhance the artistic design quality of the composition, while the raised crown motif is of particular significance as a tangible reminder of the period when Ireland formed part of the British Empire.
Sources	www.osi.ie; Limerick City & County Council 2022b[43]; www.buildingsofireland.ie

[43] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

Images	 *Post box (www.buildingsofireland.ie)*
Approx Distance from FRS Measure	Approx. 56m from the Mall House flood measure.

Reference no.	**RPS 5059**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21807036
Location	Lacka
Site Type	House
ITM	566103, 663321
Description	Spa House: Detached five-bay two-storey former assembly room, built c. 1771, having recent gable-fronted canopy to entrance and three-bay single-storey extension to front (south-east). Pitched slate roof with rendered chimneystacks and cast-iron rainwater goods. Roughcast rendered walls having cast-iron ties, cut limestone walls to ground floor with cut limestone stringcourse. Square-headed openings to first floor having limestone sills and replacement uPVC windows. Round-headed openings to ground floor with cut limestone voussoirs, keystone and replacement uPVC windows. Round-headed openings to ground floor, rear (north-west) elevation having limestone keystones and replacement uPVC windows. Entrance comprising square-headed opening with replacement uPVC door. Pair of square-profile roughcast rendered piers flanking double-leaf cast-iron gates to south-east. Spa well to south-east comprising ashlar limestone surround with impost course supporting cast-iron tympanum over square-headed door opening. Pair of square-profile roughcast rendered piers having double-leaf cast-iron gates. This former assembly room retains much of its attractive and well-proportioned façade. The house is distinguished by the finely cut limestone walls and dressings, which are indicative good craftsmanship. Significantly, the site retains the former spa well with ornate limestone surround and cast-iron plaque, which serves as a reminder of Castleconnell's former position as a popular holiday and spa resort in Ireland during the eighteenth and nineteenth centuries. High stone walls and mature vegetation will screen the house and spa well from any potential visual impact.
Sources	www.osi.ie; Limerick City & County Council 2022b[44]; www.buildingsofireland.ie

[44] Limerick City & County Council 2022b. 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

Images	 *Spa House (www.buildingsofireland.ie)*
Approx Distance from FRS Measure	Approx. 23m from the proposed Grange House flood measure.

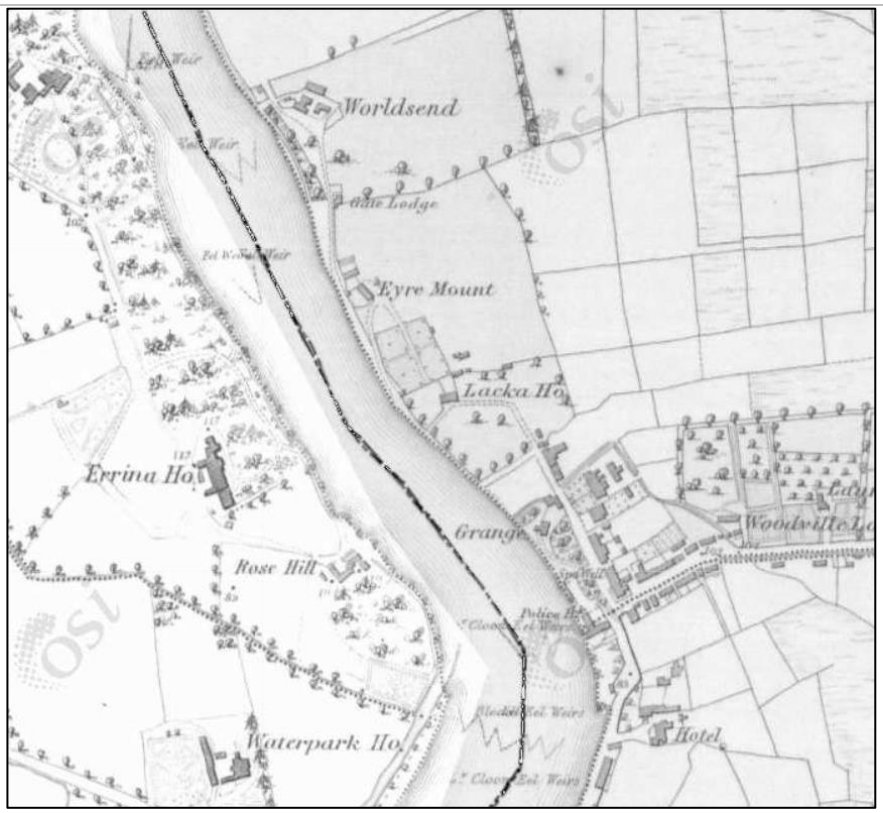
Reference no.	**RPS 5061**
Legal Status	Protected structure; Regional rating
Other Designations	NIAH 21807039
Location	Lacka
Site Type	House
ITM	566187, 663258
Description	Charco's: Detached seven-bay two-storey house, built c. 1820, having shopfront to ground floor and single-bay single-storey extension to rear. Pitched slate roof with rendered chimneystacks, overhanging eaves and cast-iron rainwater goods. Pitched slate roof to extension having red brick chimneystack. Rendered walls with render quoins. Square-headed openings to first floor having concrete sills and six-over-six pane timber sliding sash windows. Shopfront comprising timber fascia to front (south-west) and south-east elevations. Square-headed openings with timber casement windows and concrete sills. Square-headed opening having glazed overlight over timber panelled door. Render step to door. Square-headed opening to south-east elevation with timber panelled door. This house may incorporate originally more than one house. The house is distinguished by the retention of features such as the sash windows and slate roof. It is an important component of the streetscape, forming a pleasing roadside feature. High stone walls and mature vegetation will screen any potential visual impact.
Sources	www.osi.ie; Limerick City & County Council 2022b; www.buildingsofireland.ie

Images	 *Charco's*
Approx Distance from FRS Measure	Approx. 63m from the Mall House Measure

12.5.2 Undesignated Cultural Heritage Features

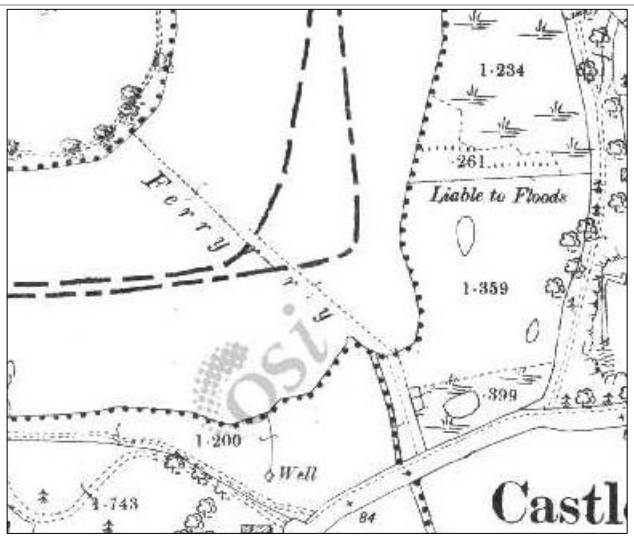
Reference no.	**MMIAH-LK-04-Ind-R-08**
Legal Status	N/A
Other Designations	N/A
Location	Cloon and Commons
Site Type	Eel weir
ITM	566089, 663087
Description	This eel weir recorded by the Evolutionary Study on the Maritime, Military and Industrial Heritage of Limerick City and County is in fact one of six eel weirs which are depicted along this portion of the River Shannon alongside the study area in the First Edition 6-inch OS map of 1844. By the time of the 1901 25-inch survey, only two of these features were depicted. This portion of the River Shannon, and particularly the Leap of Doonass to the south of the study area, were famous for eel catching. There would have been a considerable income at Castleconnell from the salmon and eel weirs interspaced between the numerous waterfalls, and there was a thriving export trade of eels and salmon to the markets of Billingsgate in London. Weirs are still visible along the river, but will not be impacted by flood relief works.
Sources	www.osi.ie; Limerick City & County Council 2019[45]

[45] Limerick City & County Council 2019. 'Evolutionary Study Report on the Maritime, Military and Industrial Heritage of Limerick City and County'. Limerick: Limerick City & County Council.

Images	 *Eel weirs at Castleconnell on First Edition 6-inch OS map, 1844 (www.osi.ie)*
Approx Distance from FRS Measure	Approx. 45m from the proposed flood measures Mall House, Mall Road North and Mall Road South.

Reference no.	**MMIAH-LK-04-Mar-S-02**
Legal Status	N/A
Other Designations	N/A
Location	Coolbane
Site Type	Ferry point
ITM	565861, 662465
Description	The site of the Castleconnell ferry is now a scenic riverside recreation area and is the site of the 'Ferry Playground'. It is no longer extant and will therefore not be impacted by the proposed FRS.
Sources	www.osi.ie; Limerick City & County Council 2019[46]

[46] Limerick City & County Council 2019. 'Evolutionary Study Report on the Maritime, Military and Industrial Heritage of Limerick City and County'. Limerick: Limerick City & County Council.

Images	 *Ferry crossing on 25-inch OS map, 1901 (www.osi.ie)*
Approx Distance from FRS Measure	Approx. 80m from the proposed Stormont House flood measure.

Reference no.	**CH4**
Legal Status	N/A
Other Designations	N/A
Location	Cloon and Commons
Site Type	Stone wall
ITM	566189, 663192
Description	A high stone wall which extends along the west side of the Mall in the Spa-well and Worldsend ACA. It extends for a distance of 82m and up to 3m high and is composed of roughly coursed limestone. The remnants of the gable end of a building is preserved in a portion of this wall, with a post wall box (RPS 5057) set into it on the northern end. It is not shown on the First Edition 6-inch map of 1844 but is indicated on 25-inch map of 1901.
Sources	N/a
Images	 *Stone wall on The Mall*

	 *Connection of Mall Road rubble stone wall abutting the modern boundary wall of Mall House*
Approx Distance from FRS Measure	Adjacent to the proposed Mall House flood measure. A low-level flood wall will abut this wall on the south end along the boundary of Mall House and Dunkineely House. It is to the rear of the wall outside the ACA.

Reference no.	**CH7**
Legal Status	N/A
Other Designations	N/A
Location	Cloon & Commons
Site Type	Stone wall
ITM	566111, 662923
Description	Roughly coursed stone wall approximately 1.2m high on east side of The Mall at Scanlon Park junction.
Sources	www.osi.ie
Images	

	Stone wall
Approx Distance from FRS Measure	On the opposite side of the road from the Mall Road North Measure

12.6 Archaeological Monitoring of Site Investigations

PROJECT

Castleconnell Flood Relief Scheme, Site Investigation Works, Archaeological Monitoring Report

CLIENT

Priority Geotechnical

PREPARED BY

Jennifer McCarthy and Caitlyn Haskins

LICENCE NO.

20E0542 & 20R0204

DATE

March 2021

Mizen Archaeology, The Forge, Inishannon, Co. Cork

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Underwater & Land Based Archaeological Services

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Plates

1. Introduction

1.1 General

Mizen Archaeology was engaged by *Priority Geotechnical* to undertake archaeological monitoring of site investigation (S.I.) works associated with Castleconnell Flood Relief Scheme. The archaeological monitoring was carried out under licence from the National Monuments Service (20E0542 & 20R0204).

2. Location

Castleconnell is a village in County Limerick located *c.*11km from Limerick City and near the boundaries of Counties Clare and Tipperary (Figure 1). It lies on the banks of the River Shannon which was an important routeway from the prehistoric period. The S.I. works were located within Cloon and Commons townland.

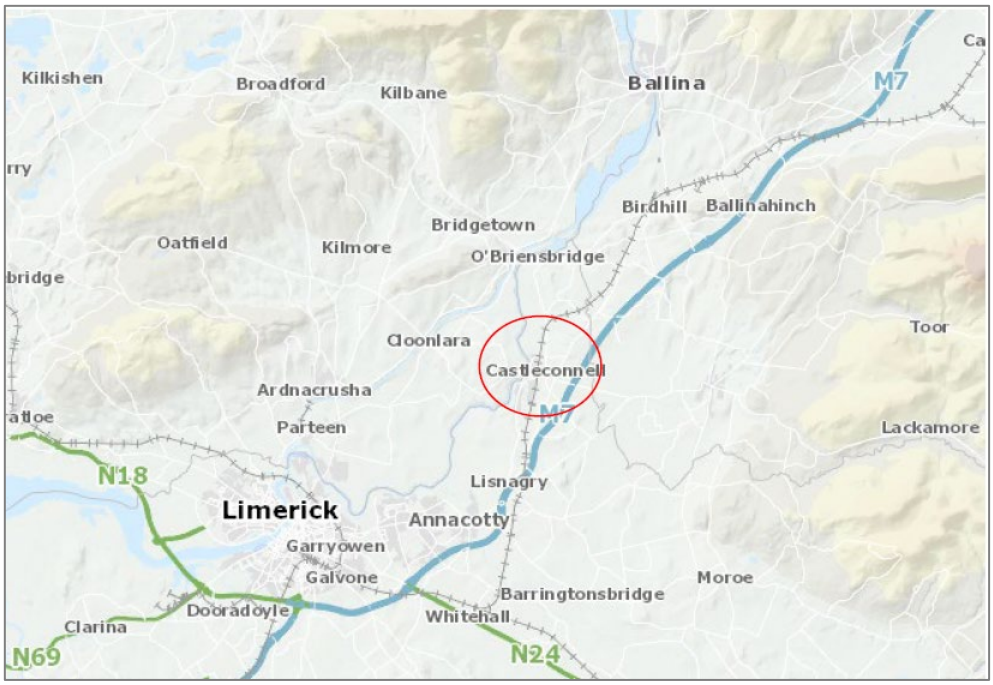

Figure 1: Site location map.

3. Scope of works

Ten site investigation trenches were archaeologically monitored:

- 4 trial pits, 1 of which are located inside the zone of notification (ZON) for the castle.
- 4 Slit trenches, 1 of which is located inside the zone of notification for the castle.

- 2 Inspection Pits to assess existing wall foundations. This is a boundary wall between the castle grounds and Coolbawn Meadows Road.

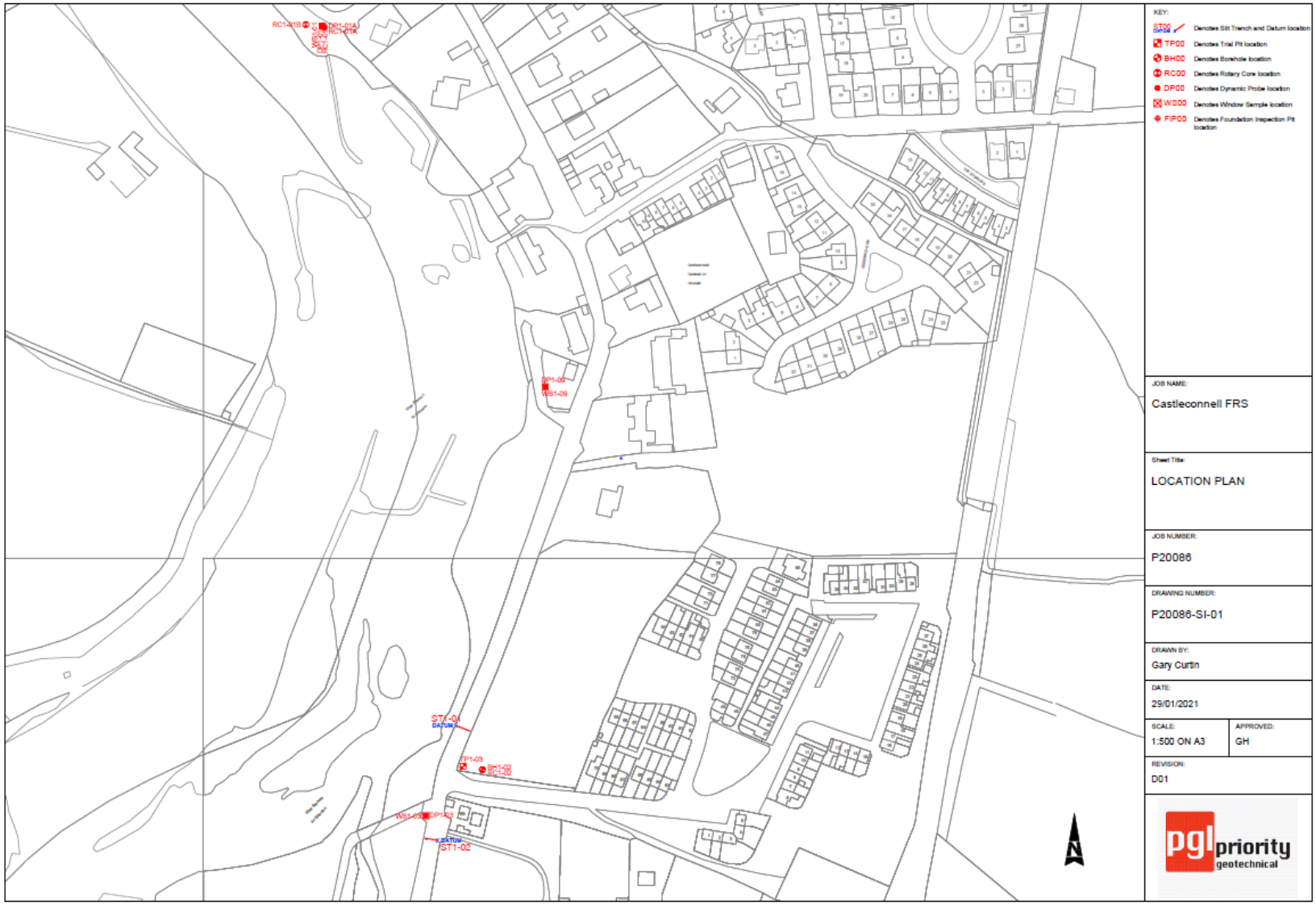

Figure 2: Site Location Map, 1 of 2

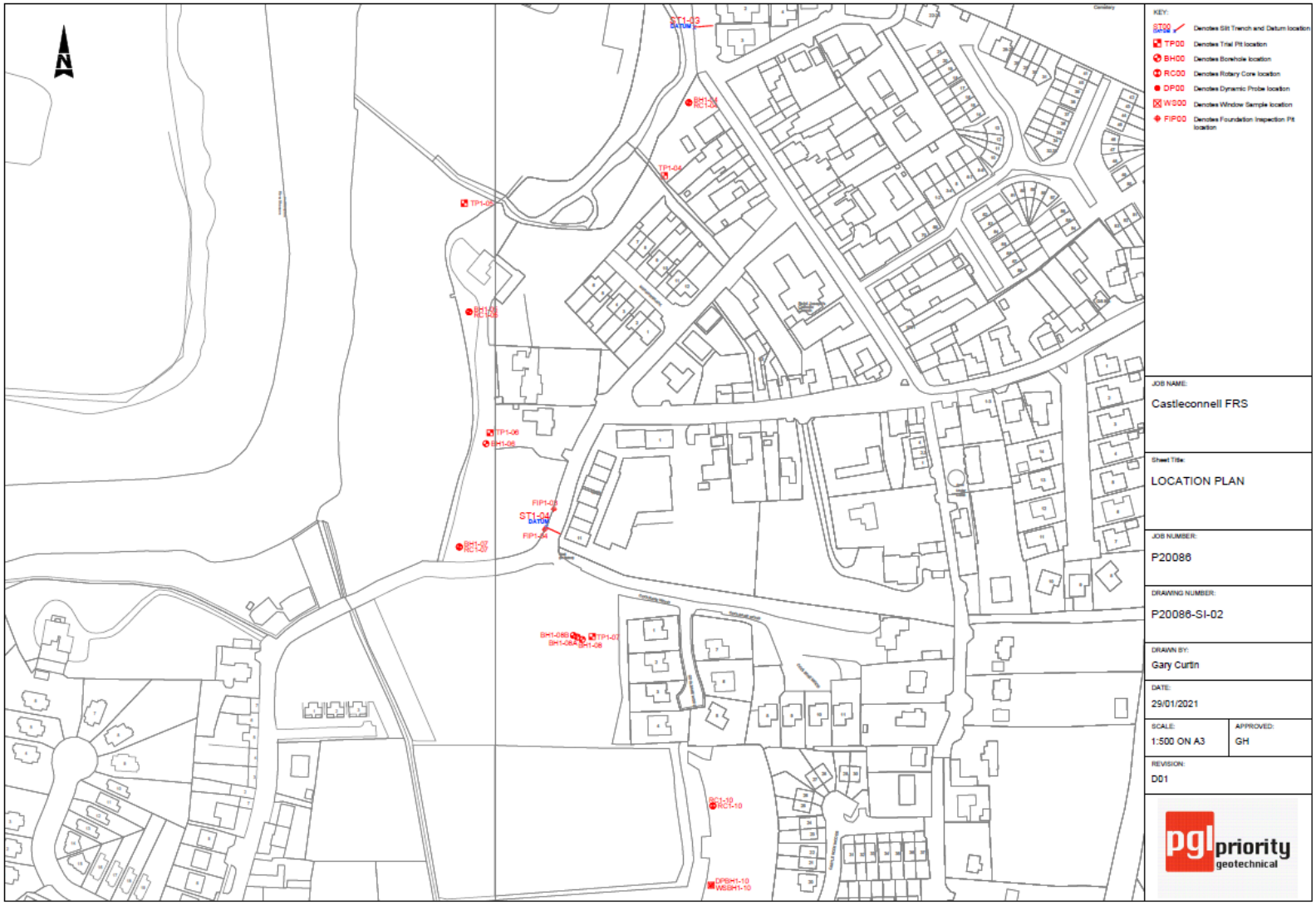

Figure 3: Site location map, 2 of 2

4. Methodology

4.1 Desktop study

A desktop study was undertaken to provide an overview of the surrounding archaeological landscape.

- The Record of Monuments and Places (RMP) compiled by the Archaeological Survey of Ireland comprises lists, classifications of monuments and maps of all recorded monuments with known locations and zones of archaeological significance. The monument records are accessible online from the National Monuments Section (NMS) of the Department of Arts, Heritage and Gaeltacht (DAHG) at www.archaeology.ie. These were used to establish the wider archaeological context of the site.
- OSI: Ordnance Survey Ireland historic and contemporary maps were examined to measure the changing landscape of the development site.
- The Excavations Bulletin online database (www.excavations.ie) which contains summaries of all archaeological excavations in Ireland, was consulted to review archaeological investigations done previously in the area.
- Cartography: Several historic maps and charts were examined (see references below for a full list).
- Aerial Photography: A variety of low and high-altitude aerial photography was examined (see references below for full list).
- Documentary sources: Several sources were examined. For a full list of all sources examined see Bibliography below.

4.2 Archaeological monitoring

Archaeological monitoring of site investigation works was undertaken during June, September and October 2020. A Bobcat E27z excavator equipped with a toothless bucket was utilised for excavating the trial pits. The spoil was spread out, visually scanned and metal detected for maximum artefact retrieval. Where potential archaeological material was uncovered in the trench, the mechanical excavation was halted to allow the monitoring archaeologist to investigate the feature by hand.

5. Results

5. Results

5.1 Historical and archaeological background

The S.I. works were located in the western limits of Castleconnell Town the vicinity of the a castle (LI001-003, Figures 4 and 5) and a church site (LI001-004001).

Figure 4: Recorded monuments in the vicinity of the works.

Castleconnell Castle is reputed to date from 1199 when King John granted five knights' fees to William de Burgh, a baron of the family of Fitz-Adelm with the condition that he erect a castle (Lewis 1837). This and the adjoining parishes were the first places in Limerick where the English obtained a foothold (*ibid*). It is thought there may have been an earlier timber castle on the site (Hannon 1984).

The castle was described by Salter (2004, 72) as standing on 'a 6m high vertical-sided rock near the Shannon are overgrown fragments of a 13th century de Burgh castle with a court measuring 48m by 30m with at least one circular tower'. Dowd (1896, 270) previously suggested that it may have originally had four round towers and at the time of writing, only two could be identified. He also interestingly noted a striking resemblance to the towers of King John's Castle downstream in Limerick city (*ibid*).

'*Caslaun Ui Chonaing*' was present by the year 1174 (Westropp 1906–7, 83). *The Annals of the Four Masters* (O'Donovan 1966) record that in the year 1200, the bawn wall of the castle was burnt by Crovderg O'Connor. The following year, Walter de Burgo was granted 'Castle Canick'. By 1242 the castle was held by Richard de Burgo which was worth £57 10s (Westropp 1906–7, 83). In 1261 under the command of Irish King Conor *na Siudaine* the castle was destroyed (*ibid*).

From 1285–7 de Burgo, harboured the Prince of Thomond, Terdeluath O'Brien in the castle in his anticipation of the raid on de Clare's lands at Cahirconlish and Grean (*ibid,* 84). The castle was repaired and enlarged by 1299 but shortly after in 1315 during the Wars of Turlough, the castle was attacked by the Bruce's (*ibid,* 84).

In the early 15th century, Walter Duff, son of Richard owned the castle amongst other large holdings and made a partition of his lands to his eldest son Richard in which it was held in the family until the mid-17th century (*ibid*, 84). The terrier of the Down Survey parish map recorded that in 1640 the castle of Castleconnell belonged to William Lord Bourke, Baron of Castleconnell.

The demise of the castle was recorded by Ferrar (1787, 470) in 1691. Under the command of prince Hesse, General Ginkle sent 700 men from Limerick to attack the castle. After a two-day siege, the garrison surrendered. Ginkle had the Castle blown up soon afterward as it was considered a potentially dangerous stronghold, in which 'the explosion was so great, that it shook the houses in Limerick and broke several windows'.

Ferrar engraved a picture of the castle which depicts the castle in a ruinous state and unroofed from the north (Figure 6). Below the castle, several thatched-roofed houses can be seen and two fishing boats on the River Shannon.

The castle today can be seen in a heavily overgrown ruinous state.

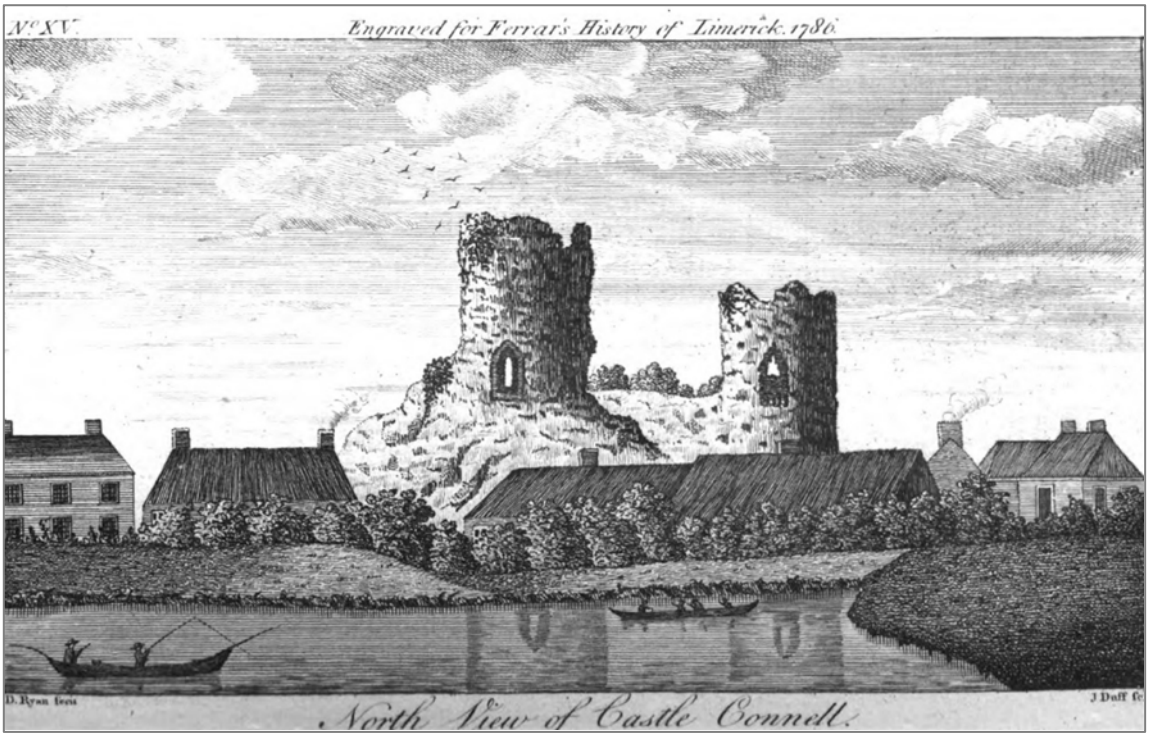

Figure 5: *'North view of Castle Connell' engraved for Ferrar's History of Limerick 1786 (468).*

C. 300m to the north of the castle lies Cloon Island and the remains of a church (LI001-004001), along with associated monuments; cross-inscribed stone (LI001-004002), cross slab (LI001-004003), a cross (LI001-004005) and a holy well (LI001-004004). The provenance of the church is uncertain and several conflicting accounts to its origins exist.

The Ordnance Survey 6-inch and 25-inch maps annotate a ‘friary’ in this location. Ferrar (1787, 193) also describes a friary which was founded in 1291 by a de Burgo, Baron of Castle Connell. Lewis (1837) also describes a friary and backs up Ferrar in stating it was founded in 1291 by Reginald de Burgh, for the Franciscans. Westropp (1904-5, 436) scepticism is clear as he describes a 'so-called "friary", of unknown identity’. No church is depicted on the Down Survey map of Stradbally parish, and it is not mentioned in the terrier of the map.

However, the presence of two Early Medieval cross-slabs built into the western gable of the church and this along with the place name and church of unknown provenance may suggest that this was an Early Medieval monastery rather than a Franciscan friary (*National Monuments Service Historic Viewer*). Alternatively, Cloon Island may have originally been the site of an Early Medieval monastery which later became a Franciscan friary in the 13th century (*ibid*).

Two cross slabs are incorporated into the fabric of the church. LI001-004002 was built into the west wall of the church. The slab measures 0.60m by 0.55m and carved with a plain encircled cross with an initial small cross and mostly illegible text overhead (Crawford 1912, 240). It was drawn by Wakeman in 1840 (Figure 6). The text was read by Macalister (1949, 98) as being a latin inscription of ‘LOBED FECET CRUCE[M]'. More recently in 2001, Okasha and Forsyth (185–7) could find no evidence to justify Macalisters reading of the slab due to the bad weathered conditions.

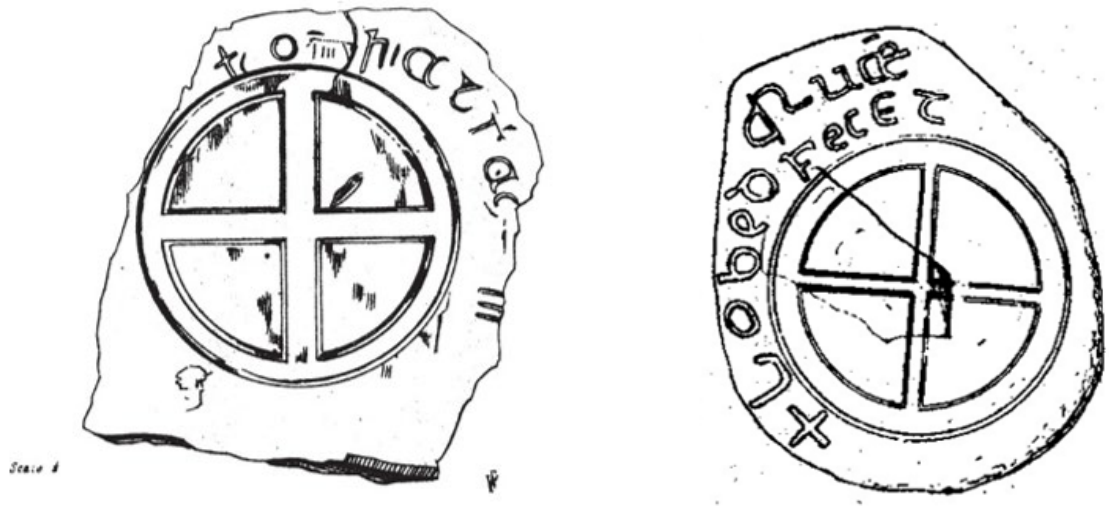

Figure 6: Drawing of two cross slabs are incorporated into the fabric of the church

Wakemans depiction of the slab in 1840 left (taken from Stokes 1872, No. 15) and Macalister's interpretation in 1949 right (slab No. 918).

The second uninscribed cross-slab measuring 0.65 by 0.80m, also inserted into the western wall is incised with a Latin cross with expanded terminals, enclosed in a rectangular frame which further adds to the churches Early Medieval foundations (Crawford 1912, 240).

A holy well is recorded as having being built on the footprint of Cloon Island House 20m to the south-west according to the Ordanance Survey letters and is steeped in local folklore.

5.2 Archaeological monitoring

Two slit-trenches, six test-pits and two inspection pits were excavated under archaeological supervision intermittently during June, September and October 2020. A Bobcat E27z excavator equipped with a toothless grading bucket was used to the excavate the slit-trenches and test-pits systematically. The up-cast spoil was spread for systematic visual assessment and metal detection using an Excalibur 1600 metal detection device. The results are tabulated below.

The borehole logs for BH1-06, 07 and 08 were obtained and reviewed as they were located within the ZON for the castle and on the immediate outskirts of the grounds. BH1–08 is located in the demesne of Coolbane house but just inside the ZON for the castle at ITM 566010, 662392. The borehole logs recorded 'made ground; dark brown, silty sandy gravel with brick fragments and high cobble content' at a depth of 0.20–1.10m which was moved *c*. 5m to the south-east to ITM 566007, 662393 due to an obstruction. BH1–08A recorded 'made ground; gravel with concrete and timber' at a depth of 0.50–0.80m.

RC1-01 located at ITM 566029, 663360 on the riverbank of the River Shannon at a depth of 3.00–3.20m, the driller recorded 'made ground; dense, boulders with timber and metal inclusions' which was then relocated *c*. 5m to the north-east at ITM 566030, 663360. RC1-01A also recorded 'made ground; boulders with metal objects' at a depth of 1.50–2.90m. Due to the small size of the rotary core at approximately 0.20m in diameter, no further information could be obtained.

Trench code: ST1-01 **Dimensions:** 9.75x0.85x0.80m **Orientation**: E-W Plate 1: ST1-01 taken from the W 	**Stratigraphy:** 0.00–0.10m Tar/concrete 0.10-0.17m Hardcore fill greyish white sandy gravel 0.17-0.70m Mid-reddish brown sandy loam with moderate small sub-angular stones 4 pipes running N-S uncovered at 0.50–1.26m

Trench code: ST1-02 **Dimensions:** 8.10x0.90x1.2m **Orientation**: E-W Plate 2: ST1-02 taken from the E 	**Stratigraphy:** 0.00-0.12m Tar/hardcore fill greyish white sandy gravel 0.12-0.25m Light beige fine sand 0.25-0.80m Light yellowish brown fine sand and gravels 0.80-1.20m Mid-reddish brown clay 2 pipes at depths of 0.54–0.75m running N-S

Trench code: ST1-03 **Trench code:** ST1-03 **Dimensions:** 11.40x0.50x1.30m **Orientation**:	**Stratigraphy:** 0.00-0.12m Tar/concrete footpath 0.12-0.40m Mid brown sandy gravel 0.40-1.30m Mid brown gravelly silt 5 pipes at depths of 0.40-1.30m running E-W
Plate 3: ST1-03 taken from S	

Trench code: ST1-04 **Dimensions:** 9.30x0.60x1.20m **Orientation**: NE-SW Plate 4: ST1-04 taken from SW 	**Stratigraphy:** 0.00-0.13m tar 0.13-0.50m backfill, dark grey sandy gravel 0.50-1.20m mid brown sandy gravel 3 pipes encountered at depths of 0.85–0.95m running NW-SE

Trench code: TP1-03 **Dimensions:** 2.10x0.80x1.95m **Orientation**: NE-SW Plate 5: TP1-03 taken from NE 	**Stratigraphy:** 0.00-0.10m Topsoil 0.10-0.60m Light brown loamy silt with frequent cobbles 0.60-3m Light reddish brown silty clay with occasional boulders

Trench code: TP 1-04 **Dimensions:** 2.50x0.70x2.05m **Orientation**: N-S Plate 6: TP 1-04 taken from S 	**Stratigraphy:** 0.00-0.05m Gravel 0.05-0.50m Light brown sandy gravel 0.50-0.70m Dark brown gravelly silt 0.70-2.05m Yellowish brown sandy clay

Trench code: TP 1-06	**Stratigraphy:**

Dimensions: 2.47m x 0.55m x 1.24m **Orientation**: N-S Plate 6: TP 1-06 taken from the S 	0.00-0.20m Topsoil 0.20-0.62m Mid brown loamy silt with frequent subangular to angular cobble inclusions. Red brick and trace amounts of charcoal. 0.62-1.24m Dark grey loamy silt with small boulder and stone inclusions. 1.24m Bedrock

Trench code: TP 1-07 **Dimensions:** 2.30 x 0.55 x 2.80 **Orientation**: E-W Plate 7: TP 1-07 taken from the W 	**Stratigraphy:** 0.00-0.10m Topsoil 0.10-0.80m Fill with modern debris (plastic fencing, cinder blocks, plastic pipe, work gloves, red brick) 0.80-2.30m Peat 2.30-2.80m Mid-grey very compact clay

Trench code: IP1-03 for wall foundations **Dimensions:** 0.65x0.50x0.47m **Orientation**: E-W Plate 8: IP1-03 taken from the W 	**Stratigraphy:** 0.00-0.50m dark brown gravelly clay Wall was 1m high and extended .35m below the current ground surface. No foundations.

Trench code: IP1-04 for wall foundations	**Stratigraphy:** 0.00-0.60m dark brown gravelly clay Wall was 1.4m high, extended 0.35m below the surface. No foundations.
Dimensions: 0.60x0.55x0.60m	
Orientation: NE-SW	
Plate 9: IP1-04 taken from NE 	

6. Conclusion

No evidence of archaeological features, stratigraphy or artefacts were uncovered during archaeological monitoring of the test pits or slit trenches.

Borehole logs RC1-01 located at ITM 566029, 663360 on the riverbank of the River Shannon at a depth of 3.00–3.20m noted the presence of timber and metal inclusions which was then relocated c. 5m to the north-east at ITM 566030, 663360. RC1-01A also recorded metal objects at a depth of 1.50–2.90m. Due to the small size of the rotary core at approximately 0.20m in diameter, no further information could be obtained. The nature of the wooden and metal material recorded in RC1-01 and RC1-01A could not be determined and it is possible that it represents archaeological material.

7. Bibliography

7.1 Documentary sources

Ferrar, J. 1787. *History of Limerick*. A. Watson and Co. http://www.askaboutireland.ie/aai-files/assets/ebooks/322_history-of-limerick/322%20The%20History%20of%20Limerick.pdf

Hannon, K. 1984. Castleconnell, part one. *Old Limerick Journal*, vol. 15, 23–28

Lewis, S. 1837. *A topographical dictionary of Ireland. London*: Lewis & Co. https://www.libraryireland.com/topog/C/Castleconnel-Clanwilliam-Limerick.php

Okasha, E. Forsyth, K. 2001. *Early Christian inscriptions of Munster: a corpus of the inscribed stones*. Cork University Press.

Salter, M. 2004. *The castles of North Munster*. Worcestershire. Folly Publications.

Westropp, T. J. 1906-7. The ancient castles of the county of Limerick. *Proceedings of the Royal Irish Academy* 26, 54-264. https://www-jstor-org.ucc.idm.oclc.org/stable/pdf/25502738.pdf?ab_segments=0%2Fbasic_search_solr_cloud%2Fcontrol&refreqid=fastly-default%3A26d5a279cb30bbd9266cf4cdf287ca6e

CASTLECONNELL FLOOD RELIEF SCHEME

Archaeological Impact Assessment (AIA) for Geotechnical Site Investigations (SI)

Dr Yolande O' Brien BA MA MIAI

10th November 2023

Ground investigations will be undertaken in advance of the Castleconnell Flood Relief Scheme in order to provide information on the ground profile and geotechnical parameters at the various locations to inform the development of the scheme and identify any areas of ground risk. The investigations will comprise of;

- 4 no. cable percussive boreholes;
- 7 no. cable percussive boreholes with rotary core follow on;
- 1 no. trial pit;
- 3 no. slit trenches;
- 6 no. inspection pits;
- 89 no. peat probes;
- 11 no. electrical resistivity tomography lines, totalling 1132 linear metres.

The following table lists specific cultural heritage constraints and archaeological potential associated with each site investigation with recommended mitigation measures. It has been prepared by Courtney Deery Heritage Consultancy and has been informed by desktop research and fieldwork associated with the scheme.

A description of the works for each SI type is as follows:

- Boreholes: A cable percussive rig, towed by a 4x4 vehicle is used to sink boreholes of up to 250mm diameter and 10-15m for cable percussive boreholes, and 10-20m for cable percussive boreholes with rotary core follow-on up to 30m deep. Cores are typically 100mm diameter and are recovered intact.
- Trial pits are machine excavated typically measuring 3m x 1m and up to a depth of approximately 4.5m bgl.
- Slit trenches are typically 0.5m-0.6m wide and can vary in depth and length depending on their purpose but are typically <1.5m. It is proposed to excavate the slit trenches by hand.
- The inspection pits will be 0.7m wide, 1m deep and 1m long It is proposed to excavate the inspection pits by hand.
- Peat probes use an initial 120cm probe with 94cm extendable rods. The probe is a handheld apparatus that is pushed into the peat manually until it refuses (reaching the bottom of the peat or hitting an obstruction). It is very non-invasive due to eh small diameter of the probe.
- It is proposed to use a flat electrode method (FEM) which uses a flat conductor placed on the ground surface, which does not damage existing paved surfaces and is non-invasive.
- There will be no underwater site investigations.

As peat probes are minimally invasive and will be undertaken across one area at Coolbane Woods, they are assessed as one unit in this AIA. It is not anticipated that the electrical resistivity tomography lines will have an impact on cultural heritage and they have therefore been scoped out of the AIA.

Three SI location (CP-009, IP-005, IP-006) fall inside the Zone of Notification (ZoN) for Castle Connell (RMP LI001-003), and it is possible that features related to this Anglo-Norman fortification will survive beneath the surface. There may also be a survival of earlier features related to the pre-

Norman fortification which existed on this site, and later structures which are depicted in an 18th century etching of the area.

Two SI locations (TP-001, ST-003) also fall within the ZoN of the 13th century friary and probable Early Christian foundation on Cloon Island (RMP LI001-004001), with another two which are within 30m of the ZoN (CP-005, CP-006). There is the potential for subsurface features related to the ecclesiastical site to survive in this area.

Four SI locations (CP/RC-004, IP-001, IP-002, IP-003) are directly adjacent to stone river walls which mark former townland boundaries. There is the potential to impact the wall and the former boundary. These walls are due to be replaced as part of the flood relief scheme and any impact will be mitigated as part of the replacement works. However, the inspection pits will be archaeologically monitored as a matter of course.

Lands in proximity to watercourses are inherently of high archaeological potential and may include sites related to settlement, industry, subsistence and communication, with the potential for waterlogged organic remains. It is therefore recommended that all inspection pits, slit trenches and trial pits will be archaeologically monitored.

Due to the small diameter and negligible impact of borehole-type investigations, archaeological monitoring is not recommended for the majority of these site investigations. However, boreholes which are located within or within 30m of statutory Zones of Notification (CP/RC-002, CP/RC-003, CP/RC-004, CP-009) will be subject to archaeological monitoring. For all other borehole-type investigations, the logs and reports of will be made available to the SI contractor's consultant archaeologist to inform on the nature and depth of stratigraphy in the area. All trial pits, slit trenches and inspection pits will be subject to archaeological monitoring.

All archaeological monitoring will take place under a Section 26 licence from the National Monuments Service of the Department of Housing, Local Government and Heritage. The consulting archaeologist who will be employed by the SI contractor to undertake the archaeological monitoring will apply for the licence which will take up to four weeks to procure.

Access for all areas apart from the Coolbane Woods area will be obtained from the surrounding properties and the main roads. Access to the northern portion of the Coolbane Woods area (for CP-009 and a portion of the peat probes) will be directly from Coolbane Lane. Access to the southern portion (CP/RC-010, CP-011, the remainder of the peat probes) is proposed via an existing construction route.

The licensed monitoring archaeologist will accompany the site investigations team to the relevant site investigation. Care will be taken to ensure there is no impact caused by machinery accessing and egressing the site investigations works area. All personnel should be made aware of the existence and extent of Zones of Notification and traffic should be limited in these areas. The licensed monitoring archaeologist will record the results of the relevant site investigations, including with photographs, detailed notes and ITM coordinates. If archaeology is encountered all excavation works will be immediately stopped in the locality and the remains will be protected. The National Monuments Service will be immediately notified. An appropriate mitigation strategy for any identified remains will be agreed with the developer and the National Monuments Service.

Twelve site investigations (CP/RC-002, CP/RC-005, CP-006, CP-007, CP/RC-008, ST-001, ST-002, ST-003, TP-001, IP-004, IP-005, IP-006) are located within the Architectural Conservation Areas (ACAs) of Castleconnell. No impact related to the character of the ACA has been identified. Potential impacts to built heritage features comprise of unintended impacts to foundations of the river walls noted above,

as potential impacts to the causeway to Island House. The causeway is a protected structure (RPS 5056) and there is the potential for two site investigations (ST-001, ST-002) to impact the structure. These slit trenches are envisaged to be excavated by hand, reducing the potential for impact to the structure. Additionally, there is the potential for inadvertent damage to the structure related to access and egress at these sites and at a further three site investigations in the grounds of Island House (CP/RC-005, ST-003, TP-001). It is recommended that a traffic management plan be implemented to protect these sites.

Cumulative impact of the overall site investigation works on archaeological and cultural heritage will be ameliorated with appropriate mitigation measures as set out in the table below. All future works will be mitigated with method statements agreed by the NMS.

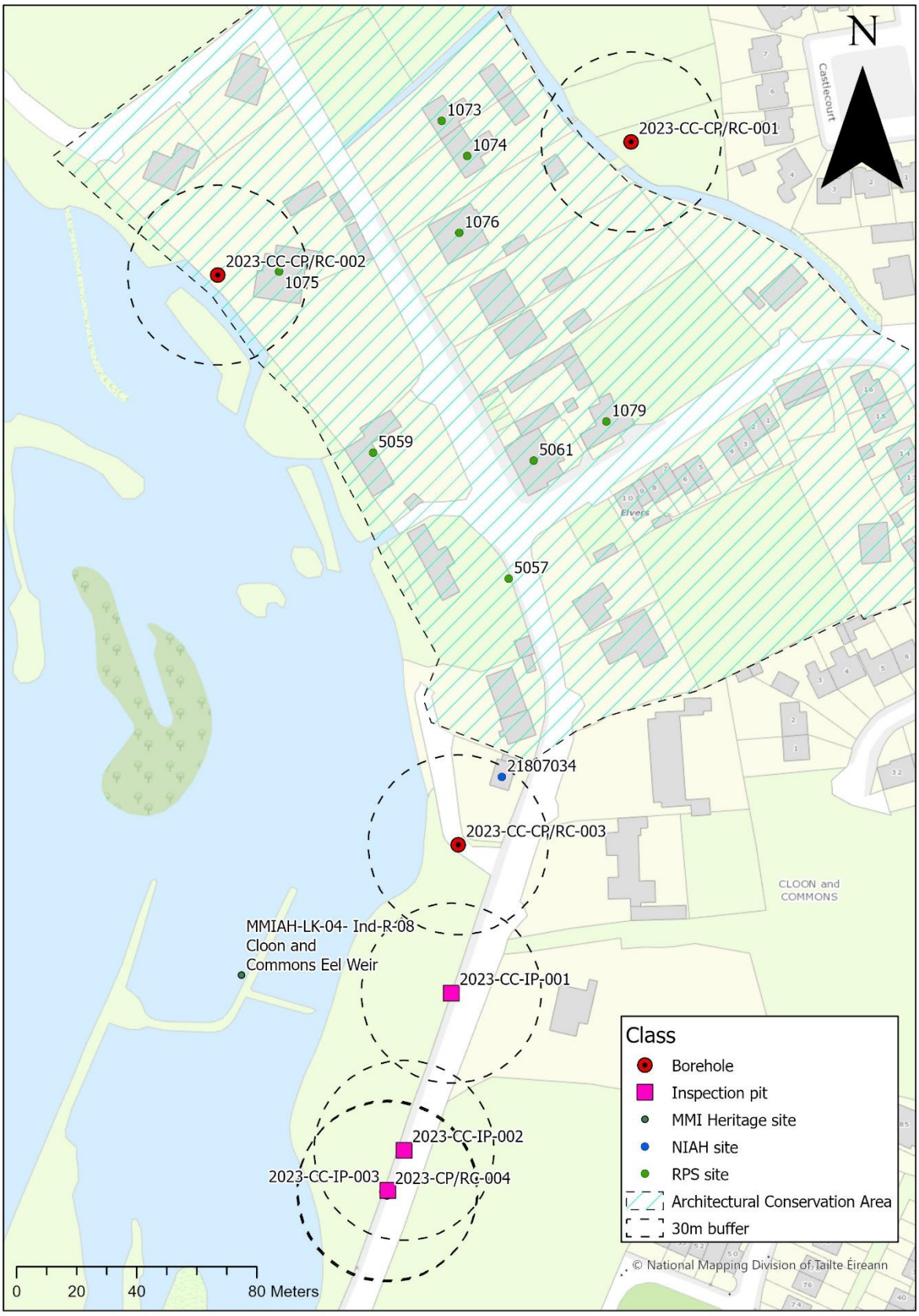

Plate 1 Site investigation locations (North)

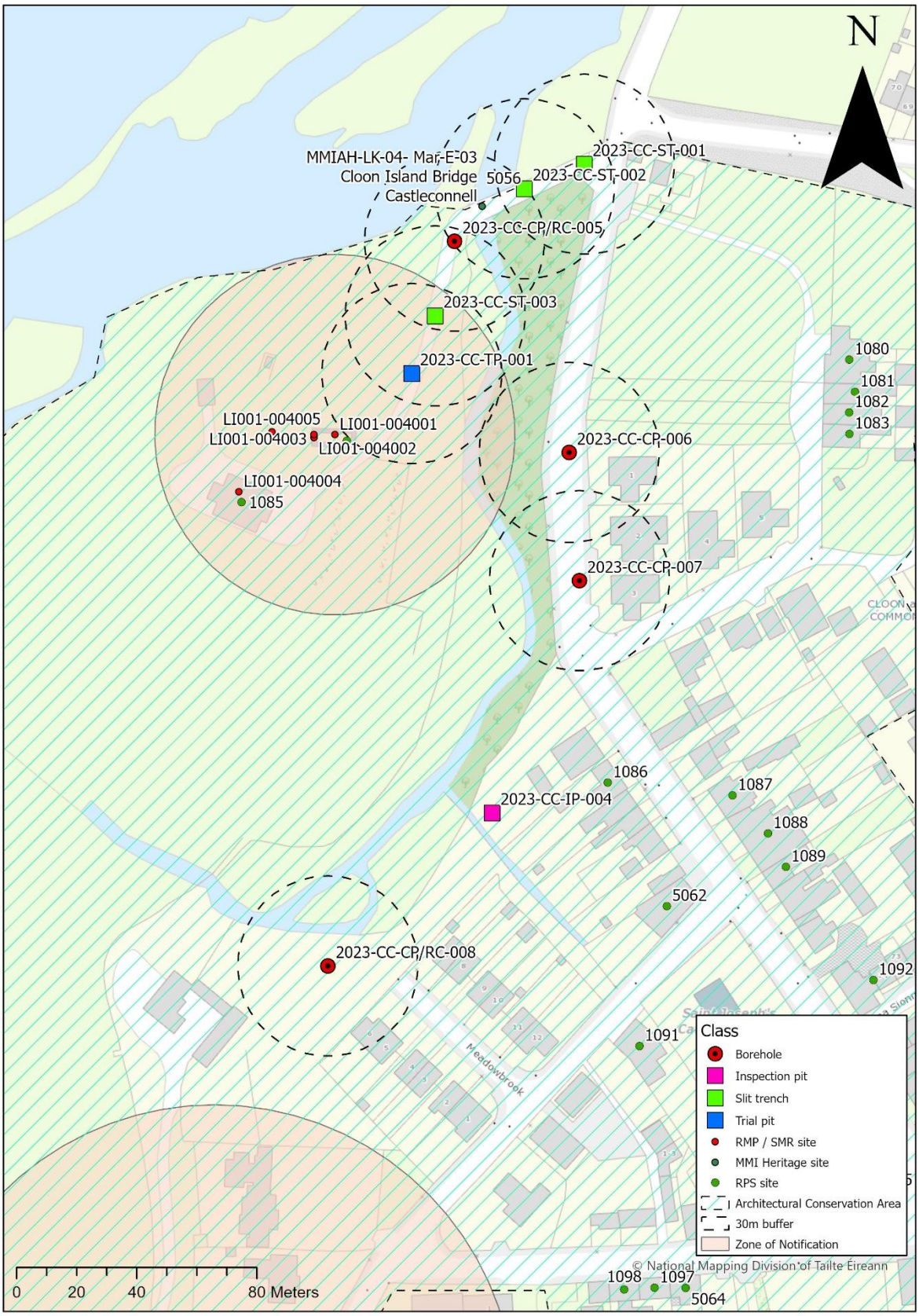

Plate 2 Site investigation locations (Central area)

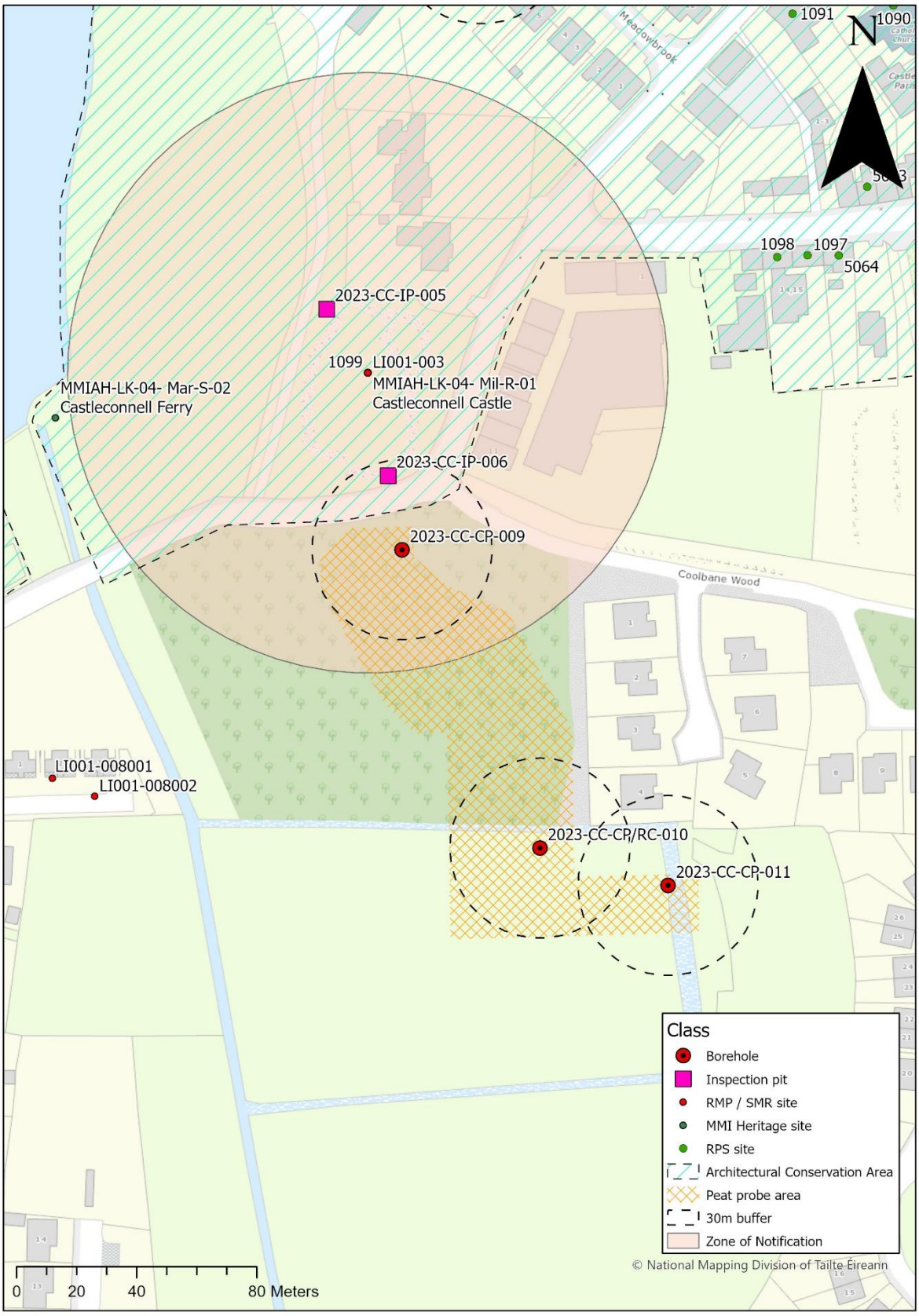

Plate 3 Site investigation locations (South)

SI No.	SI Type	ITM E	ITM N	Cultural Heritage Impact	Mitigation
2023-CC-CP/RC-001	Cable percussive borehole with rotary core follow on	566219.781	663364.47	a) Greenfield site in proximity to watercourse. Potential negligible impact to subsurface features. b) <30m from ACA. No impact.	a) SI monitoring archaeologist to review logs and reports. b) N/A
2023-CC-CP/RC-002	Cable percussive borehole with rotary core follow on	566082.123	663320.147	a) Proximity to watercourse. Potential negligible impact to subsurface features. b) Within ACA. No impact. c) <30m from designated built heritage asset – Grange House (RPS 1075). No impact. d) Adjacent to stone wall and former townland boundary. No impact.	a) SI monitoring archaeologist to review logs and reports. b) N/A c) N/A d) N/A
2023-CC-CP/RC-003	Cable percussive borehole with rotary core follow on	566162.208	663130.426	a) Proximity to watercourse. Potential negligible impact to subsurface features. b) <30m from designated built heritage asset – Mall House (NIAH 21807034). No impact. c) Adjacent to stone wall and former townland boundary. No impact.	a) SI monitoring archaeologist to review logs and reports. b) N/A c) N/A
2023-CP/RC-004	Cable percussive borehole	566138.497	663014.885	a) Proximity to watercourse. Potential negligible impact to subsurface features. b) Adjacent to stone wall and former townland boundary. Potential to impact wall and subsurface features. However, wall is to be replaced as part of flood relief measures.	a) SI monitoring archaeologist to review logs and reports. b) Will be mitigated in advance of / during construction phase. (See also IP-003).
2023-CC-CP/RC-005	Cable percussive borehole with rotary core follow on	566044.837	662867.359	a) <30m from ZoN for ecclesiastical site (RMP LI001-004001). Potential impact to related subsurface features. b) Proximity to watercourse. Potential impact to subsurface features. c) Within ACA. No impact. d) Within grounds of designated built heritage asset – Island House (RPS 1085). No impact to house.	a) Licensed archaeological monitoring. The area of the ZoN should be avoided by all machinery traversing this area and SI contractors should be made aware of the limits and extent of this ZoN. b) Licensed archaeological monitoring.

SI No.	SI Type	ITM E	ITM N	Cultural Heritage Impact	Mitigation
				e) <30m from designated built heritage asset – Causeway to Island House (RPS 5056). Potential for indirect impact from access and egress.	c) N/A d) N/A e) Licensed archaeological monitoring.
2023-CC-CP-006	Cable percussive borehole	566083.028	662797.076	a) <30m from ZoN for ecclesiastical site (RMP LI001-004001). Potential impact to related subsurface features. b) Proximity to watercourse. Potential impact to subsurface features. c) Within ACA. No impact.	a) Licensed archaeological monitoring. b) Licensed archaeological monitoring. c) N/A
2023-CC-CP-007	Cable percussive borehole	566086.442	662754.419	a) Proximity to watercourse. Potential negligible impact to subsurface features. b) Within ACA. No impact.	a) SI monitoring archaeologist to review logs and reports. b) N/A
2023-CC-CP/RC-008	Cable percussive borehole with rotary core follow on	566002.665	662626.191	a) Proximity to watercourse. Potential negligible impact to subsurface features. b) Within ACA. No impact. c) Within grounds of undesignated built heritage asset – Stormont House. No impact.	a) SI monitoring archaeologist to review logs and reports. b) N/A c) N/A
2023-CC-CP-009	Cable percussive borehole	565976.394	662421.042	a) Within ZoN for castle (RMP LI001-003). Potential impact to related subsurface features. b) Within area of peat. Potential to impact subsurface features and preserved organic remains. c) Within ACA. No impact.	a) Licensed archaeological monitoring. SI contractors should be made aware of the limits and extent of the ZoN and traffic across this area should be limited. b) Licensed archaeological monitoring. c) N/A
2023-CC-CP/RC-010	Cable percussive borehole with rotary core follow on	566022.342	662321.743	a) Within area of peat. Potential negligible impact to subsurface features and preserved organic remains.	a) SI monitoring archaeologist to review logs and reports.

SI No.	SI Type	ITM E	ITM N	Cultural Heritage Impact	Mitigation
2023-CC-CP-011	Cable percussive borehole	566064.981	662309.297	a) Within area of peat. Potential negligible impact subsurface to features and preserved organic remains.	a) SI monitoring archaeologist to review logs and reports.
2023-CC-IP-001	Inspection pit	566159.926	663081.032	a) Proximity to watercourse. Potential impact to subsurface features. b) Adjacent to stone wall and former townland boundary. (Wall is to be replaced as part of flood relief measures.) Potential to impact wall and subsurface features.	a) Licensed archaeological monitoring. b) Photographic and written record of wall and subsurface features to be taken as part of archaeological monitoring.
2023-CC-IP-002	Inspection pit	566144.183	663028.697	a) Proximity to watercourse. Potential impact to subsurface features. b) Adjacent to stone wall and former townland boundary. (Wall is to be replaced as part of flood relief measures.) Potential to impact wall and subsurface features.	a) Licensed archaeological monitoring. b) Photographic and written record of wall and subsurface features to be taken as part of archaeological monitoring.
2023-CC-IP-003	Inspection pit	566138.801	663015.34	a) Proximity to watercourse. Potential impact to subsurface features. b) Adjacent to stone wall and former townland boundary. (Wall is to be replaced as part of flood relief measures.) Potential to impact wall and subsurface features.	a) Licensed archaeological monitoring. b) Photographic and written record of wall and subsurface features to be taken as part of archaeological monitoring.
2023-CC-IP-004	Inspection pit	566057.48	662677.22	a) Proximity to watercourse. Potential impact to subsurface features. b) Within ACA. No impact to character of ACA.	a) Licensed archaeological monitoring. b) N/A
2023-CC-IP-005	Inspection pit	565951.20	662501.24	a) Within ZoN for castle (RMP LI001-003). Potential impact to related subsurface features. b) Within ACA. No impact to character of ACA. c) Within grounds of undesignated built heritage asset – Stormont House. No impact.	a) Licensed archaeological monitoring. SI contractors should be made aware of the limits and extent of the ZoN and traffic across this area should be limited. b) N/A

SI No.	SI Type	ITM E	ITM N	Cultural Heritage Impact	Mitigation
					c) N/A
2023-CC-IP-006	Inspection pit	565971.82	662445.71	a) Within ZoN for castle (RMP LI001-003). Potential impact to related subsurface features. b) Within ACA. No impact to character of ACA.	a) Licensed archaeological monitoring. SI contractors should be made aware of the limits and extent of the ZoN and traffic across this area should be limited. b) N/A
2023-CC-ST-001	Slit trench	566088.1	662893	a) Proximity to watercourse but located on 19th century masonry causeway. No impact. b) Within ACA. No impact to character of ACA, but potential for impact to a protected structure. c) On a built heritage asset – Island House causeway (RPS 5056). Potential to impact structure from slit trench and potential for indirect impact from access and egress. d) Within grounds of designated built heritage asset – Island House (RPS 1085). No impact to house but potential for impact to causeway to property.	a) N/A b) To be excavated by hand and to be archaeologically monitored. c) To be excavated by hand and to be archaeologically monitored; Traffic management plan and signage. d) To be excavated by hand and to be archaeologically monitored
2023-CC-ST-002	Slit trench	566068.1	662884.8	a) Proximity to watercourse but located on 19th century masonry causeway. No impact. b) Within ACA. No impact to character of ACA, but potential for impact to a protected structure. c) On a built heritage asset – Island House causeway (RPS 5056). Potential to impact structure from slit trench and potential for indirect impact from access and egress. d) Within grounds of designated built heritage asset – Island House (RPS 1085). No impact to house but potential for impact to causeway to property..	a) N/A b) To be excavated by hand and to be archaeologically monitored. c) To be excavated by hand and to be archaeologically monitored. d) To be excavated by hand and to be archaeologically monitored.

SI No.	SI Type	ITM E	ITM N	Cultural Heritage Impact	Mitigation
2023-CC-ST-003	Slit trench	566038.4	662842.5	a) Within ZoN for ecclesiastical site (RMP LI001-004001). Potential impact to related subsurface features. b) Proximity to watercourse. Potential impact to subsurface features. c) Within ACA. No impact. d) Within grounds of designated built heritage asset – Island House (RPS 1085). No impact to house. e) Access via designated built heritage asset – Causeway to Island House (RPS 5056). Potential for indirect impact from access and egress.	a) Licensed archaeological monitoring. SI contractors should be made aware of the limits and extent of the ZoN and traffic across this area should be limited. b) Licensed archaeological monitoring. c) N/A d) N/A e) Traffic management plan and signage.
2023-CC-TP-001	Trial pit	566030.626	662823.335	a) Within ZoN for ecclesiastical site (RMP LI001-004001). Potential impact to related subsurface features. b) Proximity to watercourse. Potential impact to subsurface features. c) Within ACA. No impact. d) Within grounds of designated built heritage asset – Island House (RPS 1085). No impact to house. e) Access via designated built heritage asset – Causeway to Island House (RPS 5056). Potential for indirect impact from access and egress.	a) Licensed archaeological monitoring. SI contractors should be made aware of the limits and extent of the ZoN and traffic across this area should be limited. b) Licensed archaeological monitoring. c) N/A d) N/A e) Traffic management plan and signage
Peat probes	89 peat probes			a) Within ZoN for castle (RMP LI001-003). Potential imperceptible impact to related subsurface features. Potential for indirect impact to ZoN from access and egress. b) Within area of peat. Potential imperceptible impact subsurface features and preserved organic remains.	a) SI contractors should be made aware of the limits and extent of the ZoN and traffic across this area should be limited. b) N/A

PROJECT

Castleconnell Flood Relief Scheme, Site Investigation Works, Archaeological Monitoring Report

CLIENT

Priority Geotechnical

PREPARED BY

Jennifer McCarthy and Caitlyn Haskins

LICENCE NO.

20E0542 & 20R0204

DATE

March 2021

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Underwater & Land Based Archaeological Services

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1. Introduction

1.1 General

Mizen Archaeology was engaged by *Priority Geotechnical* to undertake archaeological monitoring of site investigation (S.I.) works associated with Castleconnell Flood Relief Scheme. The archaeological monitoring was carried out under licence from the National Monuments Service (20E0542 & 20R0204).

2. Location

Castleconnell is a village in County Limerick located *c.*11km from Limerick City and near the boundaries of Counties Clare and Tipperary (Figure 1). It lies on the banks of the River Shannon which was an important routeway from the prehistoric period. The S.I. works were located within Cloon and Commons townland.

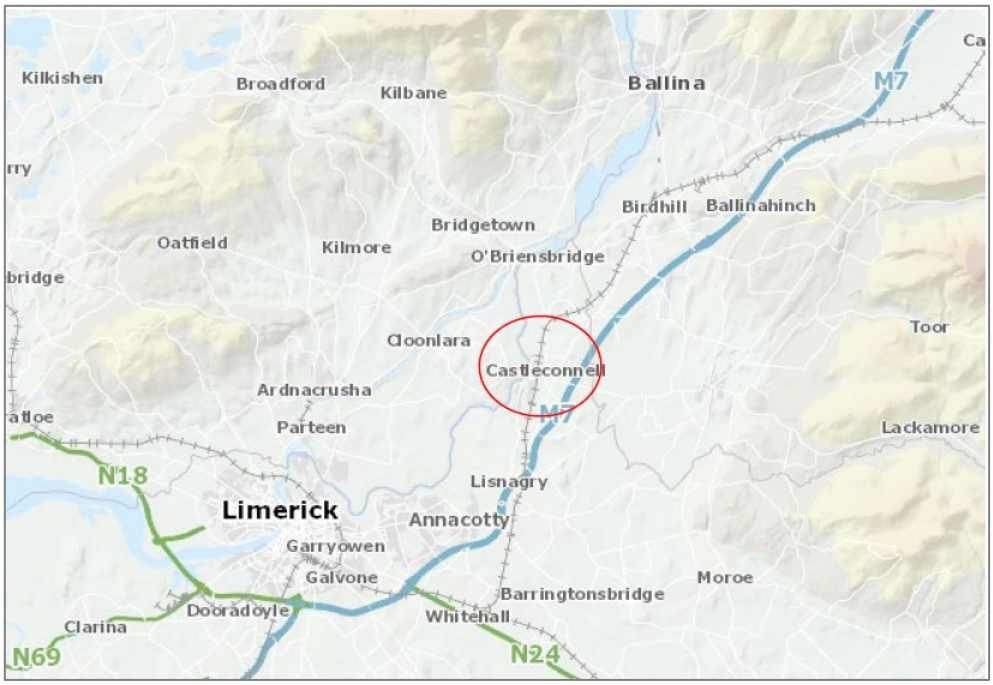

Figure 1: Site location map.

3. Scope of works

Ten site investigation trenches were archaeologically monitored:

- 4 trial pits, 1 of which are located inside the zone of notification (ZON) for the castle.
- 4 Slit trenches, 1 of which is located inside the zone of notification for the castle.

- 2 Inspection Pits to assess existing wall foundations. This is a boundary wall between the castle grounds and Coolbawn Meadows Road.

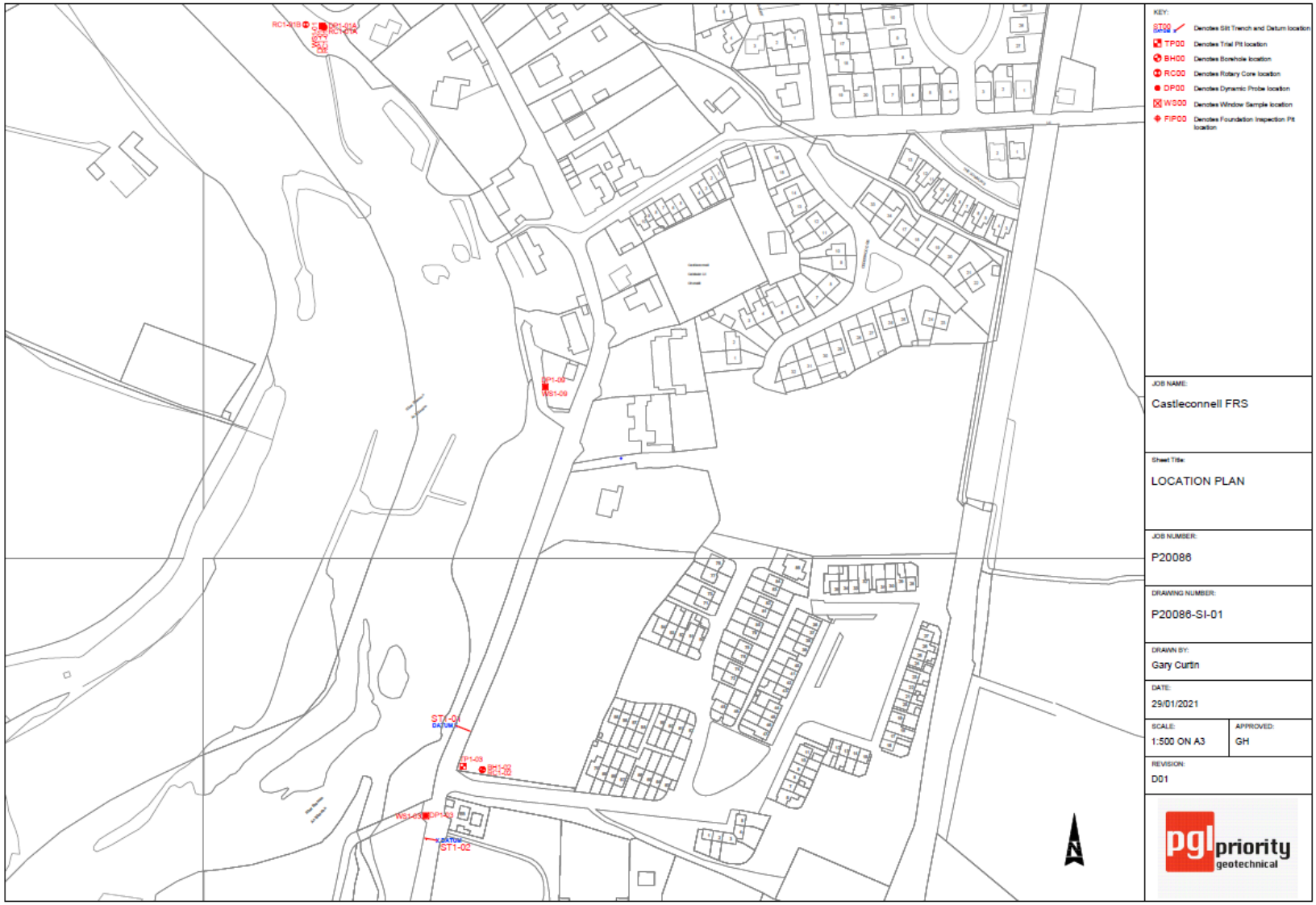

Figure 2: Site Location Map, 1 of 2

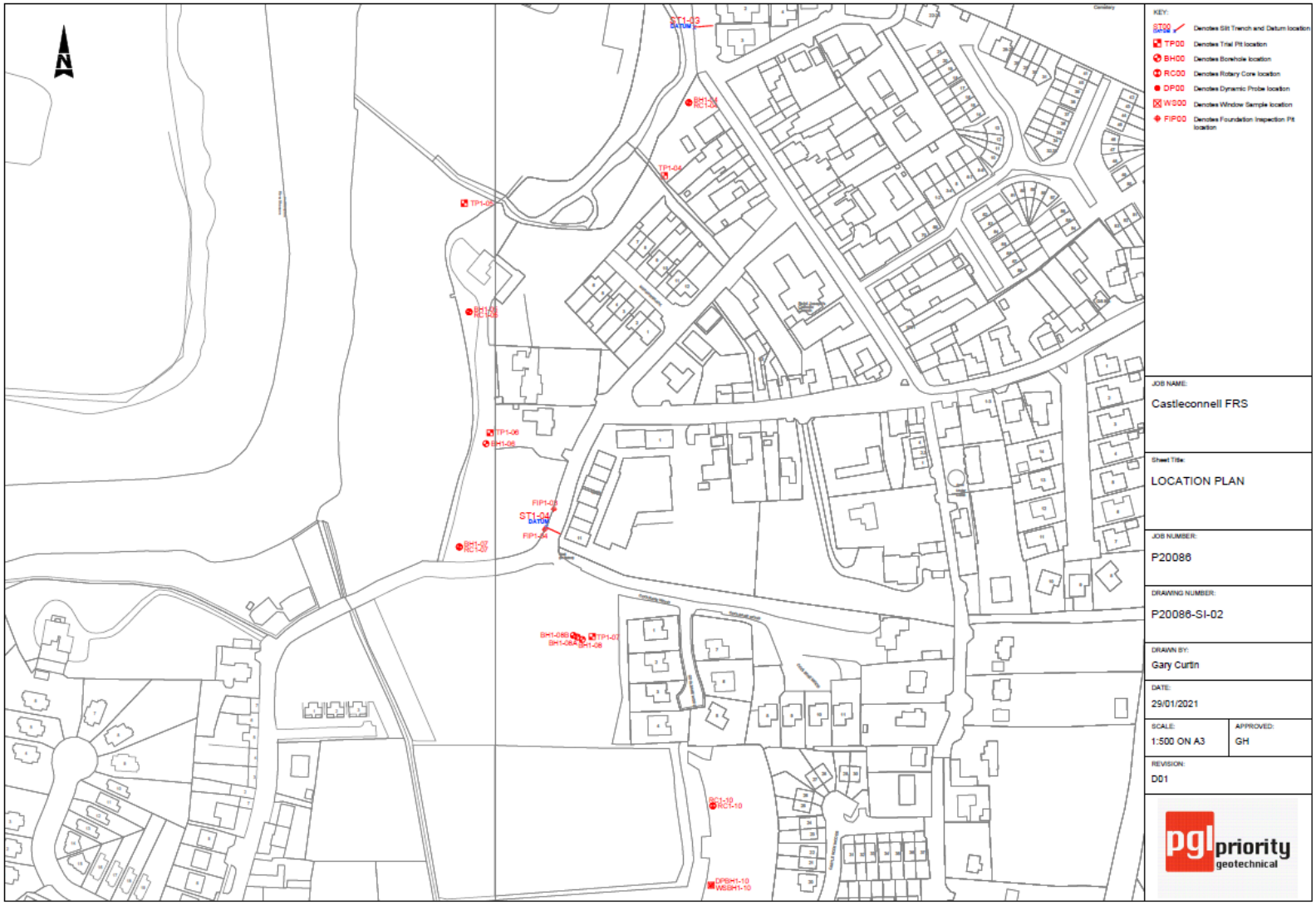

Figure 3: Site location map, 2 of 2

4. Methodology

4.1 Desktop study

A desktop study was undertaken to provide an overview of the surrounding archaeological landscape.

- The Record of Monuments and Places (RMP) compiled by the Archaeological Survey of Ireland comprises lists, classifications of monuments and maps of all recorded monuments with known locations and zones of archaeological significance. The monument records are accessible online from the National Monuments Section (NMS) of the Department of Arts, Heritage and Gaeltacht (DAHG) at www.archaeology.ie. These were used to establish the wider archaeological context of the site.
- OSI: Ordnance Survey Ireland historic and contemporary maps were examined to measure the changing landscape of the development site.
- The Excavations Bulletin online database (www.excavations.ie) which contains summaries of all archaeological excavations in Ireland, was consulted to review archaeological investigations done previously in the area.
- Cartography: Several historic maps and charts were examined (see references below for a full list).
- Aerial Photography: A variety of low and high-altitude aerial photography was examined (see references below for full list).
- Documentary sources: Several sources were examined. For a full list of all sources examined see Bibliography below.

4.2 Archaeological monitoring

Archaeological monitoring of site investigation works was undertaken during June, September and October 2020. A Bobcat E27z excavator equipped with a toothless bucket was utilised for excavating the trial pits. The spoil was spread out, visually scanned and metal detected for maximum artefact retrieval. Where potential archaeological material was uncovered in the trench, the mechanical excavation was halted to allow the monitoring archaeologist to investigate the feature by hand.

5. Results

5. Results

5.1 Historical and archaeological background

The S.I. works were located in the western limits of Castleconnell Town the vicinity of the a castle (LI001-003, Figures 4 and 5) and a church site (LI001-004001).

Figure 4: Recorded monuments in the vicinity of the works.

Castleconnell Castle is reputed to date from 1199 when King John granted five knights' fees to William de Burgh, a baron of the family of Fitz-Adelm with the condition that he erect a castle (Lewis 1837). This and the adjoining parishes were the first places in Limerick where the English obtained a foothold (*ibid*). It is thought there may have been an earlier timber castle on the site (Hannon 1984).

The castle was described by Salter (2004, 72) as standing on 'a 6m high vertical-sided rock near the Shannon are overgrown fragments of a 13th century de Burgh castle with a court measuring 48m by 30m with at least one circular tower'. Dowd (1896, 270) previously suggested that it may have originally had four round towers and at the time of writing, only two could be identified. He also interestingly noted a striking resemblance to the towers of King John's Castle downstream in Limerick city (*ibid*).

'*Caslaun Ui Chonaing*' was present by the year 1174 (Westropp 1906–7, 83). *The Annals of the Four Masters* (O'Donovan 1966) record that in the year 1200, the bawn wall of the castle was burnt by Crovderg O'Connor. The following year, Walter de Burgo was granted 'Castle Canick'. By 1242 the castle was held by Richard de Burgo which was worth £57 10s (Westropp 1906–7, 83). In 1261 under the command of Irish King Conor *na Siudaine* the castle was destroyed (*ibid*).

From 1285–7 de Burgo, harboured the Prince of Thomond, Terdeluath O'Brien in the castle in his anticipation of the raid on de Clare's lands at Cahirconlish and Grean (*ibid,* 84). The castle was repaired and enlarged by 1299 but shortly after in 1315 during the Wars of Turlough, the castle was attacked by the Bruce's (*ibid,* 84).

In the early 15th century, Walter Duff, son of Richard owned the castle amongst other large holdings and made a partition of his lands to his eldest son Richard in which it was held in the family until the mid-17th century (*ibid*, 84). The terrier of the Down Survey parish map recorded that in 1640 the castle of Castleconnell belonged to William Lord Bourke, Baron of Castleconnell.

The demise of the castle was recorded by Ferrar (1787, 470) in 1691. Under the command of prince Hesse, General Ginkle sent 700 men from Limerick to attack the castle. After a two-day siege, the garrison surrendered. Ginkle had the Castle blown up soon afterward as it was considered a potentially dangerous stronghold, in which 'the explosion was so great, that it shook the houses in Limerick and broke several windows'.

Ferrar engraved a picture of the castle which depicts the castle in a ruinous state and unroofed from the north (Figure 6). Below the castle, several thatched-roofed houses can be seen and two fishing boats on the River Shannon.

The castle today can be seen in a heavily overgrown ruinous state.

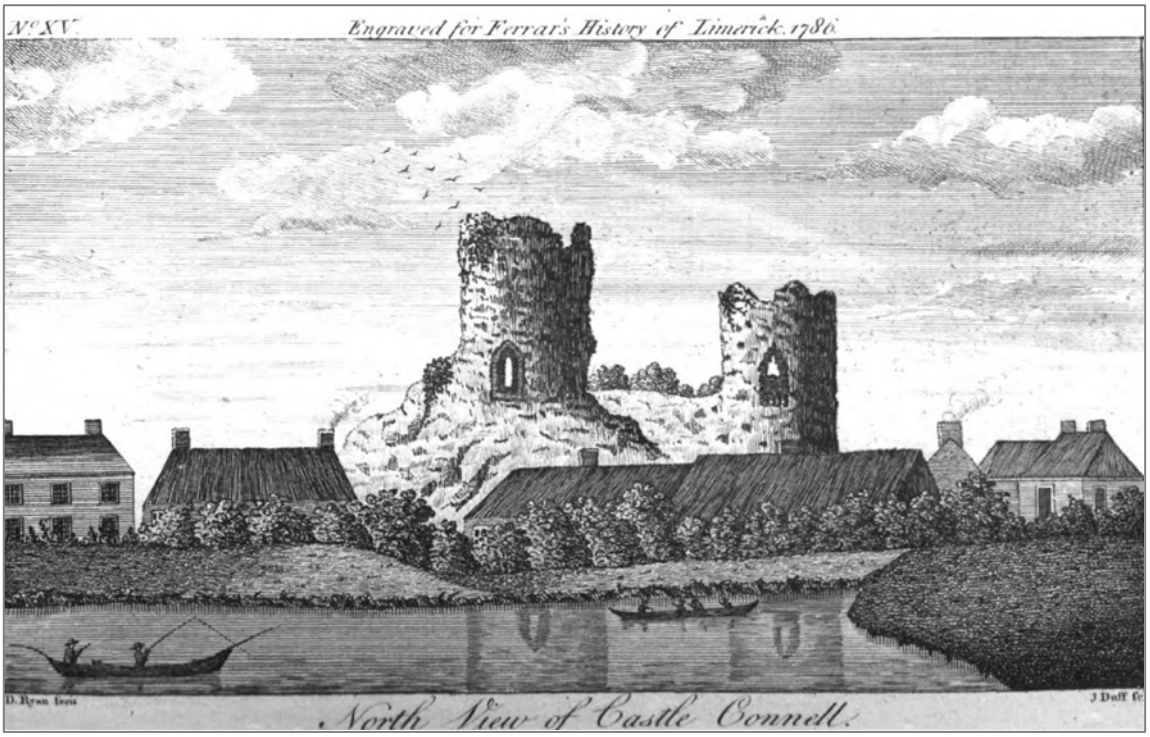

Figure 5: *'North view of Castle Connell' engraved for Ferrar's History of Limerick 1786 (468).*

C. 300m to the north of the castle lies Cloon Island and the remains of a church (LI001-004001), along with associated monuments; cross-inscribed stone (LI001-004002), cross slab (LI001-004003), a cross (LI001-004005) and a holy well (LI001-004004). The provenance of the church is uncertain and several conflicting accounts to its origins exist.

The Ordnance Survey 6-inch and 25-inch maps annotate a ‘friary’ in this location. Ferrar (1787, 193) also describes a friary which was founded in 1291 by a de Burgo, Baron of Castle Connell. Lewis (1837) also describes a friary and backs up Ferrar in stating it was founded in 1291 by Reginald de Burgh, for the Franciscans. Westropp (1904-5, 436) scepticism is clear as he describes a 'so-called "friary", of unknown identity’. No church is depicted on the Down Survey map of Stradbally parish, and it is not mentioned in the terrier of the map.

However, the presence of two Early Medieval cross-slabs built into the western gable of the church and this along with the place name and church of unknown provenance may suggest that this was an Early Medieval monastery rather than a Franciscan friary (*National Monuments Service Historic Viewer*). Alternatively, Cloon Island may have originally been the site of an Early Medieval monastery which later became a Franciscan friary in the 13th century (*ibid*).

Two cross slabs are incorporated into the fabric of the church. LI001-004002 was built into the west wall of the church. The slab measures 0.60m by 0.55m and carved with a plain encircled cross with an initial small cross and mostly illegible text overhead (Crawford 1912, 240). It was drawn by Wakeman in 1840 (Figure 6). The text was read by Macalister (1949, 98) as being a latin inscription of ‘LOBED FECET CRUCE[M]'. More recently in 2001, Okasha and Forsyth (185–7) could find no evidence to justify Macalisters reading of the slab due to the bad weathered conditions.

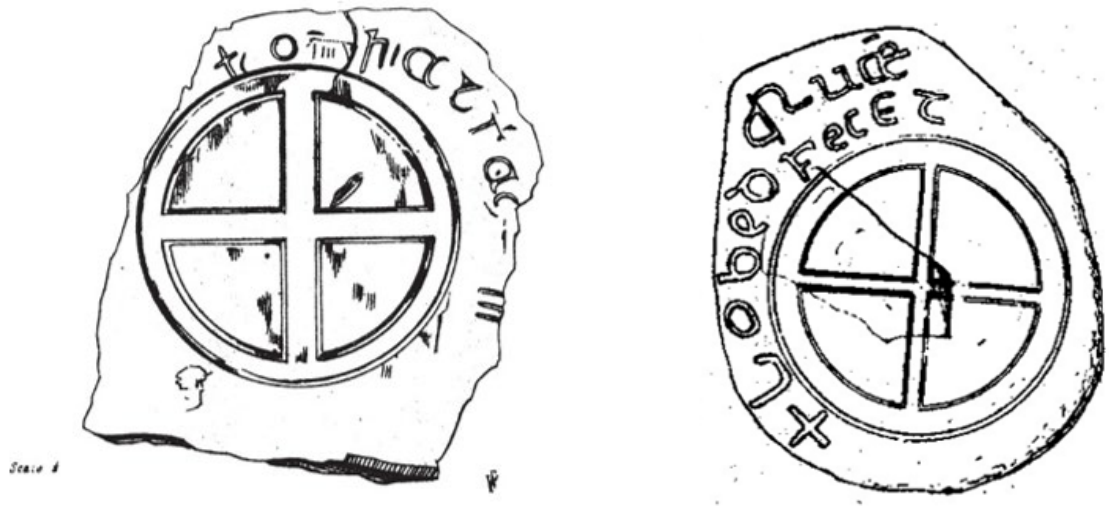

Figure 6: Drawing of two cross slabs are incorporated into the fabric of the church

Wakemans depiction of the slab in 1840 left (taken from Stokes 1872, No. 15) and Macalister's interpretation in 1949 right (slab No. 918).

The second uninscribed cross-slab measuring 0.65 by 0.80m, also inserted into the western wall is incised with a Latin cross with expanded terminals, enclosed in a rectangular frame which further adds to the churches Early Medieval foundations (Crawford 1912, 240).

A holy well is recorded as having being built on the footprint of Cloon Island House 20m to the south-west according to the Ordanance Survey letters and is steeped in local folklore.

5.2 Archaeological monitoring

Two slit-trenches, six test-pits and two inspection pits were excavated under archaeological supervision intermittently during June, September and October 2020. A Bobcat E27z excavator equipped with a toothless grading bucket was used to the excavate the slit-trenches and test-pits systematically. The up-cast spoil was spread for systematic visual assessment and metal detection using an Excalibur 1600 metal detection device. The results are tabulated below.

The borehole logs for BH1-06, 07 and 08 were obtained and reviewed as they were located within the ZON for the castle and on the immediate outskirts of the grounds. BH1–08 is located in the demesne of Coolbane house but just inside the ZON for the castle at ITM 566010, 662392. The borehole logs recorded 'made ground; dark brown, silty sandy gravel with brick fragments and high cobble content' at a depth of 0.20–1.10m which was moved *c*. 5m to the south-east to ITM 566007, 662393 due to an obstruction. BH1–08A recorded 'made ground; gravel with concrete and timber' at a depth of 0.50–0.80m.

RC1-01 located at ITM 566029, 663360 on the riverbank of the River Shannon at a depth of 3.00–3.20m, the driller recorded 'made ground; dense, boulders with timber and metal inclusions' which was then relocated *c*. 5m to the north-east at ITM 566030, 663360. RC1-01A also recorded 'made ground; boulders with metal objects' at a depth of 1.50–2.90m. Due to the small size of the rotary core at approximately 0.20m in diameter, no further information could be obtained.

Trench code: ST1-01 **Dimensions:** 9.75x0.85x0.80m **Orientation**: E-W Plate 1: ST1-01 taken from the W 	**Stratigraphy:** 0.00–0.10m Tar/concrete 0.10-0.17m Hardcore fill greyish white sandy gravel 0.17-0.70m Mid-reddish brown sandy loam with moderate small sub-angular stones 4 pipes running N-S uncovered at 0.50–1.26m

Trench code: ST1-02 **Dimensions:** 8.10x0.90x1.2m **Orientation**: E-W Plate 2: ST1-02 taken from the E 	**Stratigraphy:** 0.00-0.12m Tar/hardcore fill greyish white sandy gravel 0.12-0.25m Light beige fine sand 0.25-0.80m Light yellowish brown fine sand and gravels 0.80-1.20m Mid-reddish brown clay 2 pipes at depths of 0.54–0.75m running N-S

Trench code: ST1-03 **Trench code:** ST1-03 **Dimensions:** 11.40x0.50x1.30m **Orientation**:	**Stratigraphy:** 0.00-0.12m Tar/concrete footpath 0.12-0.40m Mid brown sandy gravel 0.40-1.30m Mid brown gravelly silt 5 pipes at depths of 0.40-1.30m running E-W
Plate 3: ST1-03 taken from S	

Trench code: ST1-04 **Dimensions:** 9.30x0.60x1.20m **Orientation**: NE-SW Plate 4: ST1-04 taken from SW 	**Stratigraphy:** 0.00-0.13m tar 0.13-0.50m backfill, dark grey sandy gravel 0.50-1.20m mid brown sandy gravel 3 pipes encountered at depths of 0.85–0.95m running NW-SE

Trench code: TP1-03 **Dimensions:** 2.10x0.80x1.95m **Orientation**: NE-SW Plate 5: TP1-03 taken from NE 	**Stratigraphy:** 0.00-0.10m Topsoil 0.10-0.60m Light brown loamy silt with frequent cobbles 0.60-3m Light reddish brown silty clay with occasional boulders

Trench code: TP 1-04 **Dimensions:** 2.50x0.70x2.05m **Orientation**: N-S Plate 6: TP 1-04 taken from S 	**Stratigraphy:** 0.00-0.05m Gravel 0.05-0.50m Light brown sandy gravel 0.50-0.70m Dark brown gravelly silt 0.70-2.05m Yellowish brown sandy clay

Trench code: TP 1-06	**Stratigraphy:**

Dimensions: 2.47m x 0.55m x 1.24m **Orientation**: N-S Plate 6: TP 1-06 taken from the S 	0.00-0.20m Topsoil 0.20-0.62m Mid brown loamy silt with frequent subangular to angular cobble inclusions. Red brick and trace amounts of charcoal. 0.62-1.24m Dark grey loamy silt with small boulder and stone inclusions. 1.24m Bedrock

Trench code: TP 1-07 **Dimensions:** 2.30 x 0.55 x 2.80 **Orientation**: E-W Plate 7: TP 1-07 taken from the W 	**Stratigraphy:** 0.00-0.10m Topsoil 0.10-0.80m Fill with modern debris (plastic fencing, cinder blocks, plastic pipe, work gloves, red brick) 0.80-2.30m Peat 2.30-2.80m Mid-grey very compact clay

Trench code: IP1-03 for wall foundations **Dimensions:** 0.65x0.50x0.47m **Orientation**: E-W Plate 8: IP1-03 taken from the W 	**Stratigraphy:** 0.00-0.50m dark brown gravelly clay Wall was 1m high and extended .35m below the current ground surface. No foundations.

Trench code: IP1-04 for wall foundations	**Stratigraphy:** 0.00-0.60m dark brown gravelly clay Wall was 1.4m high, extended 0.35m below the surface. No foundations.
Dimensions: 0.60x0.55x0.60m	
Orientation: NE-SW	
Plate 9: IP1-04 taken from NE 	

6. Conclusion

No evidence of archaeological features, stratigraphy or artefacts were uncovered during archaeological monitoring of the test pits or slit trenches.

Borehole logs RC1-01 located at ITM 566029, 663360 on the riverbank of the River Shannon at a depth of 3.00–3.20m noted the presence of timber and metal inclusions which was then relocated c. 5m to the north-east at ITM 566030, 663360. RC1-01A also recorded metal objects at a depth of 1.50–2.90m. Due to the small size of the rotary core at approximately 0.20m in diameter, no further information could be obtained. The nature of the wooden and metal material recorded in RC1-01 and RC1-01A could not be determined and it is possible that it represents archaeological material.

7. Bibliography

7.1 Documentary sources

Ferrar, J. 1787. *History of Limerick*. A. Watson and Co. http://www.askaboutireland.ie/aai-files/assets/ebooks/322_history-of-limerick/322%20The%20History%20of%20Limerick.pdf

Hannon, K. 1984. Castleconnell, part one. *Old Limerick Journal*, vol. 15, 23–28

Lewis, S. 1837. *A topographical dictionary of Ireland. London*: Lewis & Co. https://www.libraryireland.com/topog/C/Castleconnel-Clanwilliam-Limerick.php

Okasha, E. Forsyth, K. 2001. *Early Christian inscriptions of Munster: a corpus of the inscribed stones*. Cork University Press.

Salter, M. 2004. *The castles of North Munster*. Worcestershire. Folly Publications.

Westropp, T. J. 1906-7. The ancient castles of the county of Limerick. *Proceedings of the Royal Irish Academy* 26, 54-264. https://www-jstor-org.ucc.idm.oclc.org/stable/pdf/25502738.pdf?ab_segments=0%2Fbasic_search_solr_cloud%2Fcontrol&refreqid=fastly-default%3A26d5a279cb30bbd9266cf4cdf287ca6e

12.7 Archaeological Wade Survey

CourtneyDeery

ARCHAEOLOGY & CULTURAL HERITAGE

Castleconnell Flood Relief Scheme

Underwater Archaeological Impact Assessment -Wade Survey

Cedarwood Stream, Lacka (at Grange, Coole and Glenbrook), Castleconnell

Dive survey Licence No.: 23D0117

Metal Detection Licence No.: 24R0558

For

JBA Consulting Engineers

On Behalf

of Limerick County Council

Siobhán Deery BA, MA, H-dip Ed, MIAI, Licence

Eligible Archaeologist

27th July 2024

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EXECUTIVE SUMMARY

This report describes the results of an Underwater Archaeological Impact Assessment (UAIA) comprising a wade survey and metal detection survey along two stretches of the Cedarwood Stream in Lacka townland, Castleconnell, County Limerick. The survey was carried out to inform the Environmental Impact Assessment Report (EIAR) for the proposed Castleconnell Flood Relief Scheme (FRS).

The proposed works to Cedarwood Stream is concentrated to the rear of Coole House (RPS 1074) and Glenbrook House (RPS 1076) where it is proposed to widen the existing stream for 15m and to replace the existing culvert/footbridge with a larger box culvert with a new headwall arrangement. It was also proposed to replace a 40m section of a partially exposed culvert along the Cedarwood Stream at Grange House (RPS 1075) to its discharge into the River Shannon. This culvert is associated with a vernacular mill structure within Grange House and has been adapted to function as a decorative garden feature.

The wade and metal detection survey were carried out under licence to the National Monuments Service (NMS) of the Department of Heritage Local Government and Heritage (DHLGH): Dive Licence Ref: 23D0117 and Detection Licence Ref: 23R0558.

No structures, artefacts or features of archaeological significance were discovered as a result of the wade and metal detection survey. Any features or finds identified (including glass, pottery and metals) were early to mid-19th century in date or later. Based on historic Ordnance Survey , it is probable that Cedarwood Stream was initially diverted and culverted in the early 19th century towards Grange House, to harness the streams power for a small mill building. The survey identified the presence of building material in the clay banks (stone, roof tiles etc.), loose rubble stone, later concrete plinths, culverts and crossings, which show that the stream was upgraded in the 19th century for the mill and perhaps during the construction of the houses that envelop it, and once again in the early 20th century as noted on the OS maps.

Whilst the lack of, artefacts or features of archaeological significance identified as a result of the wade and metal detection survey indicates that there the FRS measures will not impact on standing/in-situ remains, it does not necessarily indicate the absence of archaeological material buried within the silt beds of the stream.

At the the time of writing it was possible to redesign the proposed measure at Glenbrook House to avoid an impact on the culvert, by realigning the culvert further to the north. The culvert will therefore remain in-situ as a garden feature.

Due to the scale of the proposed FRS works in the two survey areas examined, it is considered that a programme of archaeological monitoring would be an appropriate strategy for identifying any potential archaeological remains that may survive subsurface, for both the works to the Cedarwood Stream and the construction of the new culvert in Grange House. All groundworks associated with the FRS measures should be monitored by a qualified archaeologist, to determine whether there are any archaeological features or deposits present. The monitoring should be carried out well in advance of the construction stage of the development, allowing time within the programme for the full resolution of any archaeological features that may be identified. Monitoring will be carried out under licence to the DHLGH and will ensure the full recognition of, and – if required – the proper excavating and recording of all archaeological features, finds or deposits which may lie undisturbed beneath the ground surface.

Should any archaeological features and / or deposits be revealed during the monitoring then any further work would be subject to additional licensing with approval from the National Monuments Service (DHLGH) who may recommend preservation in situ (avoidance) or full excavation and recording of the feature in advance of construction work. Further recommendations will be made on the basis of the monitoring results. Limerick County Council and the OPW will make provision to fund any archaeological work that may take place during construction and the preparation of any reports arising from that work.

The recommendations made in this report are subject to approval of the National Monuments Service of DHLGH.

1. INTRODUCTION

1.1. General

This report describes the results of an Underwater Archaeological Impact Assessment (UAIA) comprising a wade survey and metal detection survey along two stretches of the Cedarwood Stream in Lacka townland in Castleconnell, County Limerick. The survey was carried out on behalf of Limerick County Council, JBA Consulting and EGIS to inform the Environmental Impact Assessment Report (EIAR) for the proposed Castleconnell Flood Relief Scheme (FRS).

The aim of this assessment was:

- to determine the impact of the FRS measures (stream widening of a 15m section of the Cedarwood Stream, the replacement of a box culvert and a 40m section of a stone lined culvert) on unknown and potential archaeological remains;
- to recommend mitigation measures for any underwater archaeological remains recorded within the works area.

The survey was carried out in accordance with:

- recommendations received from the National Monuments Service (NMS) of the Department of Housing, Local Government and Housing (DHLGH) through the Development Application Unit (Ref.: G Pre00273/2023);
- on-site consultation with the Underwater Archaeology Unit of the NMS;
- the Archaeology and Flood Relief Schemes Guidelines (DHLGH 2023).

The wade and metal detection survey were carried out by Siobhán Deery under licence to the NMS of the DHLGH: Dive Licence Ref: 23D0117 and Detection Licence Ref: 23R0558.

1.2. Cedarwood Stream

There are many waterbodies present in the proposed Castleconnell FRS Scheme area including the River Shannon, as well as three streams: Cedarwood stream, Cloon Stream and Stradbally Stream.

Cedarwood Stream, a tributary of the River Shannon, it lies to the north of Castleconnell and has a main stream length of 2.58km. The stream originates at the R445 and flows in a northeasterly direction, passing to the east of a railway line. It then continues past the Commons and Castlecourt housing estates, and through the rear gardens of a 19th century terrace of houses (Glenbrook, Coole and Brooklands). After this point it changes direction to the southwest, following the northwestern boundary of Brooklands. It then passes through a culvert beneath the Lacka road into Grange House. In Grange House it flows through a stone lined culvert associated with a former mill, with part of the culvert forming a decorative landscape feature in the garden of the house. The stream ultimately discharges into the River Shannon (Figure 1, Figure 2). The survey areas are concentrated on the northernmost section of the Cedarwood Stream, situated in the townland of Lacka, north of the town.

Figure 1 Castleconnell and location of the Cedarwood Stream survey areas

Figure 2 Cedarwood Stream site location and wade and metal detection survey areas

1.3. Proposed FRS Measures

River instream works required for the proposed in the FRS scheme are limited, no excavation works are required to the River Shannon or to the Cloon or Stradbally streams further to the south. There will however be construction access required on the River Shannon (through the use of a platform) which is assessed in the EIAR. The temporary working platform, to enable the installation of sheet piles for the walls from the riverside, will consist of the importation, placing and compaction of suitable bearing material along the river bank on a geotextile (Terram or similar) with silt mitigation implemented if required.

The proposed works to Cedarwood Stream is concentrated to the rear of Coole House (RPS 1074) and Glenbrook House (RPS 1076) where it is proposed to widen the existing stream for 15m and to replace the existing culvert/footbridge with a larger box culvert with a new headwall arrangement (Figure 3). The proposed culvert will be wider and deeper below the stream bed to prevent erosion and undercutting, and to reintroduce a natural sediment movement through the culvert.

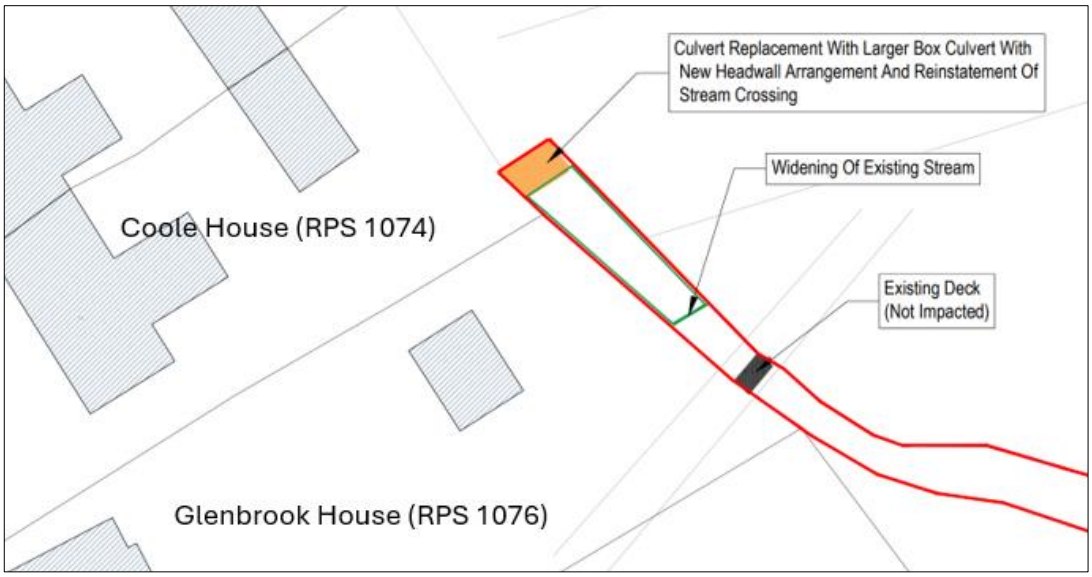


Figure 3 Proposed works to the rear of Coole (RPS 1074) and Glenbrook (RPS 1076)

At the time of the survey, it was also proposed to replace a 40m section of an open culvert along the Cedarwood Stream at Grange House (RPS 1075) to its discharge into the River Shannon (Figure 4). The open stone culvert is associated with a mid-19th century former mill building located on the left bank of the river to the rear of the property (Plate 1).

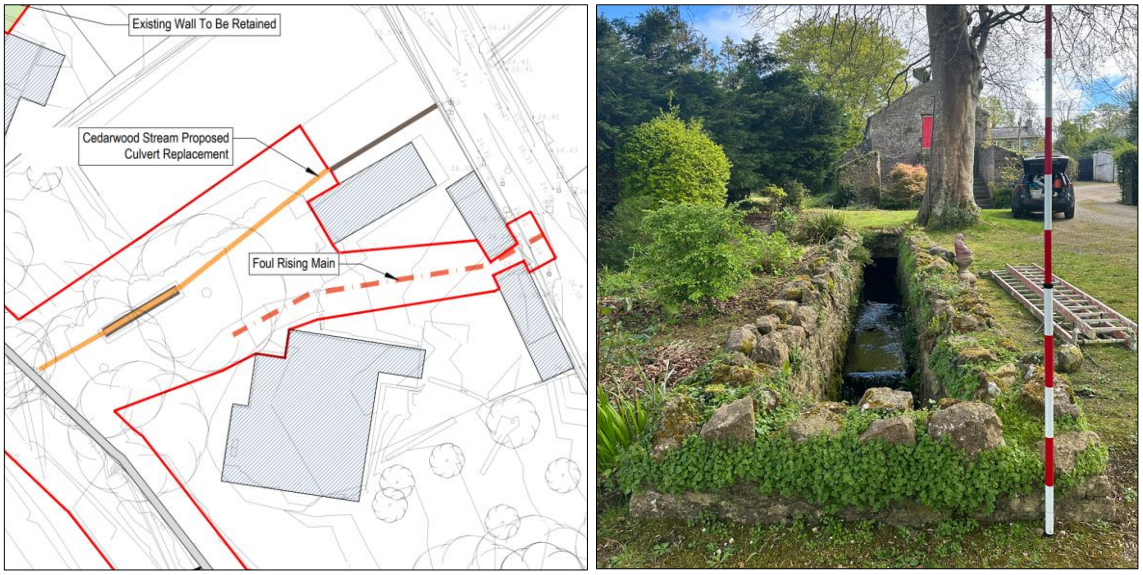


Figure 4 Grange House (RPS 1075),
Plate 1 View downstream of the open section of the stone lined culvert in Grange House with the mill building in the background.

However, it was possible to redesign this proposed measure to avoid impacting the culvert by realigning the stream to the north.

Cedarwood stream is heavily vegetated over length of 300m, and removal of overgrown vegetation will form part of the proposed scheme. An annual maintenance program is also proposed to manage further vegetation grown. This work will only require the cutting back of vegetation and tree removal, there will be no invasive in-stream or river bank works.

1.4. Archaeological and Historical Context (after O'Brien and Deery 2024)

1.4.1. Prehistoric Activity (c. 8000BC – AD 400)

The vicinity of Castleconnell is of particular significance for prehistoric studies, following the discovery of two cremations of Early Mesolithic date, the oldest recorded burial in Ireland, in the townland of Hermitage to the south of the study area (Licence no.: 01E0319; Collins & Coyne 2003[1]; 2006[2]). The discovery comprised of the cremated bones of a probable male adult within a subcircular pit. A posthole was found in the base of the pit, and the cremated remains appeared to have been placed around the former post, which may have functioned as a burial marker. A polished stone axe head and two burnt microliths, all of which showed signs of burning, were placed within the burial pit. The second burial was a large pit containing a small amount (possibly a token burial) of burnt bone of indeterminate sex, heat-shattered stone and pieces of burnt and baked clay, suggesting the remains were shovelled from fire to pit. Radiocarbon dating demonstrated that the first burial dated to c. 7400BC, while the second was from c. 7000BC. Two more cremations were found which were of later date (6610-6370 cal. BC and 2310-1750 cal. BC).

1.4.2. Early Medieval Period (400-1200)

Castleconnell is in the ancient territory of the '*Tuath Luimeach*' and was held by the Uí Chonaing or O'Gunnings. Castleconnell was known as *Mur mic an Duinn* or the Fortress of the son of Donn. Donn was well known in Celtic mythology, and it is likely his son is Eogabal, father of *Fer Fill* and *Áine* of Knockainy, Gods of the *Eoghanachta*. The later name of Castleconnell is also related to this group, being derived from *'Carrig-Cnuil'* (the fort of the O'Gunnings). Their lands stretched along the Shannon over the Tuath Luimneach, to the east of the Maigue, and to the north of Crewally, or Knocknagall. It was later a stronghold of the O' Briens of Thomond, and the site of Castleconnell is located on an earlier fort associated with the O' Briens.

Although the ecclesiastical site on Cloon Island (RMP LI001-004001) is traditionally said to have been a Franciscan friary founded in the 13th century, there is evidence that this was originally a pre-Norman site. In particular, there are two early Christian cross slabs (RMP LI001-004002/3) incorporated into the gable of the church. The provenance of the church is also uncertain and the name of Cloon Island, being a Gaelic name, also suggest an early Christian monastery. Tradition also records that Cloon House was built on the site of a holy well (SMR LI001-004004), the presence of which is consistent with early medieval foundations. One the cross-slabs (RMP LI001-

[1] Collins, T. & Coyne, F. (2003) 'Fire and Water… Early Mesolithic Cremations at Castleconnell, Co. Limerick' in Archaeology Ireland. Volume 17, No. 2. Wicklow: Wordwell.

[2] Collins, T. & Coyne, F. (2006) 'As old as we felt…' in Archaeology Ireland. Volume 20, No. 4. Wicklow: Wordwell.

004002) is carved with a Greek cross, and some indistinct markings may be part of an Ogham inscription. The other (RMP LI001-004003) is carved with a Latin cross.

1.4.3. Medieval Period (1200-1600)

The grandson of Brian Boru was murdered by the Prince of Thomond at Castle Connell in 1174, when it was described as '*Caslan Uí Chonaing*' (the castle of the O'Gunnings). The Prince of Thomond had left his followers on the other side of the Shannon to be received by the O' Briens, but they crossed the river by night and ambushed the fort.

This name and its Norman counterpart 'Castro Iconing' (-konyng, -conyn) appear in many documents from its grant to William de Burgo in 1201, when it was granted to him on condition of repairing and fortifying the castle (Ferrar 1786[3]). King John is noted as having said '*If he fortify the castle, and we desire to have it we will give him a reasonable rate'* in the Ware's Annals. The castle fell into the hands of the Bruces in 1315.

A friary, variously described as being Franciscan or Augustinian, was founded on Cloon Island in 1291 by Reginald de Burgh, baron of Castleconnell (RMP LI001-004001). Not much is known of this friary, and it was not depicted on the Down Survey of 1656-8 . In comparison, the medieval parish church (RMP LI001-002001) in Stradbally to the south of the town remained in use throughout the medieval period and was eventually replaced with a 19th century Church of Ireland structure. This church was known as 'Idumyn' in 1302 and was part of the lands in 1633, owned by the Earl of Ormond. A late 16th / early 17th century round-arched doorway with punch-dressed jambs and hood-moulding above has been inserted into the western gable of the Church of Ireland church, where it is now used as the main doorway into this church (SMR LI001-002003).

In 1578 Queen Elizabeth wrote letters of condolence to William de Burgh for the loss of his eldest son, who was slain in a skirmish with the Earl of Desmond, and the same year created him Baron of 'Castle-Connel'.

1.4.4. Post-Medieval and Early Modern Periods

In the war of 1641 'Lord Castle-Connel' forfeited his estate and title, which were restored on the accession of James II. The title became extinct in 1691.

In 1651 a garrison was placed at the castle by General Ireton while on his march to blockade Limerick. The lands of Clanwilliam were described in the Civil Survey as '*Parte parish of Stradballie W. Lord Borke, Barron of Castlecon, Irish Papist. The manor of Castlecon, both Portcrussies, Parcke, Stradbally, and Bohirkeyle, 6 plough lands with a castle, ffishing weares, one mill, a Courte Barron and other privileges'*.

The Down Survey map of 1656-8 demonstrates that a large part of the surrounding landscape comprised of bog. 'A Causeway Through the Bog' is illustrated through the narrowest part of the bog which appears to follow the orientation of the existing R445. This bog, along with the course of the River Shannon, would have created a defensible position in which to construct the

[3] Ferrar, J. (1787) 'An Essay on Castle Connell Spa, On Water in General and Cold Bathing, in The History of Limerick: Ecclesiastical, Civil and Military, From the Earliest Records to the Year 1787.

fortification at Castleconnell. The castle and the medieval church are depicted as upstanding buildings.

During the revolution in 1688, the castle held a garrison of King James' forces, and it was consequently ordered to be destroyed by General Ginkle in 1691. It was destroyed by explosives and the explosion was so great that it was felt in Limerick, where several windows were reported to have broken (Ferrar 1786[4]). In the war of 1641 'Lord Castle-Connel' forfeited his estate and title, which were restored on the accession of James II.

Much of the early modern prosperity of the town was derived first from the patronage of the Burke or Bourgh family, who were the descendants of William de Burgh, and secondly from the commercial opportunities afforded by the presence of a chalybeate spa located to the north of the town in Lacka. The town of Castleconnell was noted in the 18th and 19th centuries for it curative waters and the site of a Spa. The soil is of a calcareous nature with ferrous inclusions and the sediment of the water was successfully applied to cure ulcers. The water was chiefly consumed, but the curative properties of cold-water bathing were also reported (Ferrar 1786).

The Cedarwood Stream survey area is located in the Spa-well and Worldsend ACA Architectural Conservation Area (ACA) and is located within Grange House (RPS 1075), Coole House (RPS 1074) and Glenbrook House (RPS 1076) all listed in the record of protected (RPS) structures in the Limerick City and County Development Plan (2022-28). These houses were constructed in the early 19th century (c. 1830's).

The earliest cartographic source depicting the Cedarwood Stream is the first edition OS Map of 1838 (Figure 5). This map shows the then recently developed terrace of Brooklands and Coole and the detached Glenbrook House. The houses are set back from the road, with gardens in both front and back, along with outbuildings. The Cedarwood Stream flows to the rear of the properties. There is a bridge spanning the stream from Coole house into a field to the east of the stream. The stream then appears to have been redirected around these properties, taking an abrupt right angle run to the west. This has resulted in a wider and straighter channel compared to the upstream stream section of the to the south. The stream diverted underground beneath the road into Grange House, it flows through an irregular shaped structure that is presumably a mill, as there is a structure resembling a wheel house positioned above the stream. The culvert which appears to be open, then runs west into the River Shannon. The realignment of the of this northernmost end of Cedarwood Stream most likely occurred with the construction of Grange House and mill sometime in the 1820-30s.

[4] Ferrar, J. (1787) 'An Essay on Castle Connell Spa, On Water in General and Cold Bathing, in The History of Limerick: Ecclesiastical, Civil and Military, From the Earliest Records to the Year 1787.

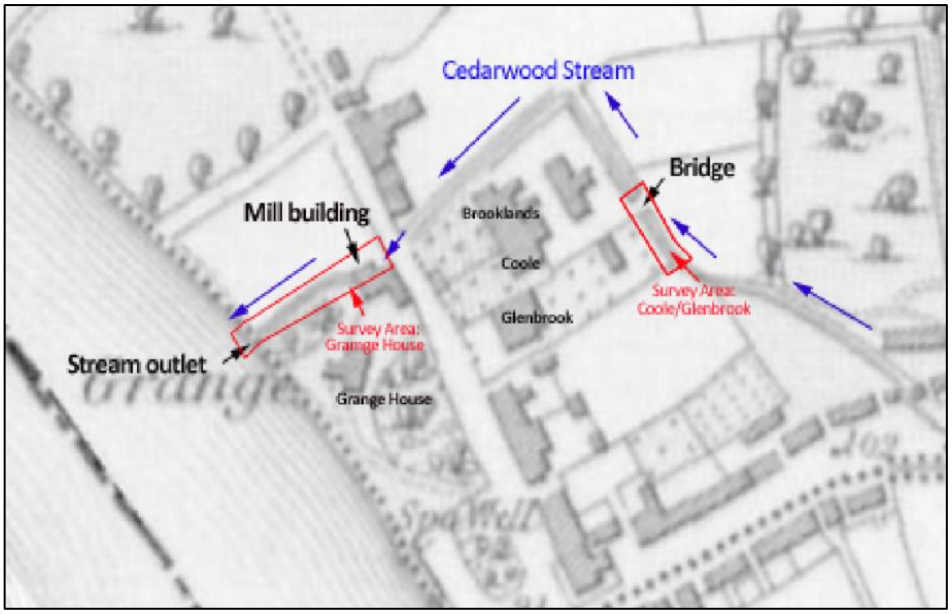


Figure 5 First Edition OS Map of 1844 with the Cedarwood Stream (with features annotated)

There is little change in the revised 2nd edition OS Map of 1844 (Figure 6), with the exception of the reconfiguration of the mill building and the covering of the open culvert within Grange House.

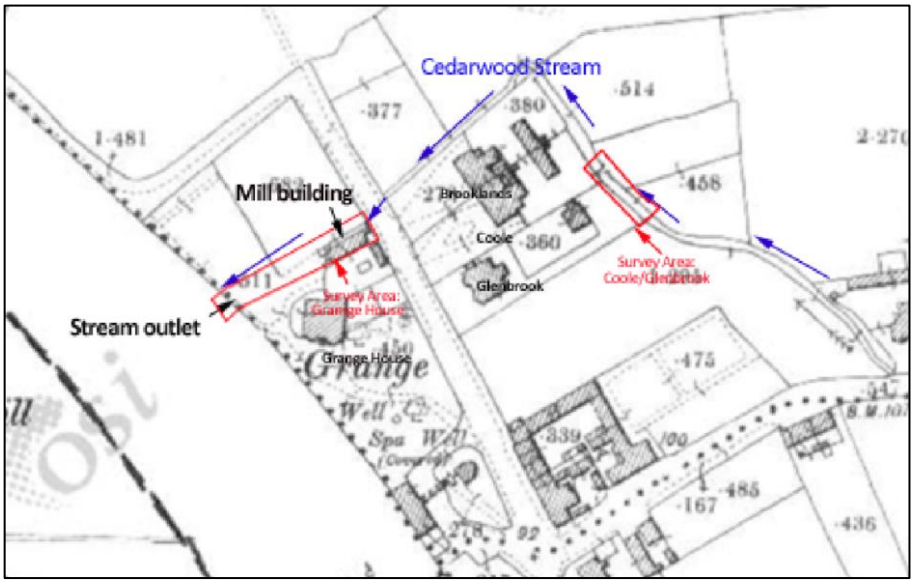


Figure 6 Revised Edition OS Map of 1899 with the Cedarwood Stream

Similarly, there was little notable change in the third revision of the OS Map of 1938 (Figure 7), except for a newly constructed bridge spanning the Cedarwood Stream at Glenbrook House, the fields located to the west of the stream are now included as part of the properties.

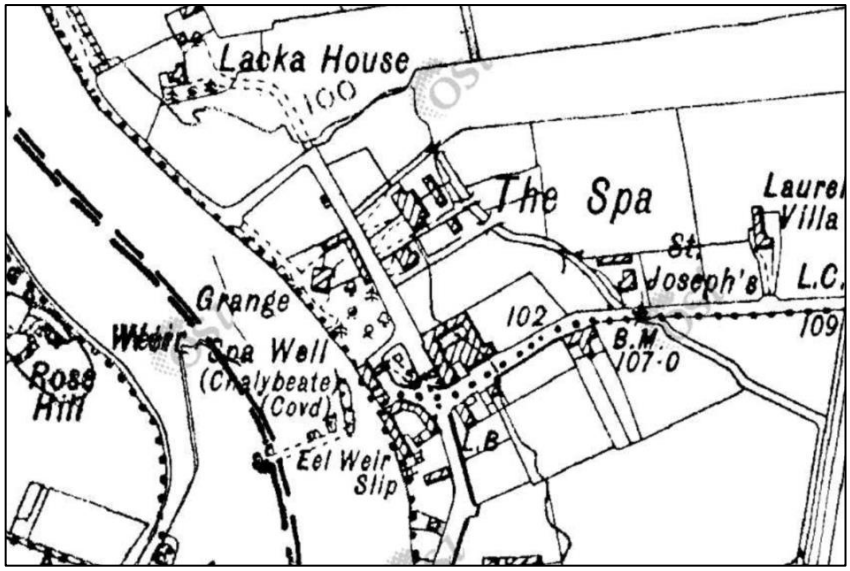


Figure 7 Revised Edition1938 OS Map

1.4.5. Stray Finds

Several stray finds from Castleconnell demonstrate prehistoric activity in the bogs surrounding the village, including a shale stone axe head at Worldsend Bog in Lacka (NMI ref.: 1931:108) and another in Thoreen Bog (NMI ref.: 1934:435). Also, in Lacka a fragment of a flint blade with no secondary working was found (NMI Ref: Record [LM 1988:3]).

In unspecified locations in Castleconnell a stone axehead is of a 'river ford type', water worn by limestone pebbles was found (NMI ref.: 1932:6377) and elsewhere an iron spearhead object inset with gold and a portion of the original haft is remaining was found (NMI ref.: S.A. 1919:1). A decorated bone marrow-scoop (decorated) was at the bottom of the River Shannon while excavating for a concrete sluice just above the site of the Old Salmon Crib at Cloon Island in 1904 (NMI ref.: 1945:74). A later find was also found in the Shannon Five gaffs used for the illegal capture of salmon (NMI Ref: . 1943:329-33).

1.4.6. Recorded archaeological sites

There are no recorded archaeological monuments in the immediate vicinity of the wade survey areas. The closest recorded site is c. 535m southeast of the survey area, it comprises a 13th-century friary and probable Early Christian foundation on Cloon Island (RMP LI001-004001) in Cloon and Commons townland. It includes a cross-inscribed stone, a cross-slab, a holy well and a cross (LI001-004001–0054).

Approximately c. 850m southeast of the survey area is a castle site, Castle Connell (RMP LI001-003), from which the town was named (Figure 8).

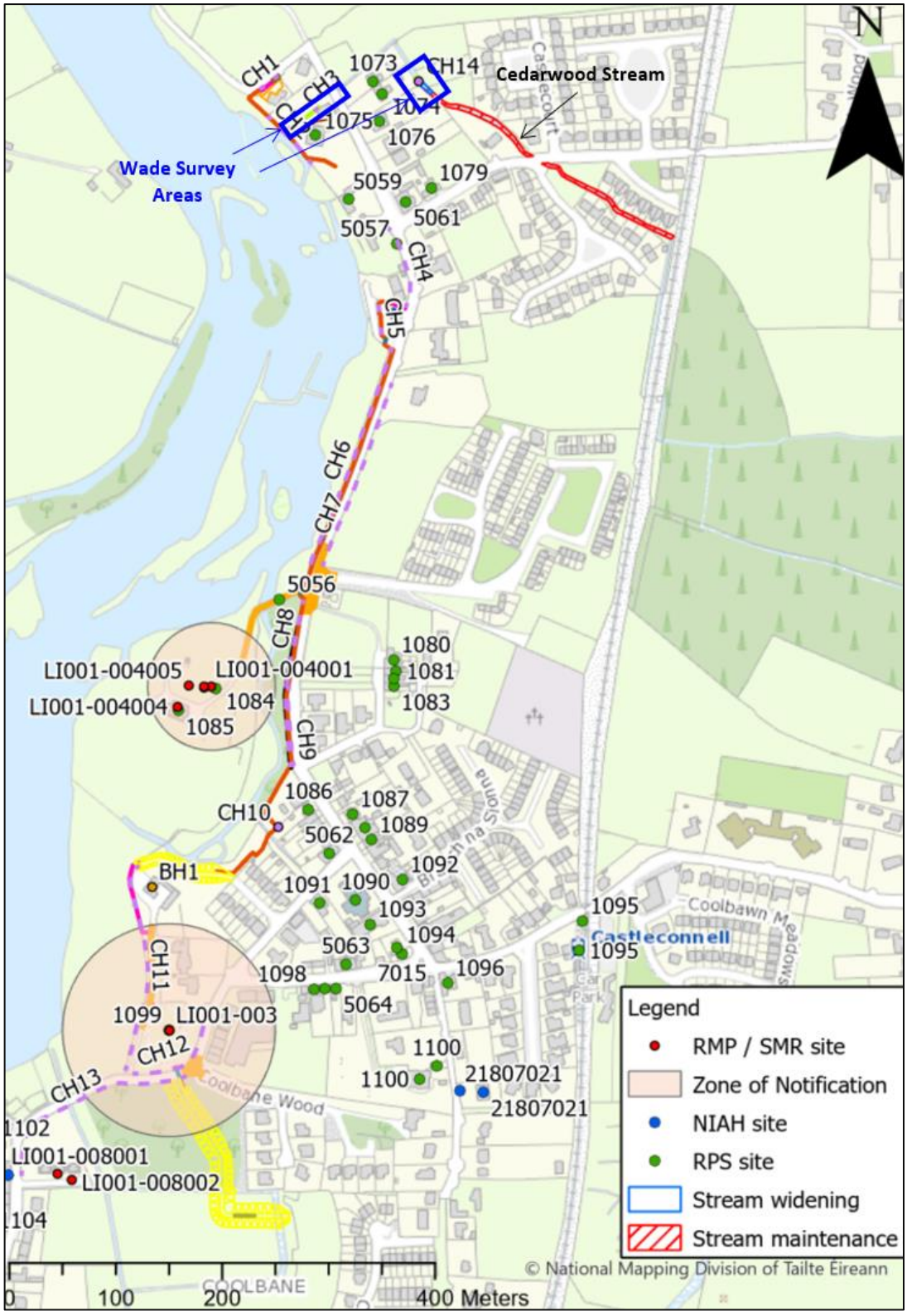


Figure 8 RMP, SMR NIAH site location with the proposed FRS measures and location of the wade surveys (inset detail of the wade survey location).

1.5. Methodology

The wade survey and metal detection survey[5] were carried out on the 23rd and 24th April and the 16th of July 2024, in clear and bright weather conditions. A team of two archaeologists carried out the survey. All works were undertaken in accordance with health and safety regulations and safety guidelines.

The survey comprised a systematic waded visual assessment of the river banks, as well as the river bed and a metal-detection survey of the river bed in order to retain metal features and identify any evidence of archaeological remains (structures/features/deposits) and archaeological objects located in, or adjacent to, the stream. A waterproof hand-held metal detector was used to assess the potential for the riverbed .

Unrestricted access to the stream channel and its adjacent banks was provided. During the survey, the banks were densely vegetated; however, within the stream, there was complete visibility. The archaeological survey area was carried out within the confines of the properties, to the rear of Coole (RPS 1074) and Glenbrook (RPS 1076) and within Grange House (RPS 1075) (Figure 9, Table 1):

- A 30m open section of the stream in the rear gardens of Coole House and Glenbrook House.
- A 55m section of the stream and culvert within Grange House to its discharge into the Shannon River.

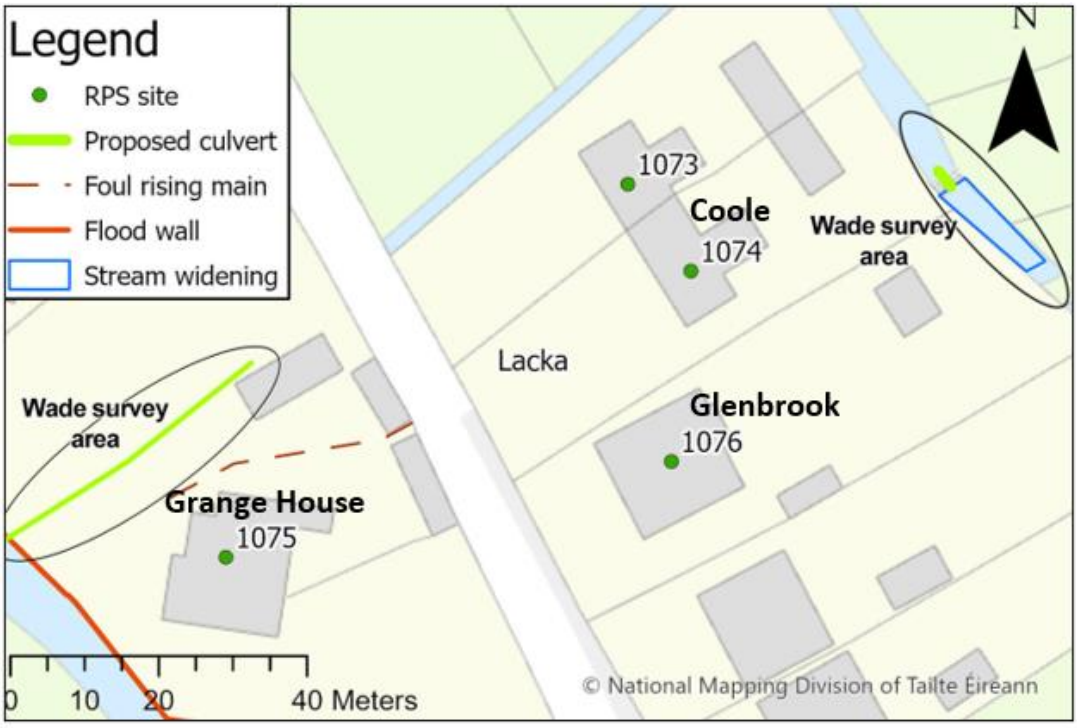


Figure 9 Wade survey locations on Cedarwood Stream

[5] A 'Type A' survey in the DHLGH 2023 guidance document

Table 1 Survey Area

Survey Location	Townland	Start	End	Survey Length
Coole and Glenbrook	Lacka	566243.97N 663329.31E	566177.16N 663374.31E	0m- 30m
Grange House	Lacka	566119N 663354E	566071N 663325E	0m-55m

A hydrographic survey of the cross-section of Cedarwood river is provided in Appendix 1 (McDonald Survey 2022) providing data on the shape, depth, and profile of riverbed and footbridges.

1.6. Survey Results

1.6.1. Introduction

The Cedarwood Stream is a narrow channel measuring with steep sides, measuring 1.28– 3.25m wide. In general, the stream channel comprises a gravel bed with some siltation and scouring from culverts . The river banks comprise clay banks, rubble stone walls or concrete revetments.

1.6.2. Cedarwood Stream to the Rear of Coole (RPS 1074) and Glenbrook (RPS 1076)

1.6.2.1. General

Cedarwood stream flows through the rear (east) gardens of the early 19th century Coole House and Glenbrook House. The stream is integrated into the gardens of these properties and as such its banks are lined by a dense screen of mature trees and decorative plants, resulting in heavily overgrown riverbanks.

The 30m stretch of river surveyed is narrow measuring 1.20m (min)–178m (max) in width with a stone and gravel and slit stream bed with frequent rubble stone boulders in it. The long profile shows a gentle drop of only 0.40cm over the 15m length of channel surveyed (excluding the footbridge/culverts which were shallower). The banks of the river varied from simple earthen banks sloping steeply to the water's edge, loosely integrated rubble stone or concrete retaining walls. Below the rubble stone there is a plinth of concrete indicting that the river channel was reformed in the past.

The survey is described from the upstream section at Glenbrook House downstream to the culvert/footbridge at Coole House. The visibility was good to moderate.

1.6.2.2. Glenbrook House

Where the stream enters the property of Coole House (ITM: 566178.96, 663386.61, 0m baseline for the survey), the river is at its widest (1.78m) and deepest point (c.40cm) (Plate 2). The stream bed comprises gravel and silt deposits. The banks on both sides comprised of clay reinforced at their base with loose rubble stone boulders. The left bank (LB) had a sloping side and measured 0.60m high, whilst the right bank (RB) was almost vertical measuring 0.53m high (measured from the river bed).

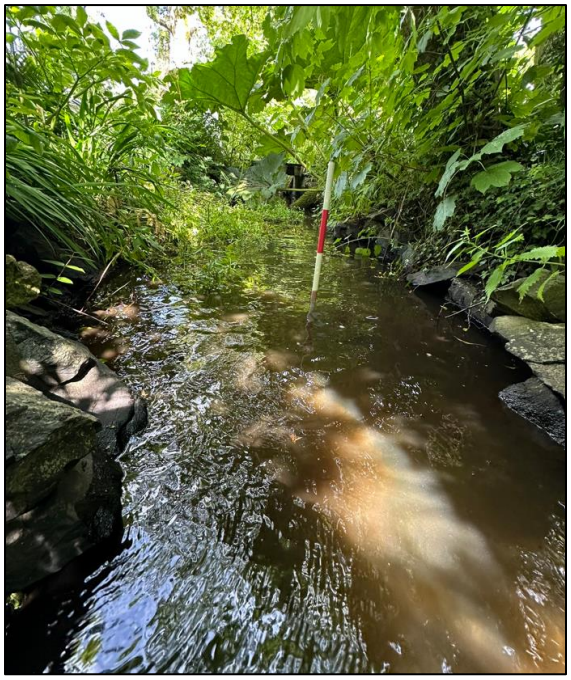


Plate 2 View downstream where the Cedarwood stream enters Coole House

Approximately 6m upstream from the survey baseline, on the right bank, just above the water level a concrete plinth is revealed beneath the rubble stone and bank structure (Plate 3).

Plate 3 Concrete plinth beneath the rubble stone and earthen bank (R.B view)

This plinth continued upstream and ran beneath a modern square headed concrete footbridge which provides access to a garden area east of the stream (Plate 4). The simple footbridge (located 0.7m upstream survey baseline, ITM 566203.26, 663342.47), spans a narrow 1.28m wide section of the river. The bridge comprises a square headed bridge structure comprised a concrete deck (measuring 1.65m wide), with a stone paving slab surface, with concrete abutments constructed

in front of the clay banks. This will be retained as part of the FRS measure. The river widens to 1.33m immediately downstream of the foot bridge.

Plate 4 Concrete footbridge in Glenbrook House

At 20m from the baseline, there is 2m high concrete walls align the river, confining the stream to just 0.65m in width, and 0.15m high. The walls on the right bank are leaning into the stream (Plate 5 and Plate 6). These walls may have formed the abutments of a former footbridge or an effort to curtail the stream.

Plate 5 View upstream of the walls defining the narrow section of the stream
Plate 6 Concrete plinth beneath the rubble stone and earthen bank (R.B)

Beyond the concrete wall the river then widens to 1.3m and is shallow at 0.12m deep. The banks were defined by rubble stone measuring c. 0.45m high which continues a further 6m upstream where the river flows into the neighbouring property of Coole House.

1.6.2.3. Coole House

Approximately 3m inside the boundary of Coole House, there is a pedestrian bridge that is 0.45m in length and 0.76m in width. The bridge deck is covered in gravel and is flanked by walls made of rubblestone that are 0.50 meters in height. The walls are capped with large limestone slabs. The parapets are covered in dense ivy growth (Plate 7).

Plate 7 Bridge over Cedarwood Stream in Coole House

Beneath the bridge a concrete pipe measuring 1.30m in external diameter, the bridge parapet above is c 0.75m. The pipe is underpinned with concrete at the base and the river bank walls of rubble stone (measuring c. 1.50m) are also founded on a coarse gravel aggregate concrete footing (Plate 8). The riverbed in this location is deep silt deposited from the pipe above.

Plate 8 Pipe culvert at Coole House, view upstream, note the concrete plinth beneath the rubble stone and earthen bank to the right of the photo. Insert: detail of the concrete footing.

The proposed FRS measure ends on the downstream side of the culvert.

From this point, the stream widens to a width of 2.35m and becomes shallower, measuring only 0.10m in depth. The stream bottom is of well sorted stone and gravel. On the right bank, there is a wall that stretches approximately 10.8m. The wall is about 1m high and is located on a flat earthen river bank approximately 0.80 centimetres wide. The left bank has a sloping dark brown silty clay bank covered in vegetation which is about 1.30m from the ground level of the adjacent field. This bank is covered with loose rubble stone and has roots from mature beech trees that are deeply embedded. The tree roots have disrupted the clay, revealing shards of construction slate and redbrick.

Plate 9 View upstream of the stream in Coole House just beyond the culvert (outside the proposed works area)

1.6.3. Grange House (RPS 1075)

The stream is culverted beneath the Lacka Road and beneath the northern boundary of Grange House which comprises a high rubble stone wall. The stream flows through a single arched culvert c. 1m high and 1.40m wide, with voussoirs of 0.60m high, a rubble stone wall and a mill building from the abutments for the structure. Approximately 0.35m above the arch there is an opening in the spandrel wall for the road surface drain above (Plate 10).

The right bank comprises a vertical rubble stone wall c. 1.20m high, large tree roots are woven into its structure undermining it in places (Plate 11).

The wall of a two-storey mill building runs parallel to the river on the left bank. There is a red brick arched culvert at river level. It appears to be obstructed and dry. Except for two windows on the upper level, the wall is featureless (Plate 12).

The stream bed is composed of gravels and rubble stone.

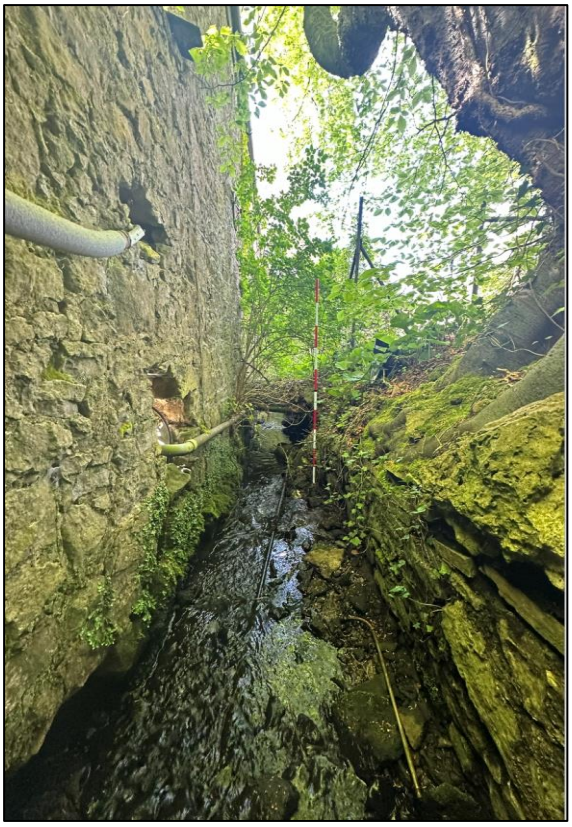


Plate 10 Culvert and eastern boundary wall of Grange House beneath the Lacka road. Note square opening is for the road surface runoff

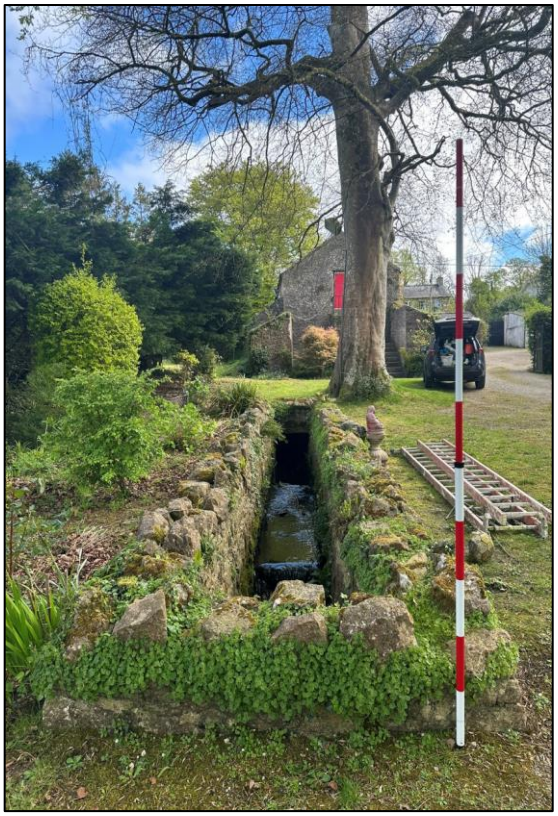
Plate 11 View downstream of the river bound by the mill building on the left bank, and rubble stone wall on right bank.

Plate 12 Red brick arch culvert from beneath the mill building

The stream is then crossed by a large limestone flag forming a platform and continues beneath two single storey lean-to structures attached to the mill building one of which may have functioned as a wheel house (Plate 13).

Plate 13 Northern (rear/riverside)façade of the mill building (Grange House to the rear right-hand side.)

The stream continues west beneath the garden and reemerges in an open stone lined culvert surrounded by a decorative low wall (Plate 14, Plate 15). It comprises of rubble side walls and limestone slabs c.1m wide and 0.07m thick. The culvert descends in c. 20cm stages downstream to a drop of 1.6m where it is then once again covered by the garden surface and runs beneath the river wall that forms the western boundary of the property.



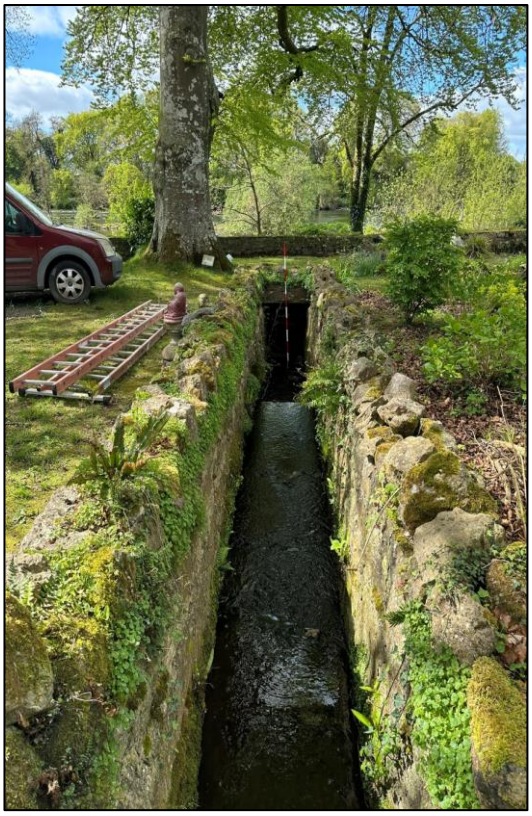


Plate 14 View upstream from the western end of the culvert with the mill building in the background

Plate 15 View downstream from the west end of the culvert towards the river wall and the Shannon outlet

The river discharges into the River Shannon through a masonry arch outlet (Plate 16), a view under the culvert shows that large limestone slabs form the roof of the culvert with rubble stone walls (Plate 17).

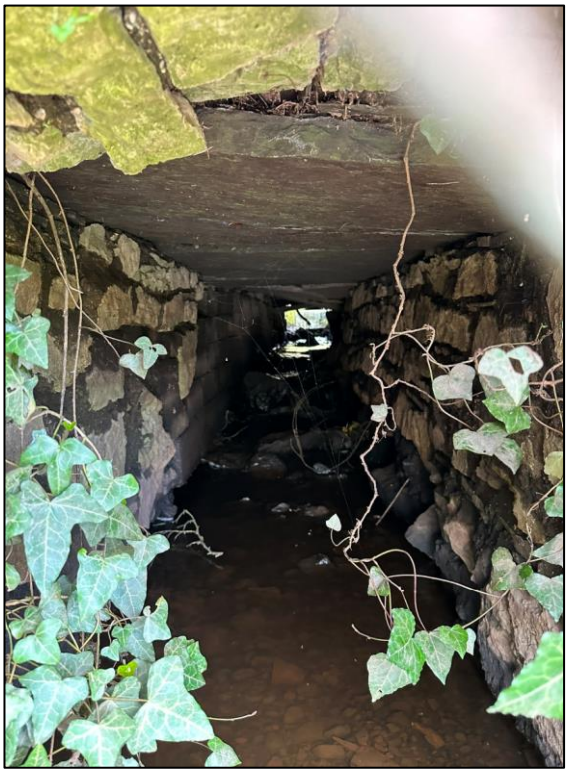


Plate 16 View of the outlet of the Cedarwood Stream into the River Shannon

Plate 17 Detail of the interior of the culvert/outlet looking upstream

There is a build-up of silt and gravel at the outlet and the stream cuts through the soft riverine mud and silts into the River Shannon (Plate 18).

Plate 18 View downstream from the west end of the culvert towards the river wall and the Shannon outlet

1.6.4. Results of the metal detection

The metal detector targets picked up identified modern pieces of metal and pipes which were visible in the water or partially covered by the silt/gravels. The metal detector was rendered ineffective in Grange House section of the survey due to a distortion caused by a long metal pipe embedded in the stream along the right bank. Rare occurrences of 19th century bottles, and broken plant pots and a firelighter were found in the stream section behind Coole and Glenbrook house. However, where the stream discharges into the River Shannon more frequent occurrences of glass, bottles, jars pottery and rare occurrences of butchered animal bone, also dating to the 19th century, were found partially buried in the silt and gravels. These finds demonstrate that artefacts can be washed downstream even with obstructions such as the stone lined culvert at Grange (Plate 18).

Plate 19 Some of the finds identified at the Cedarwood Stream outlet

2. SUMMARY OF THE WADE SURVEY

In the wade survey area, the Cedarwood stream is integrated into the gardens of three protected structures. Based on historic Ordnance Survey , it is probable that Cedarwood Stream was initially diverted and culverted in the early 19th century towards Grange House, to harness the streams power for a small mill building. The survey identified the presence of building material in the clay banks (stone, roof tiles etc.), loose rubble stone, later concrete plinths, culverts and crossings, which show that the stream was upgraded in the 19th century for the mill and perhaps during the construction of the houses that envelop it, and once again in the early 20th century as noted on the OS maps (Section 1.1.4).

The metal detection of the streambed revealed modern metals (steel pipes and a metal plate) and nothing of archaeological significance. The visual survey identified glass and pottery all of 19th century date and two pieces of animal bone.

No archaeological sites or features were recorded during the assessment. However, the absence of definitive archaeological features in the streambed does not necessarily reflect the potential buried archaeological content within the stream sediment.

3. IMPACT ASSESSMENT

3.1. Culvert replacement and widening of Cedarwood Stream at Coole and Grange House

The materials identified in the river were 19th-century bottles and ceramics along with some slate and other building materials in the banks which suggest that the river may have been disturbed during the construction of the row of houses fronting the Lacka Road and in the section culverted in Grange house for milling. While there are no obvious archaeological features recorded within the works area, there is a potential that previously unknown subsurface features, that lie buried and concealed from view may be revealed.

3.2. Culvert replacement Grange House

At the time of writing, further to discussions on site with and recommendations from the National Monuments Service and the National Built Heritage Service the project design team redesigned the Grange House flood relief measure in order avoid an impact on the open culvert which is associated with a former mill and is now in use as a garden feature. The stream will instead be realigned to the north of the existing culvert. There is however a potential that the earthmoving works associated with this realignment may reveal unknown subsurface archaeological finds or features.

3.3. Annual Maintenance Programme

An annual maintenance program will be completed which is anticipated to include the following elements:

- Annual inspection of Cedarwood Stream and removal of vegetation for improved conveyance if required.
- Twice-annual cutting of grass on embankments.
- Inspection of entire scheme following a flood event.
- Annual inspection and installation of demountable barriers and flood gates, and inspection non-return valves and drainage outfall.

This maintenance and monitoring program are not expected to impact the stream bed or banks and subsurface or buried in stream archaeological remains that might survive.

4. RECOMMENDATIONS

Due to the scale of the proposed FRS works in the two survey areas examined, it is considered that a programme of archaeological monitoring would be an appropriate strategy for identifying any potential archaeological remains that may survive subsurface, for both the works to the Cedarwood Stream and the construction of the new culvert in Grange House. All groundworks associated with the FRS measures should be monitored by a qualified archaeologist, to determine whether there are any archaeological features or deposits present. The monitoring should be carried out well in advance of the construction stage of the development, allowing time within the programme for the full resolution of any archaeological features that may be identified.

Monitoring will be carried out under licence to the DHLGH and will ensure the full recognition of, and – if required – the proper excavating and recording of all archaeological features, finds or deposits which may lie undisturbed beneath the ground surface.

Should any archaeological features and / or deposits be revealed during the monitoring then any further work would be subject to additional licensing with approval from the National Monuments Service (DHLGH) who may recommend preservation in situ (avoidance) or full excavation and recording of the feature in advance of construction work. Further recommendations will be made on the basis of the monitoring results. Limerick County Council and the OPW will make provision to fund any archaeological work that may take place during construction and the preparation of any reports arising from that work.

The recommendations made in this report are subject to approval of the National Monuments Service of DHLGH

The recommendations made in this report are subject to consultation with the Underwater Archaeological Unit of National Monuments Service DHLGH and the relevant planning authority.

5. REFERENCES

National Monuments Service, DHLGH. 2023. Archaeology and Flood Relief Schemes: Guidelines. Dublin.

O' Brien, Y. Deery, S, 2024. Cultural Heritage EIAR Chapter 12 for the Castleconnell Flood Relief Scheme, Castleconnell, County Limerick. JBA, Limerick County Council and OPW.

O' Brien, Y. 2019. Unpublished -Castleconnell Flood Relief Scheme, Castleconnell, County Limerick. Cultural Heritage Constraints Study by Courtney Deery Archaeology, for JBA

5.1. Online Sources

www.archaeology.ie

www.downsurvey.tcd.ie

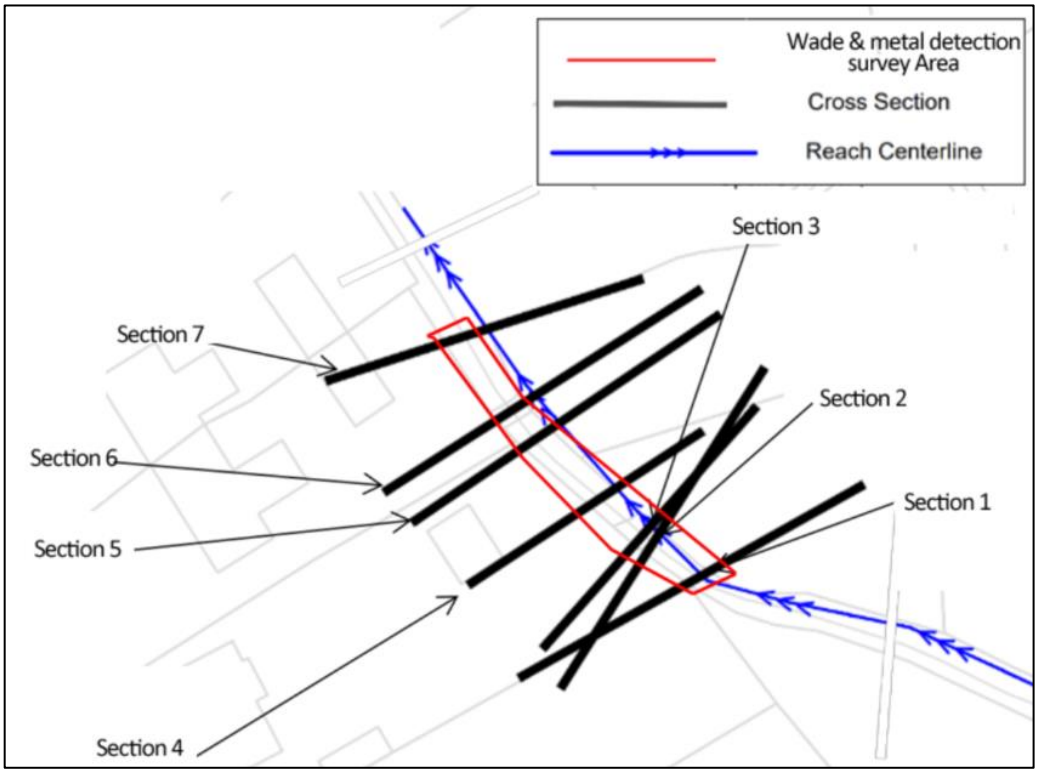
www.excavations.ie

www.heritagemaps.ie

www.osi.ie

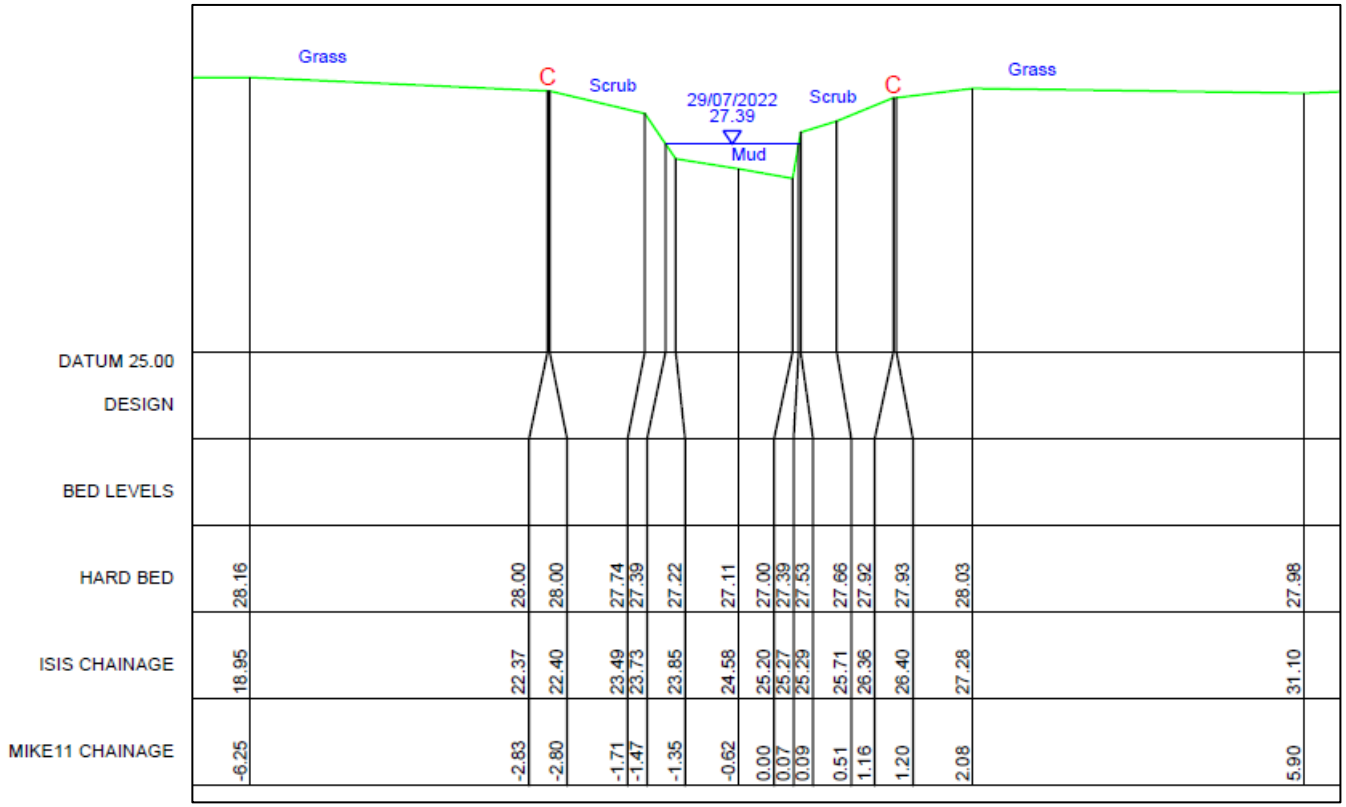
APPENDIX 1 Hydrographic Survey Cross Sections of the Cedarwood Stream

To follow is a channel survey comprising seven cross sections of the Cedarwood Stream to the rear of Coole (RPS 1074) and Glenbrook (RPS 1076) (McDonald Survey 2024).



Cedarwood Stream Channel Survey – Cross Section Location Plan and the Wade and Metal Detection Survey Area

Section 1: ITM: 566200.42, 663338.95



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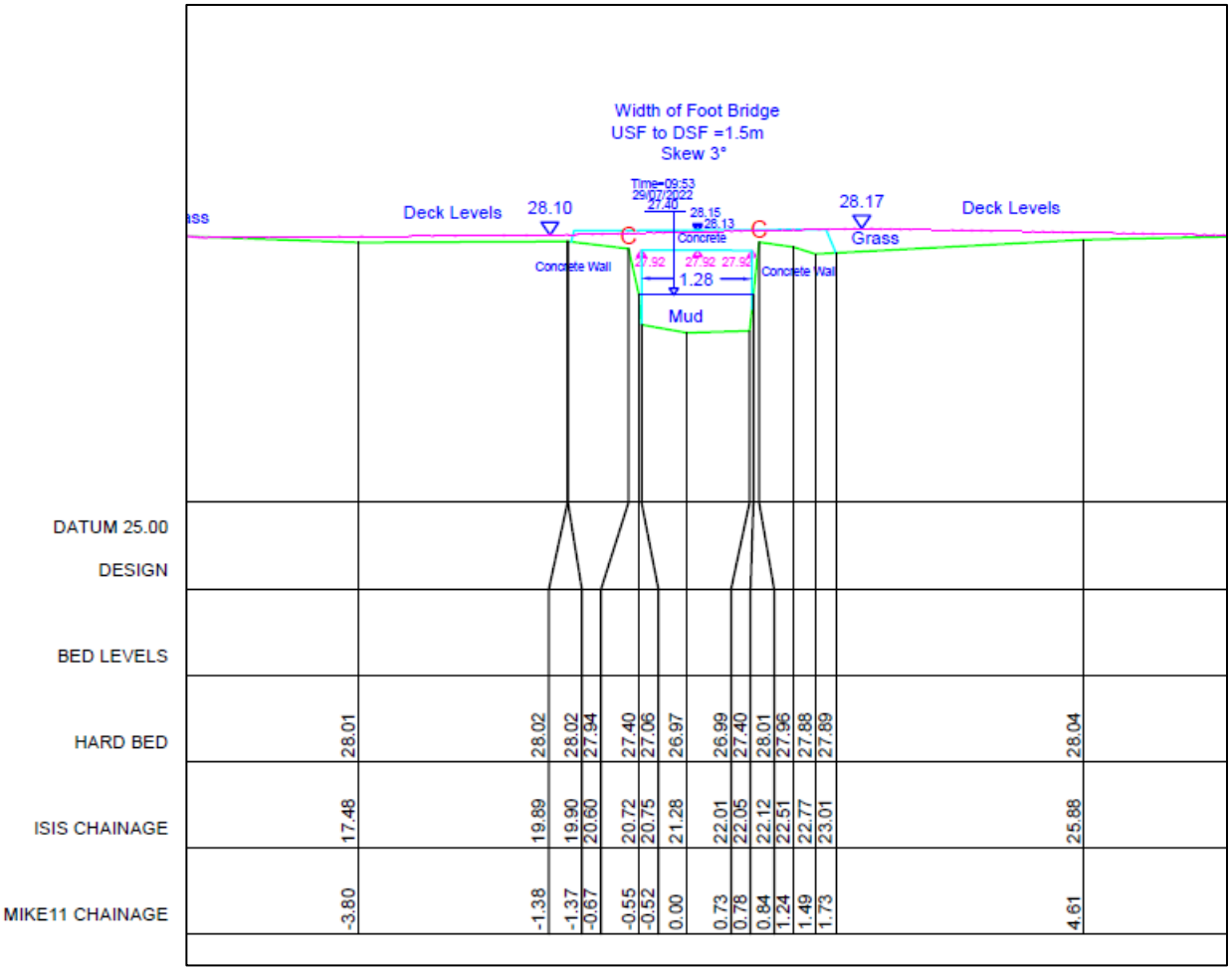

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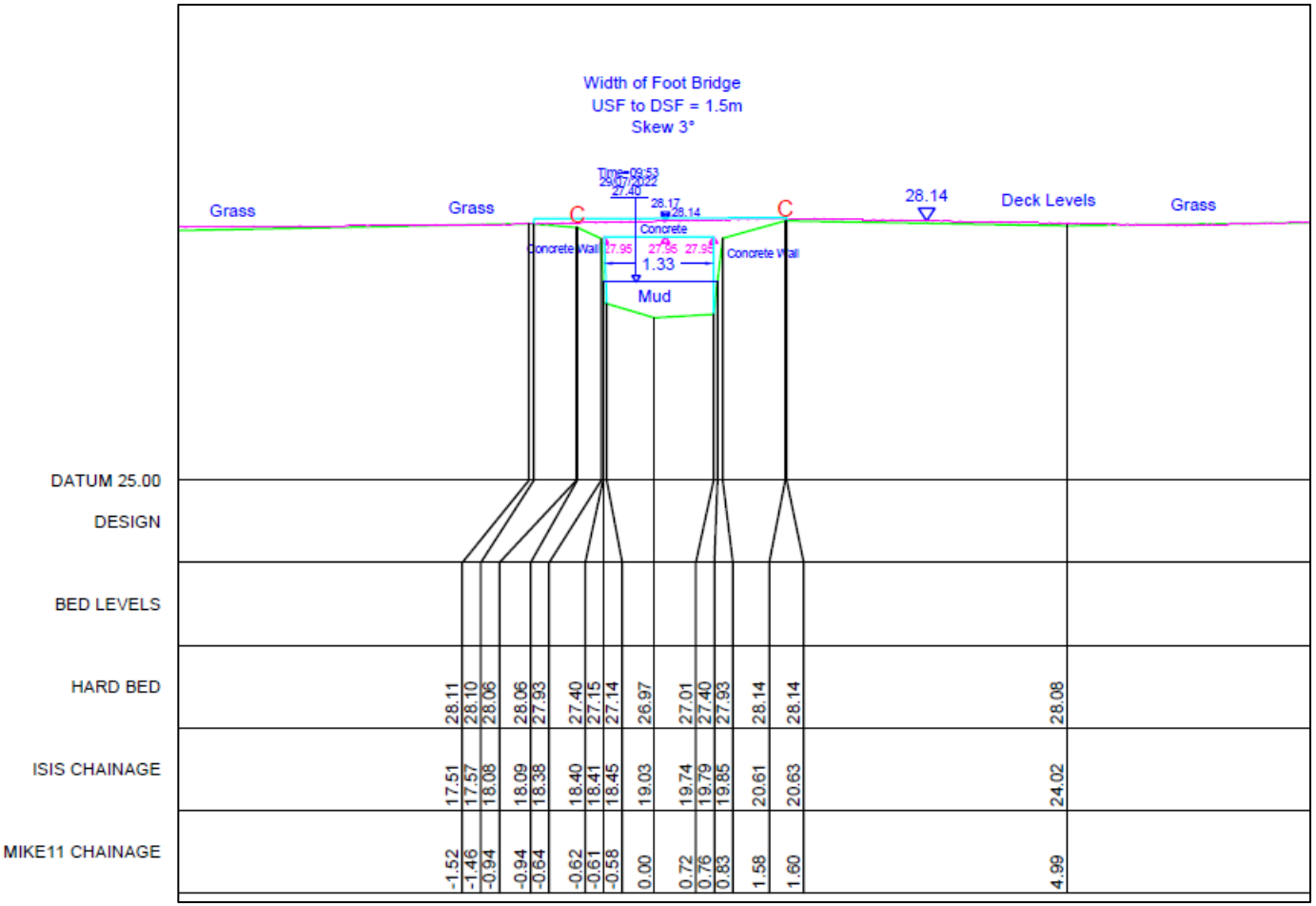
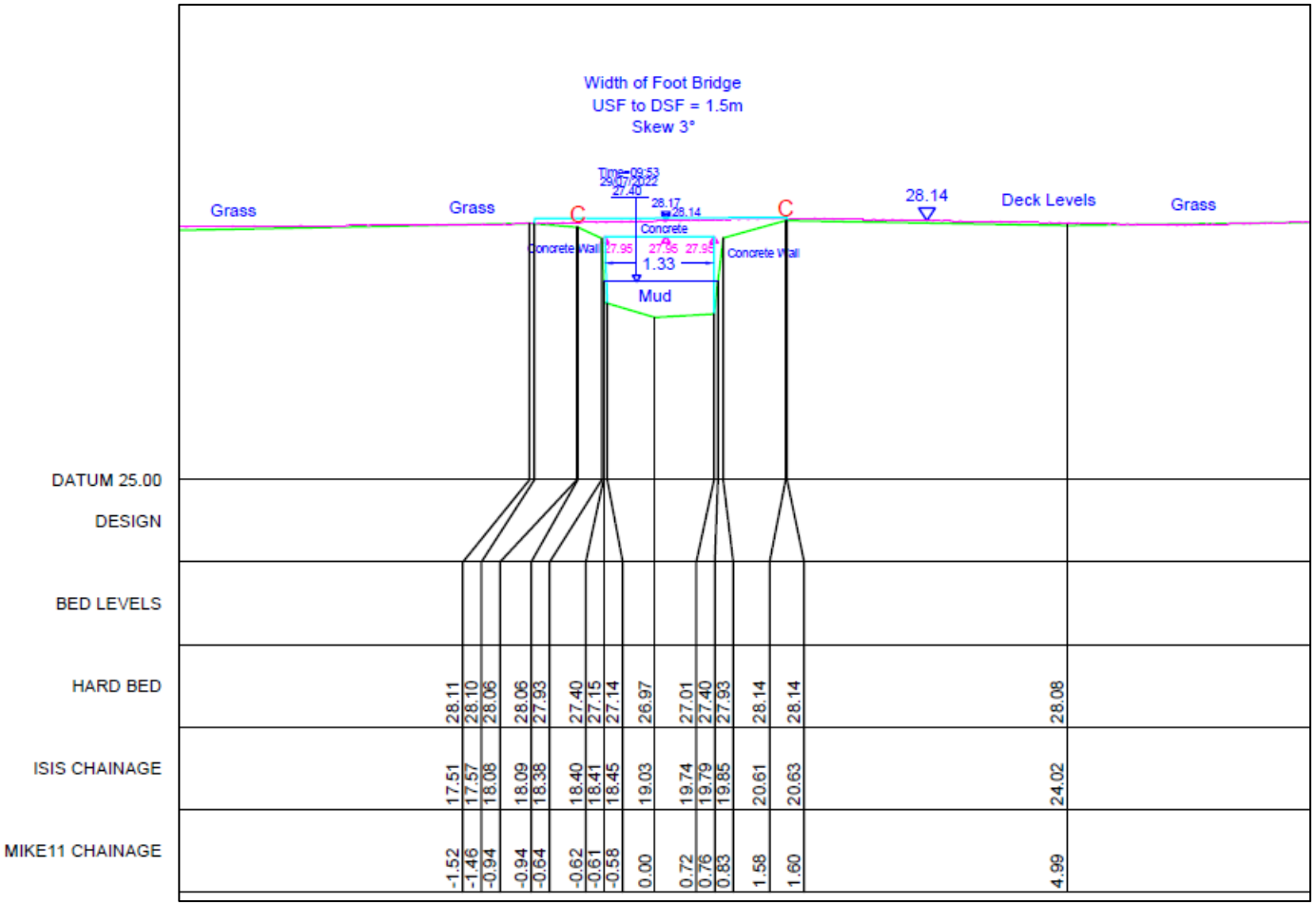
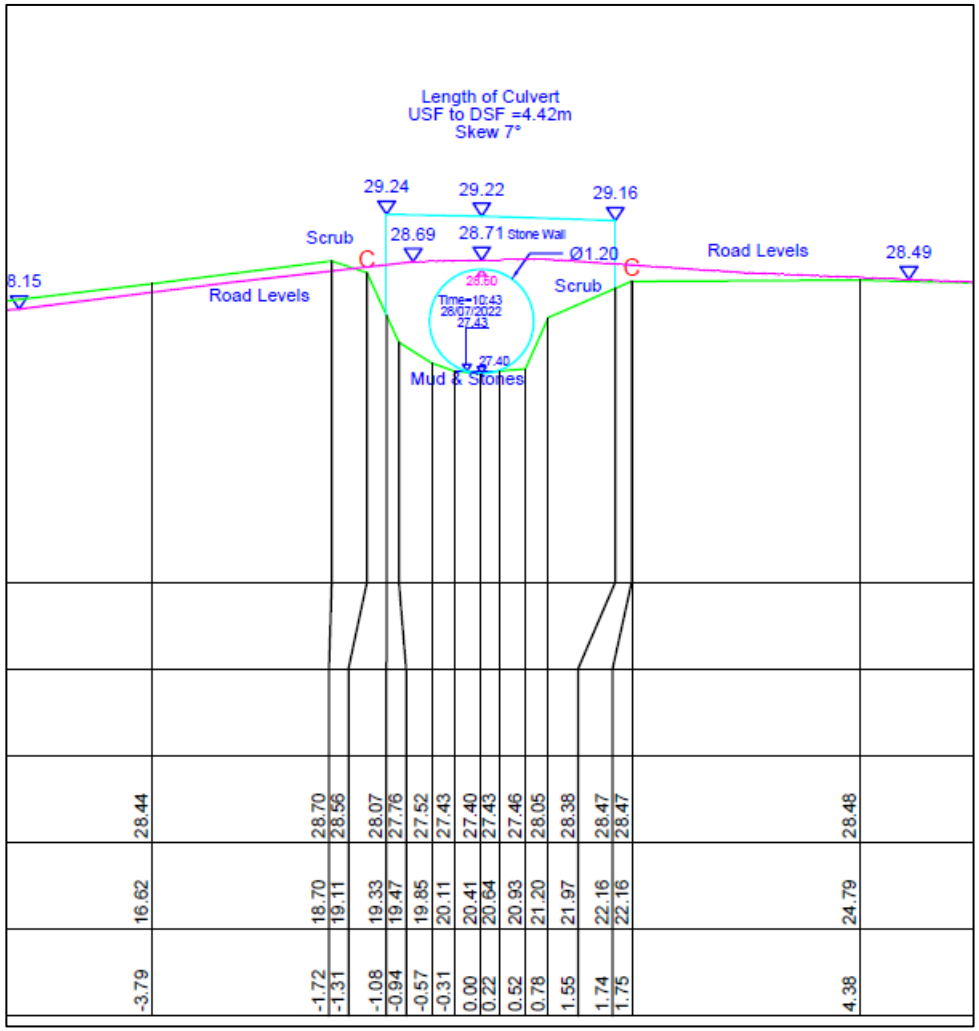


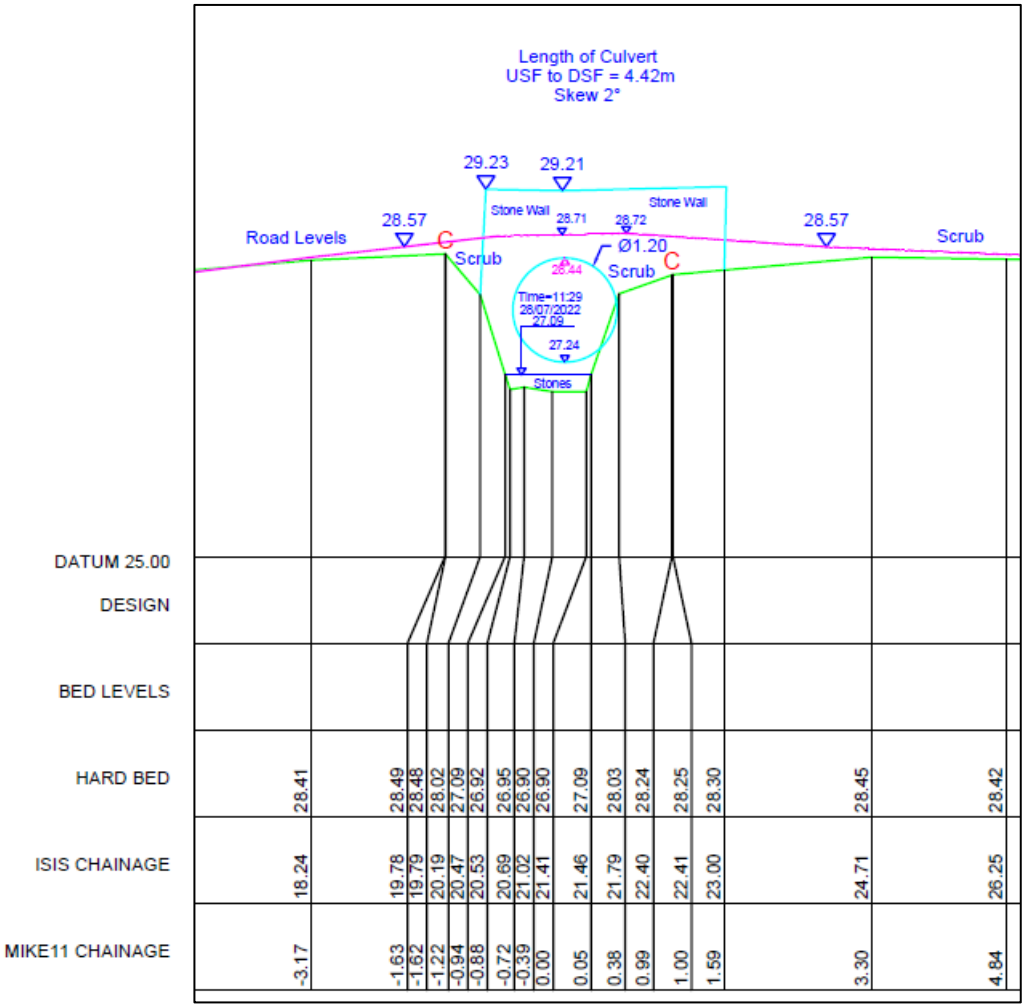
Section 4: ITM 566203.26, 663342.47



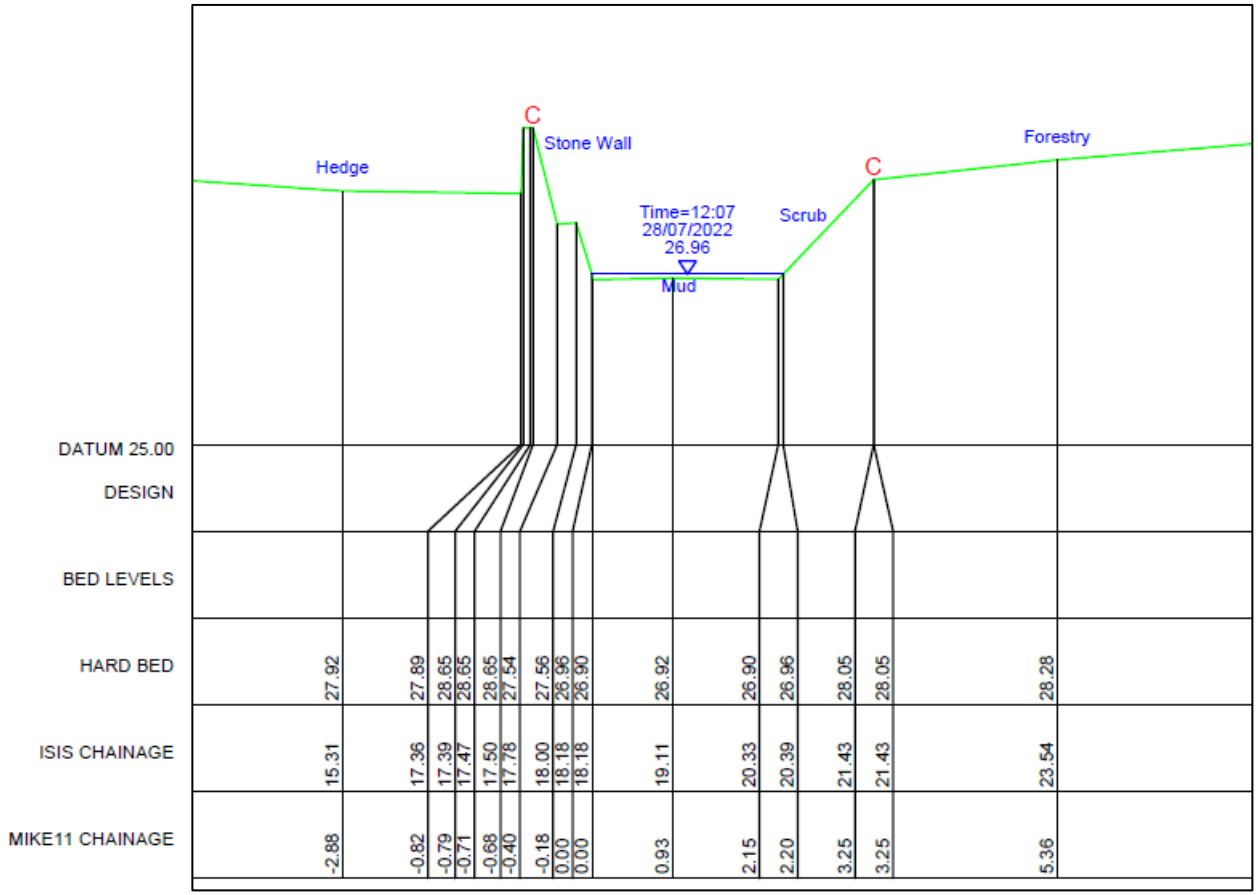
Section 5: ITM 566187.53, 663357.65



Section 6: 566184.16, 663361.31



Section 7: ITM 566177.16, 663374.31



12.8 Archaeological Test Excavation

CourtneyDeery

ARCHAEOLOGY & CULTURAL HERITAGE

Castleconnell Flood Relief Scheme

Archaeological Testing Report

Coolbane, Castleconnell, Co. Limerick

ITM 565938–E 662634N and 565938E– 662634N

Excavation Licence No. 24E0386

For

JBA Consulting Engineers

On Behalf

of Limerick County Council

Siobhán Deery BA, MA, H-dip Ed, MIAI, Licence
Eligible Archaeologist

27th July 2024

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EXECUTIVE SUMMARY

This report describes the results of an archaeological impact assessment including archaeological testing, carried out by Siobhán Deery of Courtney Deery Heritage Consultancy Ltd. (Licence No. 24E0386). The survey was carried out to inform the Environmental Impact Assessment Report (EIAR) for the proposed Castleconnell Flood Relief Scheme (FRS).

Archaeological testing was carried out over a three-day period, on the 23rd and 24th April and 25th July 2024. Two test trenches were opened across two proposed FRS embankment measures, test trench 1 in Stormont House at the western end of the Stormont embankment measure and test trench 2 in Coolbane Woods, on the southern end of the Coolbane Woods embankment measure.

No structures, artefacts or features of archaeological significance were discovered as a result of the test trenches opened. Test trench 1 in Stormont established that the land in the immediate vicinity of Stormont house comprises natural bedrock boulders close to the surface, on a natural rise in the landscape. Test trench 2 in Coolbane provided evidence of a dynamic riverine floodplain environment with layered well sorted alluvial deposits of clay, sand, peat overlying an impermeable clay layer. The natural dynamics of the floodplain would have been altered by the implementation of water management practices and the introduction of culverts/drainage ditches located to the north and west of the field. This finding is unsurprising considering that the area is shown as being 'Liable to floods' on historic mapping.

Due to the scale of the proposed FRS works in the two survey areas examined, it is considered that a programme of archaeological monitoring would be an appropriate strategy for identifying any potential archaeological remains that may survive subsurface, for construction of the proposed embankments. All groundworks associated with the FRS measures should be monitored by a qualified archaeologist, to determine whether there are any archaeological features or deposits present. The monitoring should be carried out well in advance of the construction stage of the development, allowing time within the programme for the full resolution of any archaeological features that may be identified. Monitoring will be carried out under licence to the DHLGH and will ensure the full recognition of, and – if required – the proper excavating and recording of all archaeological features, finds or deposits which may lie undisturbed beneath the ground surface.

Should any archaeological features and / or deposits be revealed during the monitoring then any further work would be subject to additional licensing with approval from the National Monuments Service (DHLGH) who may recommend preservation in situ (avoidance) or full excavation and recording of the feature in advance of construction work. Further recommendations will be made on the basis of the monitoring results. Limerick County Council and the OPW will make provision to fund any archaeological work that may take place during construction and the preparation of any reports arising from that work.

The recommendations made in this report are subject to approval of the National Monuments Service of DHLGH.

.

1. INTRODUCTION

1.1. General

This report describes the results of archaeological testing carried out by Siobhán Deery of Courtney Deery Heritage Consultancy Ltd. (Licence No. 24E0386) in two areas Castleconnell Flood Relief Scheme (FRS). The survey was carried out on behalf of Limerick County Council, JBA Consulting and EGIS to inform the Environmental Impact Assessment Report (EIAR) for the proposed Castleconnell Flood Relief Scheme (FRS).

The survey was carried out in accordance with recommendations received from the National Monuments Service (NMS) of the Department of Housing, Local Government and Housing (DHLGH) through the Development Application Unit (Ref.: G Pre00273/2023), consultation with the Underwater Archaeology Unit of the NMS and the Archaeology and the Archaeology and Flood Relief Schemes Guidelines (DHLGH 2023).

The aim of the test excavation was to determine the presence, extent, character and nature of archaeological features, deposits or material within the site and offers recommendations to mitigate the impact of development on any such archaeology.

The testing was carried out under licence to the NMS of the DHLGH Licence Ref: 24E0386.

1.2. The Proposed Development

Castleconnell is located approximately 10km north east of Limerick city. The village centre is located approximately 1km off the old Limerick/Dublin national road. The land-use is predominantly residential. The topography of Castleconnell and surrounding areas is low-lying. The main watercourse influencing flooding in Castleconnell is the 'Old Shannon River' and its feeder streams within the village; Stradbally East Stream, Cloon Island Stream and Cedarwood Stream.

Castleconnell is underlain by a wide vein of Waulsortian Limestones which comprise, unbedded lime-mudstones formed during the early or mid-Carboniferous period. The soils comprise brown Podzolic, Brown Earth, Podzol and Groundwater Gley and areas of peat.

The Castleconnell FRS measures are located on the eastern side of the River Shannon within the town. The flood measures proposed include embankments, flood walls and localised culverts, foul rising main, road raising, driveway reconfigurations, flood gate/demountable barriers and stream maintenance of Cedarwood Stream.

1.3. Approved Testing Strategy

Test excavation was discussed on-site in advance with the National Monuments Service. Given the flood relief measures proposed (predominantly flood walls) and their location in immediate proximity to River Shannon SAC, to existing walls and public footpaths, not all proposed measures could be tested. Three areas at the southern end of the scheme that were identified to be potentially suitable for archaeological test trenching, these were located at Maher's Pub, Stormont House and Coolbane Woods. A licence was granted by the DHLGH to open the test trenches in these locations, Licence Ref: 24E0386. Due to access issues however the scope of the testing was reduced, and location of the test trenches restructured as follows:

1.3.1. Maher's Pub

A flood wall is proposed around Maher's Pub carpark, part of which replaces a portion of an existing wall. A single test trench, T1, was proposed along the line of a flood wall measured at the rear of the pub in the car park (Figure 1). The ground surface comprises a level area with a gravel surface and some concrete. It was not possible to carry out the testing at this location as there was a risk that the proposed test trench measuring 1.8m wide and up to 12m long would substantially sink after backfilling and would deem the carpark unusable for parking.

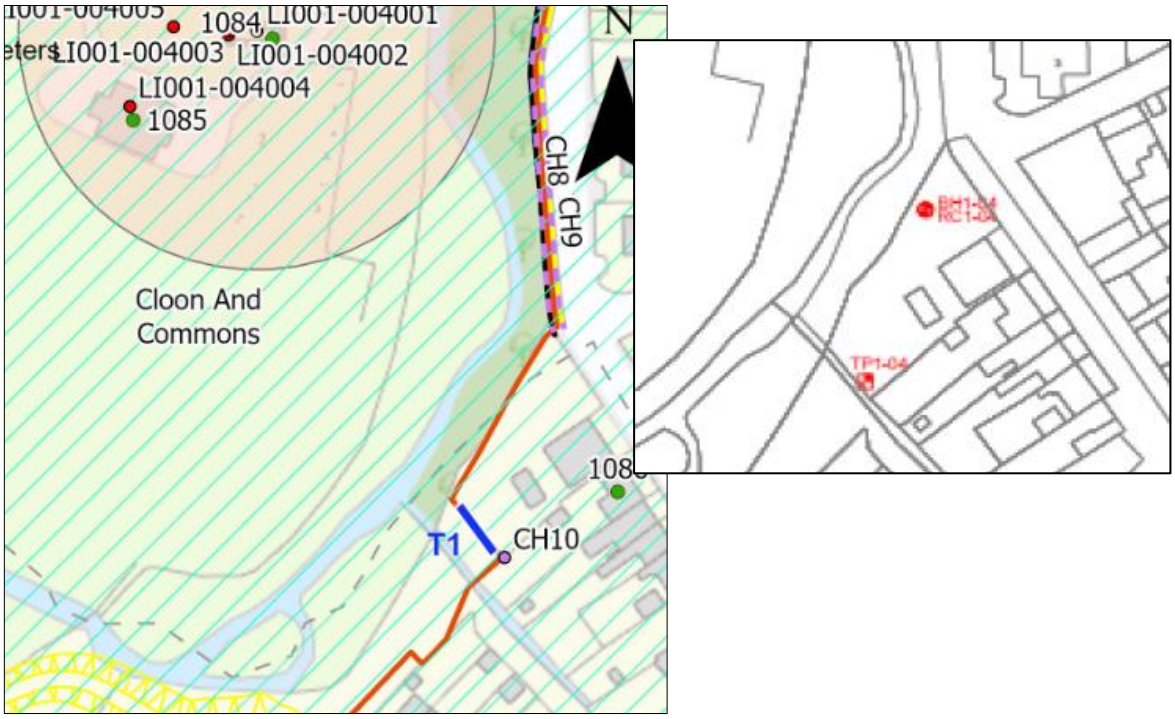

Figure 1: Location of Test Trench 1at Maher's Pub, and location of SI woks

An engineering test pit (Ref: TP1-04) however was previously opened in this area in 2020 and was monitored by Mizen Archaeology under licence 20E0542 (McCarthy and Haskins 2021). The trench measured 2.50m x 0.70m x2.05m and had the following stratigraphy:

Depth	Stratigraphy
0.00-0.05m	Gravel
0.05-0.50m	Light brown sandy gravel
0.50-0.70m	Dark brown gravelly silt
0.70-2.05m	Yellowish brown sandy clay

There was no evidence of archaeological features, stratigraphy or artefacts in the trench opened.

1.3.2. Stormont House

A proposed embankment is proposed north of Stormont House outside the RMP Zone of Notification (ZoN) for Castle Connell (RMP LI001-003) to the south. Two test trenches were proposed north of Stormont House. T3 (measuring 20m) located in a lawn area in front of the house, and T2 (measuring 30m) in an area that was recently covered in vegetation (Figure 2).

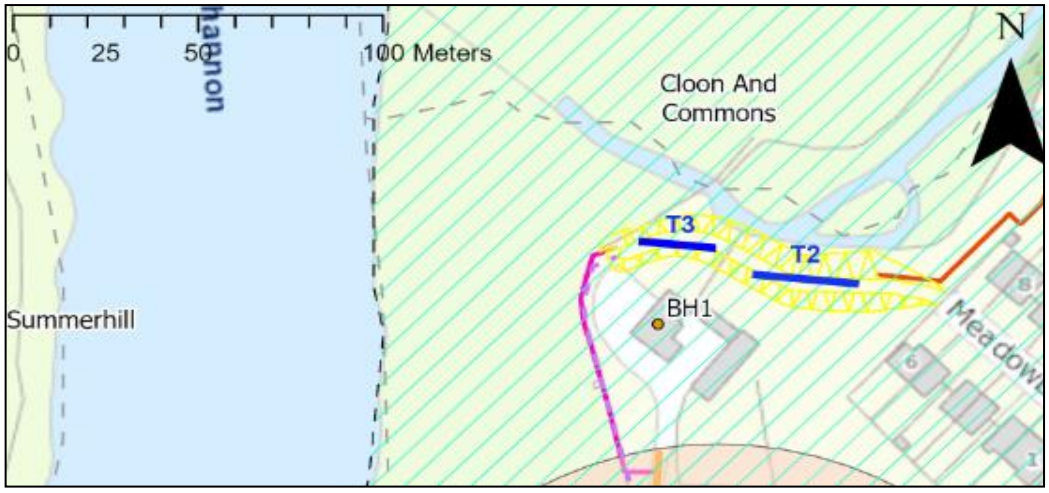

Figure 2: Stormont house embankment measure and location of T2 and T3

It was not possible to access the test trench T2 with a 13-ton machine due to the presence of a rubble stone gate pier hidden by vegetation. Trench 3 (now Trench 1- See Section 3) was possible in the front garden of the house positioned at the westernmost end of the proposed embankment.

1.3.3. Coolbane Woods

At Coolbane Woods two test trenches were proposed within the woodland area to investigate a proposed embankment (Figure 3). The measure is located south of Castle Connell (RMP LI001-003) and lies within its RMP Zone of Notification (ZoN). Archaeological testing was proposed at the northern end of the embankment, with tentative locations of two further trenches along the embankment depending on access (Figure 3).

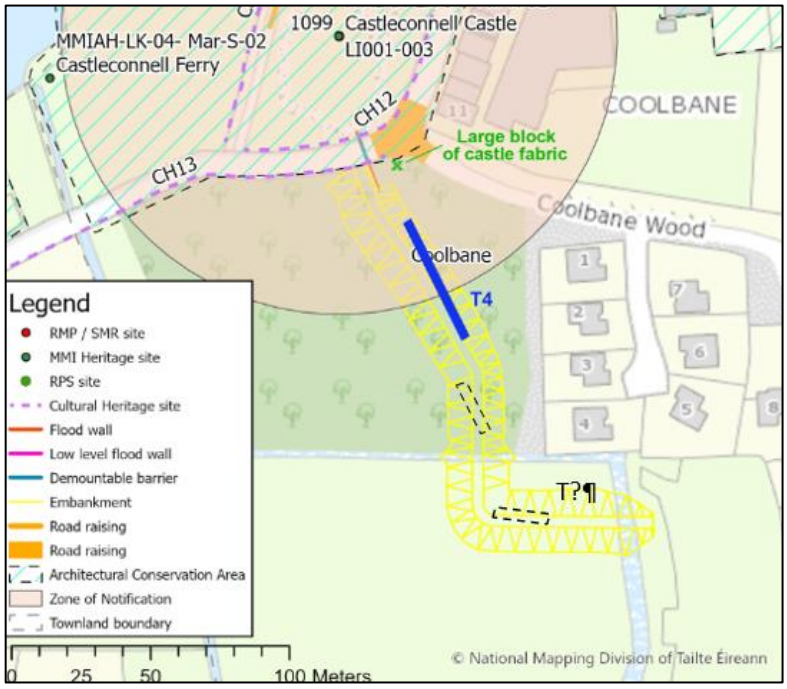

Figure 3: Proposed test trenches in Coolbane Woods

Permission to access the lands to carry out the testing however was withheld in the wooded area. Aerial imagery however shows that in northern part of the embankment that the area appears to have previously been stripped of topsoil and used as a haul road/compound area, possibly associated with neighbouring construction works. Testing in this area may not have yielded useful result. As an alternative a trench (Test Trench 2) was opened in the field to the south at the southern end of the proposed embankment, access to this was facilitated by Torca Homes who were constructing a development in an adjacent site (Figure 4).

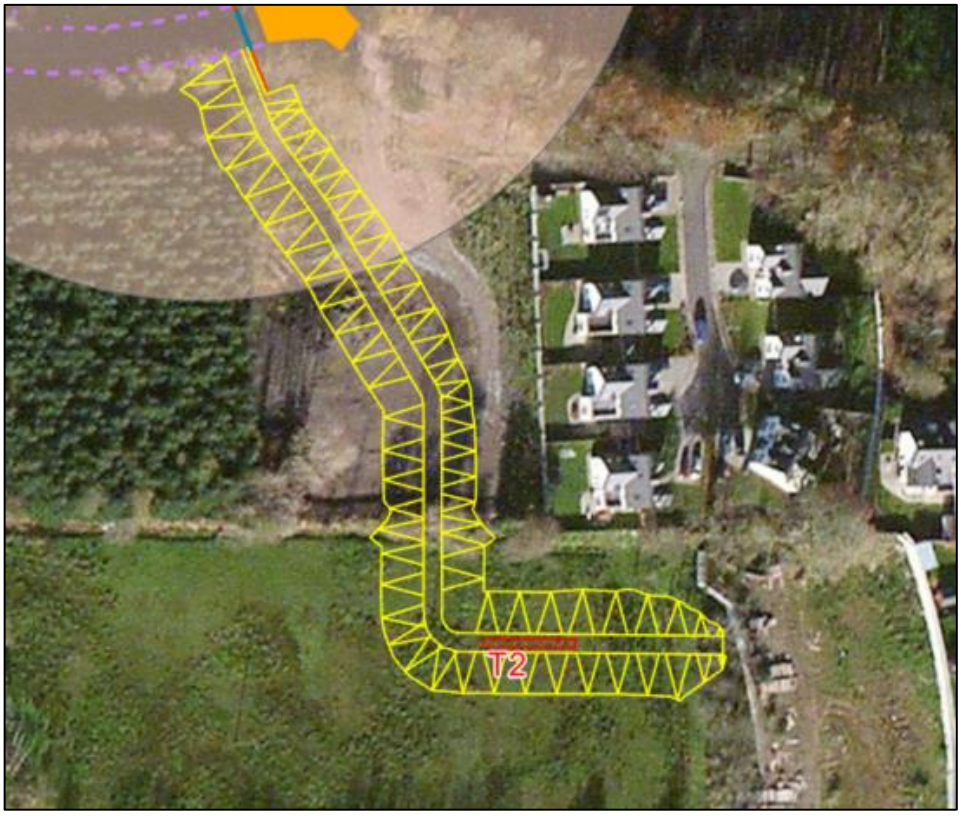

Figure 4: Aerial view showing the northern part of the embankment stripped of topsoil and test trench opened

2. ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

2.1. Archaeological and Historical Context (after O'Brien and Deery 2024)

2.1.1. Prehistoric Activity (c. 8000BC – AD 400)

The vicinity of Castleconnell is of particular significance for prehistoric studies, following the discovery of two cremations of Early Mesolithic date, the oldest recorded burial in Ireland, in the townland of Hermitage to the south of the study area (Licence no.: 01E0319; Collins & Coyne 2003[1]; 2006[2]). The discovery comprised of the cremated bones of a probable male adult within a

[1] Collins, T. & Coyne, F. (2003) 'Fire and Water… Early Mesolithic Cremations at Castleconnell, Co. Limerick' in Archaeology Ireland. Volume 17, No. 2. Wicklow: Wordwell.
[2] Collins, T. & Coyne, F. (2006) 'As old as we felt…' in Archaeology Ireland. Volume 20, No. 4. Wicklow: Wordwell.

subcircular pit. A posthole was found in the base of the pit, and the cremated remains appeared to have been placed around the former post, which may have functioned as a burial marker. A polished stone axe head and two burnt microliths, all of which showed signs of burning, were placed within the burial pit. The second burial was a large pit containing a small amount (possibly a token burial) of burnt bone of indeterminate sex, heat-shattered stone and pieces of burnt and baked clay, suggesting the remains were shovelled from fire to pit. Radiocarbon dating demonstrated that the first burial dated to c. 7400BC, while the second was from c. 7000BC. Two more cremations were found which were of later date (6610-6370 cal. BC and 2310-1750 cal. BC).

2.1.2. Early Medieval Period (400-1200)

Castleconnell is in the ancient territory of the '*Tuath Luimeach'* and was held by the Uí Chonaing or O'Gunnings. Castleconnell was known as *Mur mic an Duinn* or the Fortress of the son of Donn. Donn was well known in Celtic mythology, and it is likely his son is Eogabal, father of *Fer Fill* and *Áine* of Knockainy, Gods of the *Eoghanachta*. The later name of Castleconnell is also related to this group, being derived from *'Carrig-Cnuil'* (the fort of the O'Gunnings). Their lands stretched along the Shannon over the Tuath Luimneach, to the east of the Maigue, and to the north of Crewally, or Knocknagall. It was later a stronghold of the O' Briens of Thomond, and the site of Castleconnell is located on an earlier fort associated with the O' Briens.

Although the ecclesiastical site on Cloon Island (RMP LI001-004001) is traditionally said to have been a Franciscan friary founded in the 13th century, there is evidence that this was originally a pre-Norman site. In particular, there are two early Christian cross slabs (RMP LI001-004002/3) incorporated into the gable of the church. The provenance of the church is also uncertain and the name of Cloon Island, being a Gaelic name, also suggest an early Christian monastery. Tradition also records that Cloon House was built on the site of a holy well (SMR LI001-004004), the presence of which is consistent with early medieval foundations. One the cross-slabs (RMP LI001-004002) is carved with a Greek cross, and some indistinct markings may be part of an Ogham inscription. The other (RMP LI001-004003) is carved with a Latin cross.

2.1.3. Medieval Period (1200-1600)

The grandson of Brian Boru was murdered by the Prince of Thomond at Castle Connell in 1174, when it was described as '*Caslan Uí Chonaing'* (the castle of the O'Gunnings). The Prince of Thomond had left his followers on the other side of the Shannon to be received by the O' Briens, but they crossed the river by night and ambushed the fort.

This name and its Norman counterpart 'Castro Iconing' (-konyng, -conyn) appear in many documents from its grant to William de Burgo in 1201, when it was granted to him on condition of repairing and fortifying the castle (Ferrar 1786[3]). King John is noted as having said '*If he fortify the castle, and we desire to have it we will give him a reasonable rate'* in the Ware's Annals. The castle fell into the hands of the Bruces in 1315.

A friary, variously described as being Franciscan or Augustinian, was founded on Cloon Island in 1291 by Reginald de Burgh, baron of Castleconnell (RMP LI001-004001). Not much is known of

[3] Ferrar, J. (1787) 'An Essay on Castle Connell Spa, On Water in General and Cold Bathing, in The History of Limerick: Ecclesiastical, Civil and Military, From the Earliest Records to the Year 1787.

this friary, and it was not depicted on the Down Survey of 1656-8 . In comparison, the medieval parish church (RMP LI001-002001) in Stradbally to the south of the town remained in use throughout the medieval period and was eventually replaced with a 19th century Church of Ireland structure. This church was known as 'Idumyn' in 1302 and was part of the lands in 1633, owned by the Earl of Ormond. A late 16th / early 17th century round-arched doorway with punch-dressed jambs and hood-moulding above has been inserted into the western gable of the Church of Ireland church, where it is now used as the main doorway into this church (SMR LI001-002003).

In 1578 Queen Elizabeth wrote letters of condolence to William de Burgh for the loss of his eldest son, who was slain in a skirmish with the Earl of Desmond, and the same year created him Baron of 'Castle-Connel'.

2.1.4. Post-Medieval and Early Modern Periods

In the war of 1641 'Lord Castle-Connel' forfeited his estate and title, which were restored on the accession of James II. The title became extinct in 1691.

In 1651 a garrison was placed at the castle by General Ireton while on his march to blockade Limerick. The lands of Clanwilliam were described in the Civil Survey as '*Parte parish of Stradballie W. Lord Borke, Barron of Castlecon, Irish Papist. The manor of Castlecon, both Portcrussies, Parcke, Stradbally, and Bohirkeyle, 6 plough lands with a castle, ffishing weares, one mill, a Courte Barron and other privileges'*.

The Down Survey map of 1656-8 demonstrates that a large part of the surrounding landscape comprised of bog. 'A Causeway Through the Bog' is illustrated through the narrowest part of the bog which appears to follow the orientation of the existing R445. This bog, along with the course of the River Shannon, would have created a defensible position in which to construct the fortification at Castleconnell. The castle and the medieval church are depicted as upstanding buildings.

During the revolution in 1688, the castle held a garrison of King James' forces, and it was consequently ordered to be destroyed by General Ginkle in 1691. It was destroyed by explosives and the explosion was so great that it was felt in Limerick, where several windows were reported to have broken (Ferrar 1786[4]). In the war of 1641 'Lord Castle-Connel' forfeited his estate and title, which were restored on the accession of James II.

Much of the early modern prosperity of the town was derived first from the patronage of the Burke or Bourgh family, who were the descendants of William de Burgh, and secondly from the commercial opportunities afforded by the presence of a chalybeate spa located to the north of the town in Lacka. The town of Castleconnell was noted in the 18th and 19th centuries for it curative waters and the site of a Spa. The soil is of a calcareous nature with ferrous inclusions and the sediment of the water was successfully applied to cure ulcers. The water was chiefly consumed, but the curative properties of cold-water bathing were also reported (Ferrar 1786).

[4] Ferrar, J. (1787) 'An Essay on Castle Connell Spa, On Water in General and Cold Bathing, in The History of Limerick: Ecclesiastical, Civil and Military, From the Earliest Records to the Year 1787.

2.2. Previous Archaeological Investigations

Eight previous archaeological investigations have been undertaken within the study area. Three investigations have targeted the site of a burial ground on Chapel Hill (RMP LI001-008001), the earliest being in 1974 (IA/142/74; Cahill & Sikora 2011, 494[5]). Another investigation in 1990 revealed one, and possibly two, shallow graves ('Excavations' ref: 1990:085; Hodkinson 1990[6]), with the most recent archaeological works revealing at least thirteen individuals, including ten articulated human remains and disarticulated remains representing at least three other individuals (Licence no.: 03E0214; Lynch 2003[7]; Coyne 2003[8]). The name of 'Chapel Hill' would suggest the presence of a church, with local tradition also recording a church at the site of a nearby old schoolhouse, which would suggest that this was the associated burial ground. There was also a tradition of the site having functioned as a famine plot.

Archaeological investigations as part of the Castleconnell Sewerage Scheme revealed the remains of a burnt spread behind the primary school in Coolreiry and medieval layers in the vicinity of the castle (RMP LI001-003; Licence no.: 01E0416; McCutcheon 2001a[9]; 2002[10]). Post-medieval remains were noted throughout the village.

Testing was carried out on the 'Track of Cromwell's Road' on the existing R525, revealing what may have been an original dirt track predating surfacing efforts in the 19th / 20th century (Licence no.: 98E0429). Investigations in the vicinity of a recorded souterrain (RMP LI001-007) revealed nothing of archaeological significance.

A test excavation at a low mound in Stradbally North showed the mound to have been natural (Licence no.: 01E0318; McCutcheon 2001b[11]). Investigations in advance of a housing development in the vicinity of a souterrain (RMP LI001-007; Licence no.: 02E0435; Collins 2002[12]) revealed nothing of archaeological significance.

[5] Cahill, M. & Sikora, M. (2011) *Breaking Ground, Finding Graves – reports on the excavations of burials by the National Museum of Ireland, 1927-2006*. National Museum of Ireland Monograph Series 4, Volume 2. Dublin: Wordwell.

[6] Hodkinson, B. (1990) 'Stradbally North, Limerick'. Available at https://excavations.ie/report/1990/Limerick/0001020/ [Accessed 09/10/23]

[7] Lynch, L. (2003) 'Stradbally North, Limerick'. Licence no.: 03E0214. Available at https://excavations.ie/report/2003/Limerick/0010241/ [Accessed 09/10/23]

[8] Coyne, F. (2003) 'Stradbally North, Limerick'. Licence no.: 02E0214. Available at https://excavations.ie/report/2003/Limerick/0010242/ [Accessed 09/10/23]

[9] McCutcheon, S. (2001a) 'Ballyvollane / Prospect / Newgarden North / Cooleiry / Derreen / Lacka / Coolbane / Cloon / Commons, Limerick'. Licence no.: 01E0416. Available at https://excavations.ie/report/2001/Limerick/0006686/ [Accessed 09/10/23]

[10] McCutcheon, S. (2002) 'Ballyvollane / Prospect / Newgarden North / Hermitage / Stradbally North / Cooleiry / Derreen / Lacka / Coolbane / Cloon / Commons, Limerick'. Licence no.: 01E0416. Available at https://excavations.ie/report/2002/Limerick/0008442/ [Accessed 09/10/23]

[11] McCutcheon, S. (2001b) 'Stradbally North, Limerick'. Licence no.: 01E0318. Available at https://excavations.ie/report/2001/Limerick/0006741/ [Accessed 09/10/23]

[12] Collins, T. (2002) 'Stradbally North, Castleconnell, Limerick'. Licence no.: 02E0435. Available at https://excavations.ie/report/2002/Limerick/0008461/ [Accessed 09/10/23]

2.3. Site Investigations

Archaeological monitoring has been undertaken of site investigations which were carried out at an early stage of this flood relief scheme (Licence no.: 20E0542, 20R0204; McCarthy & Haskins[13]). The archaeological monitoring programme included metal detection of spoil and comprised:

- 4 trial pits, one of which was within the Zone of Notification (ZoN) for the castle (RMP LI001-003);
- 4 slit trenches, one of which was within the ZoN for the castle and
- 2 inspection pits at the boundary wall between the castle and the road (CH12).

No evidence of archaeological features, stratigraphy or artefacts were uncovered during archaeological monitoring of the test pits or slit trenches.

Borehole logs were also obtained for investigations within the ZoN of the castle or in proximity to it. Borehole logs RC1-01 (ITM 566029, 663360) on the riverbank of the River Shannon at a depth of 3.00–3.20m noted the presence of timber and metal inclusions which was then relocated c. 5m to the north-east (ITM 566030, 663360). RC1-01A also recorded metal objects at a depth of 1.50–2.90m. Due to the small size of the rotary core at approximately 0.20m in diameter, no further information could be obtained. The nature of the wooden and metal material recorded in RC1-01 and RC1-01A could not be determined, and it may represent archaeological material.

[13] McCarthy, J. & Haskins, C. (2021) 'Castleconnell Flood Relief Scheme, Site Investigation Works, Archaeological Monitoring Report'. Licence no.: 20E0542, 20R0204. Unpublished report: Mizen Archaeology.

3. ARCHAEOLOGICAL TESTING RESULTS

3.1. General

Archaeological testing was carried out over a three-day period, on the 23rd and 24th April and 25th July 2024. It was carried out using a 13- ton tracked excavator fitted with a toothless grading bucket. All trenches were excavated to the surface of archaeological or potential archaeological deposits or to the underlying natural subsoil, whichever was encountered first.

In total two test trenches were opened, one in Stormont House (T1) and one in Coolbane (T2). The test trenches were set out using a GPS unit.

3.2. Results of the Test Trenches

3.2.1. Test Trench 1, Stormont House, Coolbane

At Stormont House, Test Trench 1 targeted the western end of a proposed embankment measure in the front northeastern lawn of the house (ITM 565938–E 662634N to 565958E- 662641N) (Figure 5, Plate 1). The proposed measure runs just inside the northern boundary of the property in a lawn area and in walled yard area to the northeast of the main house that is overgrown with vegetation.

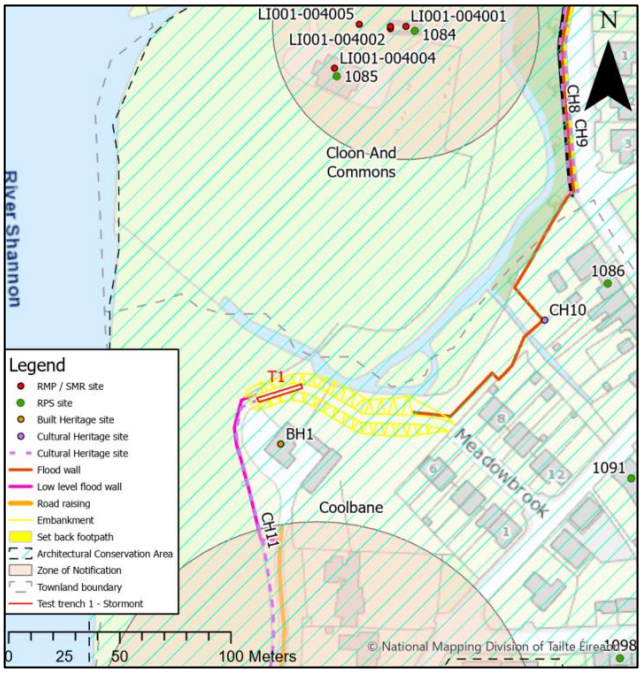

Figure 5: Location of test trench 1
Plate 1 Drone view of Trench 1 and Stormont House (the front façade of the house is due southwest)

The trench ran in a northeast to southwest direction, it measured 1.8m wide and was 21m long. The natural subsoil comprised a light brown silty clay with seams of limestone bedrock/large in-situ boulders (Plates 2 and 3).

Table 1 Summary of Trench 1

Depth	Description	Interpretation
0 – 0.10m	Loose humic dark brown layer	Garden topsoil
0.25m – 0.80m	Mid-brown loose silty clay with natural lenses of sand (c.0.05m deep) and infrequent subangular stone inclusions.	Subsoil
0.80m +	Friable light brown silty clay with seams of limestone bedrock/large in-situ boulders	Natural Bedrock

Plate 2 Trench 1, view towards the northeast

Plate 3 Trench 1, view towards the southwest

No features, soils or finds of archaeological potential was identified in Trench 1. The testing confirms that Coolbane house was founded on a knoll of dry land on the edge of the river.

3.2.2. Test Trench 2, Coolbane Woods

Test trench 2 targeted the southernmost east-west leg of the proposed embankment in Coolbane (Figure 6). Access to the area was gained through a construction site immediately to the east. The measure is located in a damp unused meadowland. The trench (ITM 565938E– 662634N to 565958E- 662641N) was positioned to avoid impact on mature trees and focused on a clearing of reeds and water loving plants and also avoided working under an overhead electricity line.

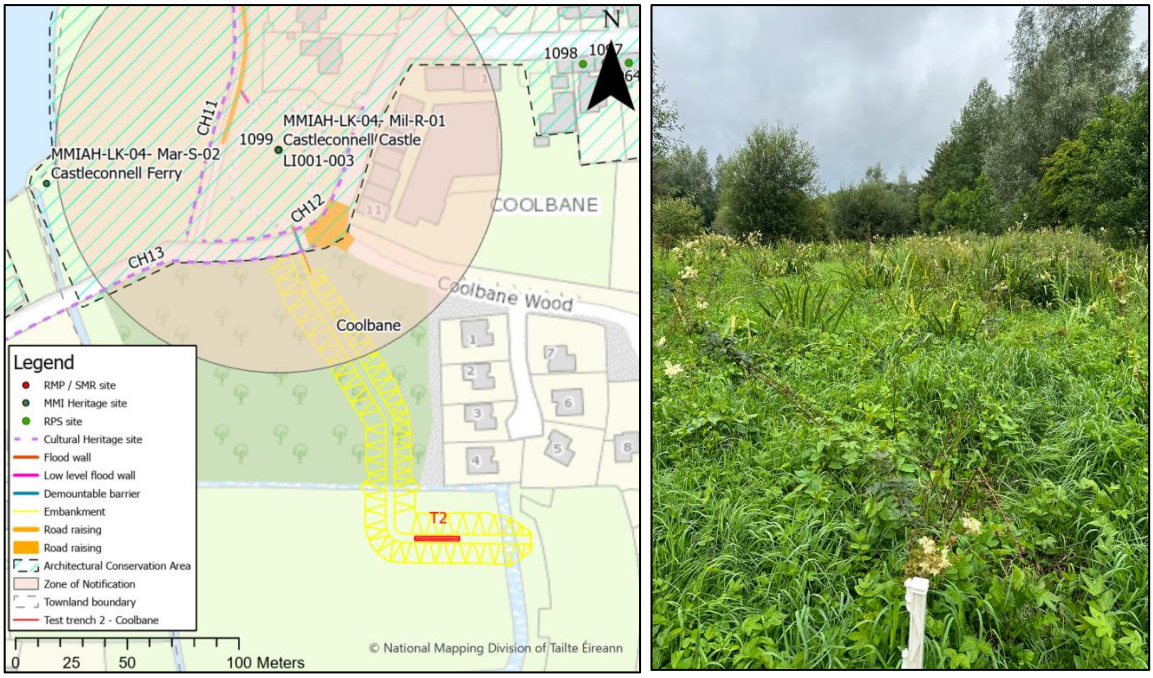

Figure 6: Location of test trench 2
Plate 4 View west of the test trench location

The trench ran in an east–west direction, it measured 1.8m wide and 20m long.

Table 2 Summary of Trench 2

Depth	Description	Interpretation
0–0.20m	Loose humic rooty dark brown clay- some metal waste and plastic	Topsoil
0.20m–0.40m	Mildly compact friable light brown sand layer with no inclusions	Subsoil
0.40m–0.55m	Dark brown fibrous peat deposit	Subsoil
0.55–0.70	Compact beige- grey sand layer with no inclusions	Subsoil
0.70m–2m+	Compact light grey silty clay	Natural subsoil

No features finds or soil of archaeological interest was identified in the trench.

Test trench 2 revealed dynamic riverine environment, with the identification of alluvial deposits indicating occurrences of flooding, deposition and periods of standing water (Plates 5 and 6). These well sorted deposits were to be expected in the floodplain of the River Shannon which lies a close distance to the northwest. The peat layer in the area tested was shallow (0.25m thick), the anaerobic environment of peat would have the potential to preserve organic features and artefacts, however the layer it did not contain any inclusions of note (such as timbers or worked wood/leather etc. of any kind).

Plate 5 View looking east along Trench 2

Plate 6 Profile of Trench 2

4. SUMMARY OF THE RESULTS

The two trenches were placed across proposed embankments at Stormont and at Coolbane Woods.

- Trench 1 in Stormont established that the land in the immediate vicinity of Stormont house comprises natural bedrock boulders close to the surface, on a natural rise in the landscape.
- Trench 2 in Coolbane provided evidence of a dynamic riverine floodplain environment with layered well sorted alluvial deposits of clay, sand, peat overlying an impermeable clay layer. The natural dynamics of the floodplain would have been altered by the implementation of water management practices and the introduction of culverts/drainage ditches located to the north and west of the field. The findings are unsurprising considering that the area is shown as being 'Liable to floods' on historic mapping.

No features or finds of an archaeological potential was identified in the test trenches opened.

5. IMPACT ASSESSMENT

Flood embankments require considerable earthmoving works A temporary working space of 5-10m on each side of the embankment as dig-and-replace works of approximately 2m deep may be required (TBC by SI). Given the large-scale nature of the proposals, the proximity of the site to the River Shannon and Castle Connell there is a potential that archaeological finds or features may be identified during the earthmoving works associated with the embankments, especially in the areas not tested.

6. RECOMMENDATIONS

All groundworks associated with the embankments should be monitored by a qualified archaeologist, to determine whether there are any archaeological features or deposits present. The monitoring should be carried out well in advance of the construction stage of the development, allowing time within the programme for the full resolution of any archaeological features that may be identified.

Monitoring will be carried out under licence to the DHLGH and will ensure the full recognition of, and – if required – the proper excavating and recording of all archaeological features, finds or deposits which may lie undisturbed beneath the ground surface.

Should any archaeological features and / or deposits be revealed during the monitoring then any further work would be subject to additional licensing with approval from the National Monuments Service (DHLGH) who may recommend preservation in situ (avoidance) or full excavation and recording of the feature in advance of construction work. Further recommendations will be made on the basis of the monitoring results. Limerick County Council and the OPW will make provision to fund any archaeological work that may take place during construction and the preparation of any reports arising from that work.

The recommendations made in this report are subject to approval of the National Monuments Service of DHLGH

The recommendations made in this report are subject to consultation with the Underwater Archaeological Unit of National Monuments Service DHLGH and the relevant planning authority.

7. REFERENCES

Collins, T. & Coyne, F. (2003) 'Fire and Water… Early Mesolithic Cremations at Castleconnell, Co. Limerick' in *Archaeology Ireland.* Volume 17, No. 2. Wicklow: Wordwell.

Collins, T. & Coyne, F. (2006) 'As old as we felt…' in *Archaeology Ireland.* Volume 20, No. 4. Wicklow: Wordwell.

Crawford, H.S. (1912) 'A descriptive list of early cross-slabs and pillars'. *Journal of the Royal Society of Antiquaries of Ireland,* Volume 42, pp. 217-44

Department of Arts, Heritage and the Gaeltacht (2011) 'Architectural Heritage Protection. Guidelines for Planning Authorities'. Department of Arts, Heritage and the Gaeltacht.

Dowd, J. (1896) *Round about the County of Limerick.* Limerick: G. McKern & Sons.

Dúchas The Heritage Service (1997) 'Record of Monuments and Places: County Limerick'. Department of Arts, Heritage, Gaeltacht and the Islands.

Ferrar, J. (1787) 'An Essay on Castle Connell Spa, On Water in General and Cold Bathing, in *The History of Limerick: Ecclesiastical, Civil and Military, From the Earliest Records to the Year 1787.*

Gowen, M. (1998) 'Archaeological Appraisal: Proposed Castleconnell Sewage Scheme, Co. Limerick'. Unpublished report: Margaret Gowen & Co. Ltd.

Gwynn, A., & Hadcock, R. N. (1970) *Medieval religious houses: Ireland*. London.

Joyce, P.W. (1910-1920) *The Origin and History of Irish Names of Places.* Volumes 1-3. Dublin: M.H. Gill and Son.

Lewis, S. (1837) *A Topographical History of Ireland*. London: Lewis & Co.

Limerick City & County Council (2013) 'Castleconnell Local Area Plan 2013-2019'. Limerick: Limerick City & County Council.

Limerick City & County Council (2019) 'Evolutionary Study Report on the Maritime, Military and Industrial Heritage of Limerick City and County'. Limerick: Limerick City & County Council.

Limerick City & County Council (2022a) 'Draft Castleconnell Local Area Plan 2023-2029'. Limerick: Limerick City & County Council.

Limerick City & County Council (2022b) 'Limerick County Development Plan 2022-2028'. Limerick: Limerick City & County Council.

Macalister, R.A.S. (1949) *Corpus Inscriptionum Insularum Celticarum*. Dublin: Irish Manuscripts Commission.

O' Brien, Y. (2019) 'Castleconnell Flood Relief Scheme, Castleconnell, Co. Limerick. Cultural Heritage Constraints Study'. Unpublished report: Courtney Deery Heritage Consultancy Ltd.

O' Brien, Y. (2022) 'Cultural Heritage Options Assessment Report. Castleconnell Flood Relief Scheme, Co. Limerick'. Unpublished report: Courtney Deery Heritage Consultancy Ltd.

O'Brien, J. (2022) 'Limerick's Stormont House and grounds on historically strategic river location for €975,000'. *Irish Independent*. Available at https://www.independent.ie/life/home-garden/limericks-stormont-house-and-grounds-on-historically-strategic-river-location-for-975000-42153317.html (Accessed 02/12/22)

Okasha, E. & Forsyth, K. (2001) *Early Christian inscriptions of Munster: a corpus of the inscribed stones.* Cork University Press.

Salter, M. (2004) *The Castles of North Munster*. Worcestershire: Folly Publications.

Stokes, M. (1872) *Christian inscriptions in the Irish language, chiefly collected and drawn by George Petrie L.L.D.* Dublin: The Royal Historical and Archaeological Society of Ireland.

Westropp, T.J. (1904-05) 'A survey of the ancient churches of Co. Limerick'. *Proceedings of the Royal Irish Academy.*

Westropp, T.J. (1906-07) 'The ancient castles of the county of Limerick'. *Proceedings of the Royal Irish Academy* 26, pp. 54-264

7.1. Online Sources

www.archaeology.ie

www.downsurvey.tcd.ie

www.excavations.ie

www.heritagemaps.ie

www.osi.ie

12.9 Method Statement and Specification – Structural Conservation

Method Statement and Specification
Structural conservation

Castleconnell Flood Relief Scheme
For:
Limerick County Council

Courtney Deery Archaeologists

Southgate Associates
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Sketches

1. Specifications for Masonry Repairs to Island House Causeway

Conservation Specifications and Methodologies

- Masonry consolidation is required to the causeway parapets as shown on drawing **SA202413 /SKCR1.**

Environmental considerations

- When removing material from the bridge to clean and expose the masonry, this should be removed into buckets to avoid contamination of the river.
- If archaeological material is noted by the builder the contract archaeologist should be informed.

Cleaning Masonry- Removal of Vegetation:

- Carefully remove minor plants, root systems and associated soil/debris from joints, voids and facework.

- Use dampened temporary timber wedges or other approved method to assist removal of roots. Where growths cannot be removed completely without disturbing masonry seek instructions. Where a significant root or trunk is heavily ingrained in a section of masonry not easily removeable it should be cut as close as possible to the face of the masonry, a 15mm copper pipe should be cored into the cut face and an approved Glyphosphate treatment applied regularly by syringe, this will gradually kill the plant which will reduce in size as it dies and event rots or falls away.

Pointing

- Deep pointing in up to 3 passes.
- Lime Secil NHL 3.5.
- Medium aggregate grit 5-7m.
- Pinning included.
- See **SA202413/SKC2** for details.

Reviewing scope of work:

- Inspect each relevant area of masonry with Conservation Professional to confirm the type and extent of the work.
- Mark clearly on face any masonry any areas to be repaired.
- Identify each masonry unit that is to be repaired with a code number cross-referenced to drawings/photographs.
- Adequately record the characteristics of existing masonry in areas affected by repair works. Use measurements and photographs as appropriate to record bonding patterns, joint widths, special features, etc.

Workmanship Generally

Raking out:

• Rake out joints by hand to a depth at least twice the width of the joint opening, or as much as is necessary. Remove loose debris from the joints using a dry brush.

• Power tools for the removal of mortar is generally not permitted.

Pointing:

• Dampen the masonry prior to pointing

• Neatly point to the specified flush profile in a continuous operation from the side of the arch. If the joints are very deep, it may be necessary to leave out the larger aggregate in the first few passes in order to ensure mortar is packed right to the back of the joint.

• The pointing operation may involve removing loose stones and resetting.

• The trial mix for pointing will be as detailed above in 1:2.5 lime sand. The sand must be dry, sharp, and well-washed. In order to maintain the sharpness of the sand and accurately use the correct volume of sand it is vital that it is stored correctly – ensure storage conditions at the suppliers are adequate in addition to ensuring appropriate storage conditions are available on-site, i.e., as a minimum, on a pallet off the ground and covered. A separate sample in NHL 5 Prompt should be carried out also for inspection.

• It is recommended on historic structures that the original lime mortar mix be replicated in terms of the selection of aggregates

Laying:

• Dampen stones to control suction as necessary and lay on their natural bed on a full even bed of NHL3.5 lime mortar with all joints filled and between 12–18 mm wide.

• Keep stonework clean during construction and until Practical Completion. Ensure that no mortar encroaches on face when laying. Turn back scaffolding boards at night and during heavy rain. Rubbing to remove marks or stains will not be permitted.

Adverse Weather:

• Do not use frozen materials or work in freezing conditions.

• Do not lay masonry when the air temperature is at or below 3 degC unless mortar has minimum temperature of 4 degC when laid and walling is protected. Do not lay mortar. on frozen surfaces.

• Maintain temperature of the work above freezing until mortar has fully hardened.

• Rake out and replace mortar damaged by frost. When instructed, rebuild damage work.

• Protect newly erected walling against rain and snow by covering when precipitation occurs, and at all times when the work is not proceeding.

• If mud or clay is being used this should not be carried out in wet conditions generally

Aftercare of Lime work

• To prevent from drying out too rapidly allow each pass to dry out thoroughly to ensure that drying shrinkage is substantially complete before applying the next pass.

• Adequately protect newly applied lime work against drying out too quickly using hessian or against frost and rain for the first 48 hours using polythene sheeting hanging clear of the work.

1.2 Grouting

On the abutments and parapets, low pressure grouting is to be carried out. See SA/SK C2 for details.

- The methods used for low-pressure void-filling grouting are as follows: The area to be grouted is to be carefully cleaned and inspected and a decision needs to be taken as to which method and type of grout is to be employed. In this case Coulinex NHL 3.5 is to be used, NHL 5.0 Prompt NHL 5 is to be used for the bottom 1000mm.

- Methods of administering grout differ from situation to situation, but generally a decision is made based on the condition of the wall; if the wall is constructed with little through-bonding or is constructed of very small nodes or unit sizes, such as flintwork, or low quality small rubblework, then the amount of grout-fill and pressure of application is kept low as too much wet-fill administered with an excess head of pressure can easily push the masonry apart. In the case of the arch a very low pressure is required due to the location and shallowness of the masonry arch.

- In cases where the masonry is very unstable it is sometimes necessary to introduce mechanical ties to bond the wall together first, then, once stabilized, to remove odd, individual, non-through stones and carefully grout the affected area from ground up using, even, as little pressure as from pouring the grout through a watering can, re-fixing the individual stone as necessary whilst carefully monitoring the conditions of the walling and amount of wet liquid poured. If employing the above approach, bear in mind the limitations of achieving a reasonable flow of grout, as with only, say, 300mm to 600mm head of gravity pressure through a 22mm diameter pipe, the amount and spread of grout may be very limited.

- Hand help mortar pumps can be used also for grout filling, and are relevant, as work proceeds at higher levels. Generally, the term 'low pressure' means, when used on mass masonry, approximately between three meters and six hundred millimetres in height, through a twenty-two to twenty-five millimetres in diameter pipe. For example, for a solid masonry wall which is (A) or washed out, loose hearting fill (B) we would

fully rake out any defective pointing as necessary, clean down and inspect and if practical, drill through the joints into the core of the wall with a twenty five millimetre masonry drill to attempt to connect with the voids within the walling at four hundred to five hundred millimetres along the crack (five number holes per square meter

- Once aa strip is cleared and entry points into the masonry are identified, they can be tested to see which ones will take grout by washing out with a hosepipe of water. This is not always applicable because the introduction of more water into a mass of masonry is sometimes not advisable, although more often successful grouting will not be achieved without washing out and dampening of the voids prior to grouting, even if ideally you would not allow more moisture to be introduced to the mass of masonry.

- At this stage, mark up drill holes which take water i.e., connected to the void, then re-point the arch as necessary and fill unusable holes. In some cases, re-pointing can be carried out after the grouting operation, especially when the core is remote from the face of the masonry.

- Allow the pointing to cure/set ideally beyond the initial set. Set up the grout equipment, grout and mixing equipment as close to each other as possible. It is important to check thoroughly for small holes, cracks, or voids in the areas to be grouted as, if successful, grout will find any small tracts within the arch.

- Mixing should ideally be done using a mechanical, slow turning plasterers' whisk. The consistency required will vary, in simple terms, thicker than good quality emulsion paint and thinner than porridge. Wetting the holes immediately before grouting is most effective (from grouting terms!) Continual mixing whilst pouring is usually required.

- Continually check where the grout is going and once the head is established, keep the length of pipe to a minimum as resistance along the length of pipe will have a bearing on the flow rate. When grouting cracks (A) depending on the amount of grout being taken only attempt to fill in say, two to three holes at a time, fill them and leave the grout to settle and start to set. As the nozzle is removed from each hole it can be

temporarily filled with clay. When grouting walling i.e. (B) then it is preferable to work horizontally along the structure and allowing set to occur before re-visiting the same area of elevation, remembering that with three meters of head, say, without knowing you could be filling an area up to three meters above the nozzle. This is especially relevant at the base of the abutments.

- All equipment must be kept clean and free of setting grout as with the surrounding areas i.e., scaffolding etc. and spilt grout should be thoroughly washed off walling, masonry, and structures before it sets and stains; clean water and churn brushes are usually sufficient.

- Good practices of manual handling should be applied throughout the operation as often the bags of grout will exceed twenty kilograms. More often grouting works will need to be undertaken from suitable access scaffolding, therefore, all current legislation and good working practices whilst working from height should be adhered to. If the scaffold needs adjusting to facilitate the grout operation, this must be carried out by a competent, certified operative. All the appropriate warning and information signage should be evident adjacent to the works and site curtilage.

- Bearing in mind that grouting can be a dusty and messy operation, site operatives and the general public should be adequately protected. Refer to Preliminary Health & Safety Plan for details.

2. New flood relief walls cladding and capping

These are shown on **SA 202413/ SKCR2**

Stone

Where possible reuse existing stone which in the case of this scheme is Limerick limestone. Sufficient reclaimed stone is expected to be available from the works. In the unlikely event of a shortfall a similar size and colour of stone should be obtained from a salvage source.

Mortar Specification

- We would recommend 1:1:6 cement has sand for wall cladding, as it is the most appropriate for durability and strength and appears similar in appearance to an historic mortar.
- Binder: Ordinary Portland cement: Cloghrennane lime 1:1
- Medium aggregate: 5mm-7mm washed grit – stone type dependant on mortar texture. No fines.
- Pinnings: Where mortar joints are larger than 2 thumb widths generally pinnings (small stones 25-50mm) will be required (in pointing course only). A sample panel should be prepared and approved.

Workmanship Generally

Pointing:

- Dampen the masonry prior to pointing.

- Neatly point to the specified flush profile in a continuous operation from the top of the wall. If the joints are very deep it may be necessary to leave out the larger aggregate in the first few passes in order to ensure mortar is packed right to the back of the joint.
- The pointing operation may involve removing loose stones and resetting. This will allow any existing vegetation roots to be removed from the area, but it appears that there is little to no vegetation present overall.

Laying:

- Dampen stones to control suction as necessary and lay on their natural bed on a full even bed of NHL 3.5 lime mortar with all joints filled and between 12–18 mm wide.
- Accurately plumb all wall faces, angles, and features. Set out carefully to ensure satisfactory junctions and joints with adjoining or built-in elements and components.
- Keep stonework clean during construction and until Practical Completion. Ensure that no mortar encroaches on face when laying. Turn back scaffolding boards at night and during heavy rain. Rubbing to remove marks or stains will not be permitted.

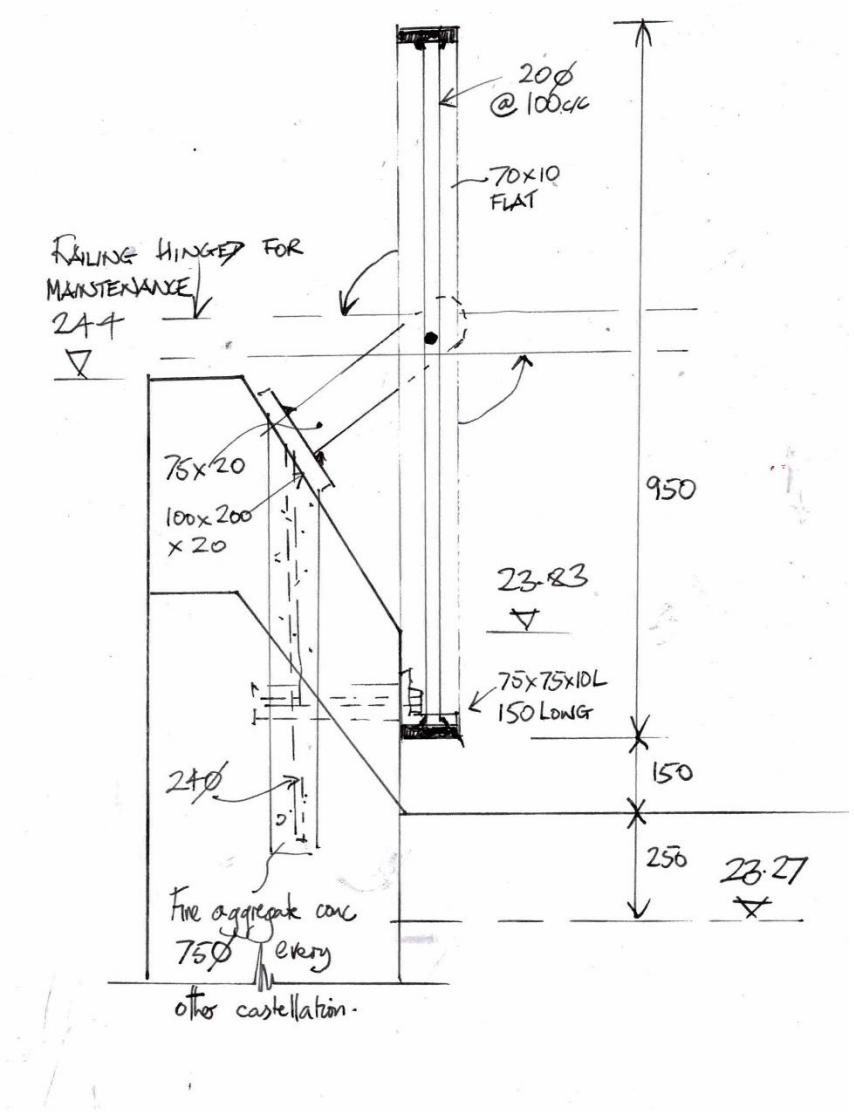
Adverse Weather:

- Do not use frozen materials or work in freezing conditions.
- Do not lay masonry when the air temperature is at or below 3 degC unless mortar has a minimum temperature of 4 degC when laid and walling is protected. Do not lay mortar on frozen surfaces.
- Maintain temperature of the work above freezing until mortar has fully hardened.
- Rake out and replace mortar damaged by frost. When instructed, rebuild damaged work.
- Protect newly erected walling against rain and snow by covering when precipitation occurs, and at all times when the work is not proceeding.
- Allow each pass to dry out thoroughly to ensure that drying shrinkage is substantially complete before applying the next pass.
- Adequately protect newly applied masonry against drying out too quickly using hessian or against frost and rain for the first 48 hours using polythene sheeting hanging clear of the work.

Domed mortar capping for masonry clad walls

- The wall top which is to be capped should be free of debris and any loose stones.
- Once the base is complete a 1:1:6 mortar should be built up to the desired domed shape.
- Flat stones of 15 to 20mm depth should be added to the upper layer of mortar this adds strength to the weather bearing face of the capping.
- Once the capping is laid it should be finished similarly top other areas of pointing i.e. brushed and sponged down etc.

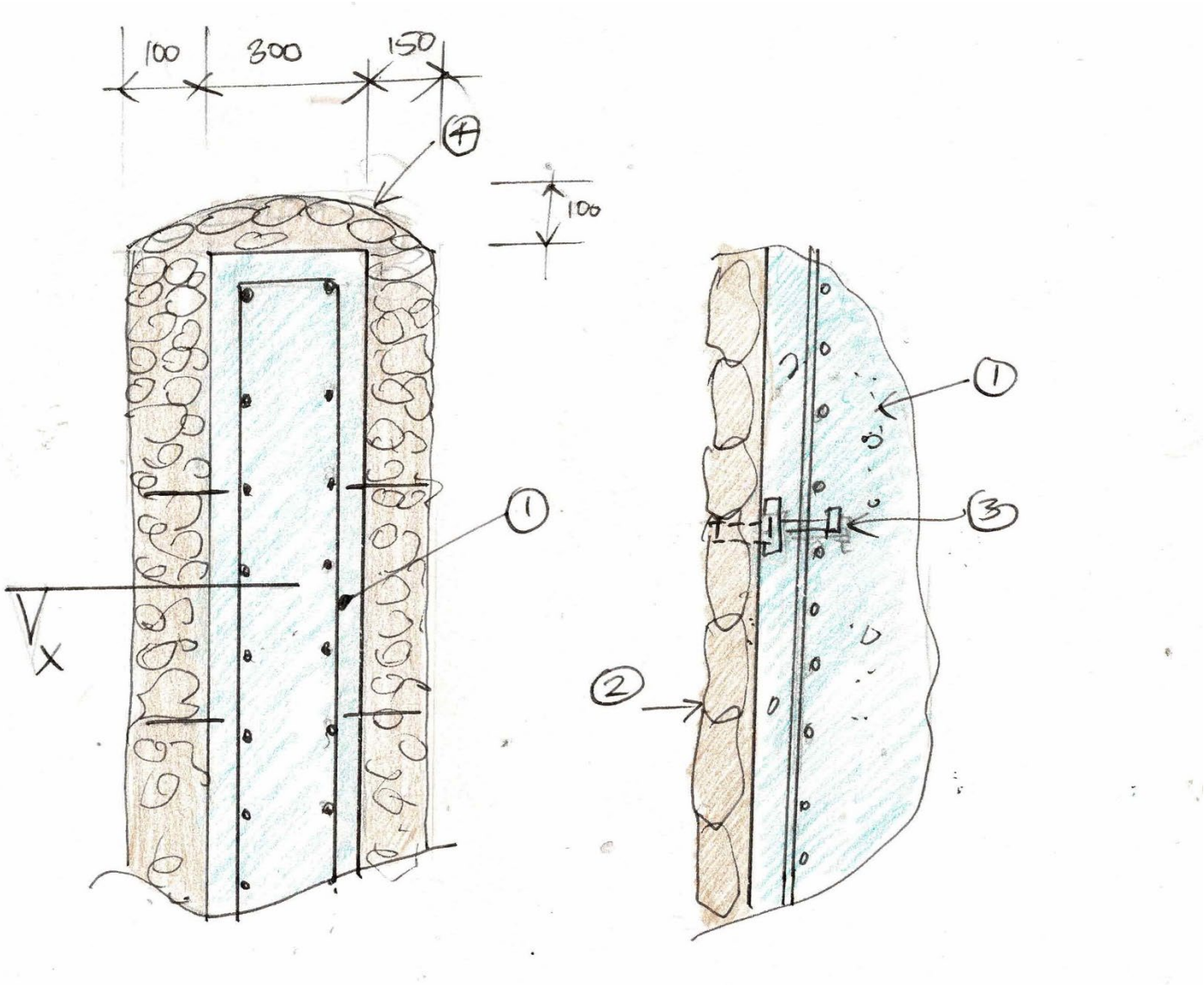
SKETCHES



Notes

1. New stainless steel railing to engineer's specifications.
2. See specification for masonry pointing of parapet on inside face in NHL 3,5 lime mortar to SA specification
1. Cast in brackets in concrete at every other castellation
2. Handrail designed to be hinged for maintenance and repiar

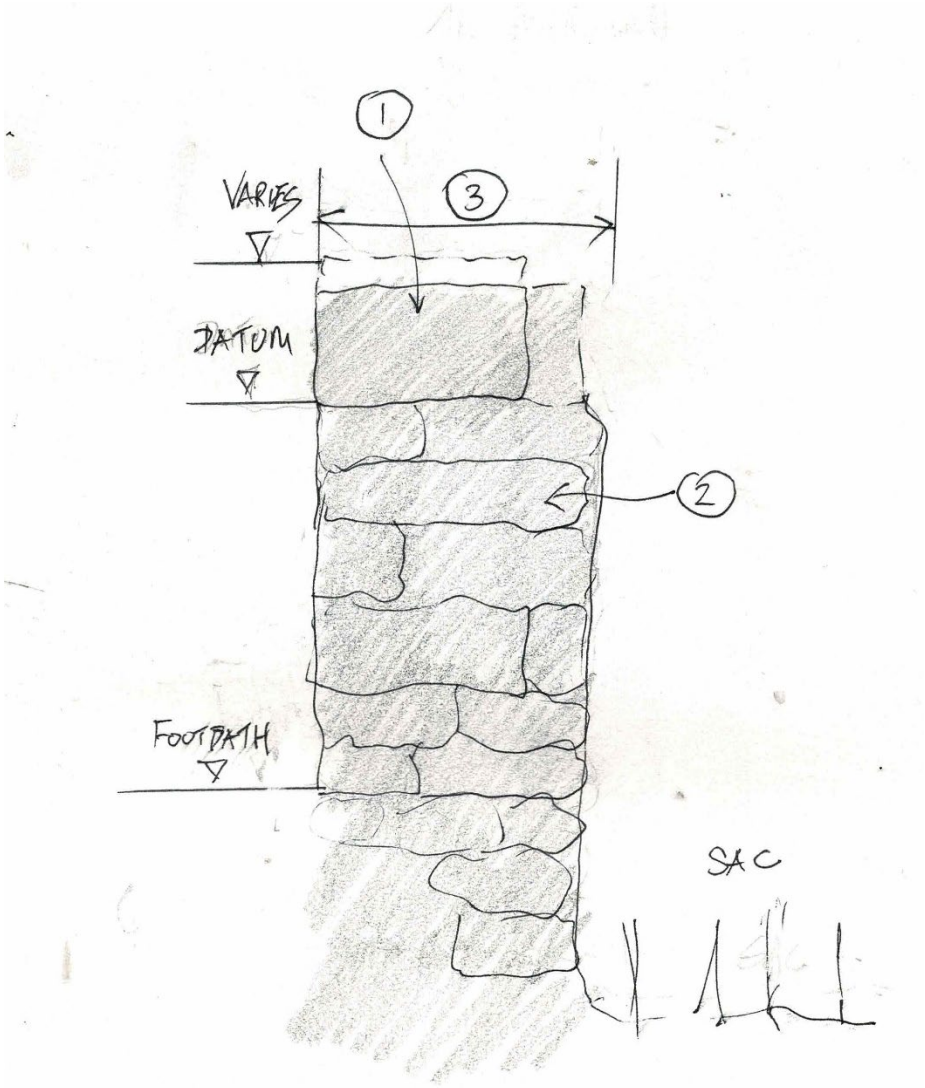
Sketch SA 202413/CR1 New railing for Island Bridge House. Missing masonry to be replaced and the entire inside of the parapet to be repointed. No work is proposed to the outside face of the causeway. See SA specification.



Key

1. Reinforced concrete flood wall to engineer's specifications.
2. Reclaimed stone facing in M4 (1:1:6) mortar with 5-7mm grot nd pinning stones to conservation engineer's specification.
3. Halfen or similar cast in restraint channels at 750mm horizontal centres with masonry ties at approximately 450mm vertical centres.
4. Domed mortar capping in M4 (1:1:6) mortar with flat stones 10 to 20mm deep as per conservation engineer's specification.

Sketch SA 202413/CR2 New flood relief wall cladding and capping



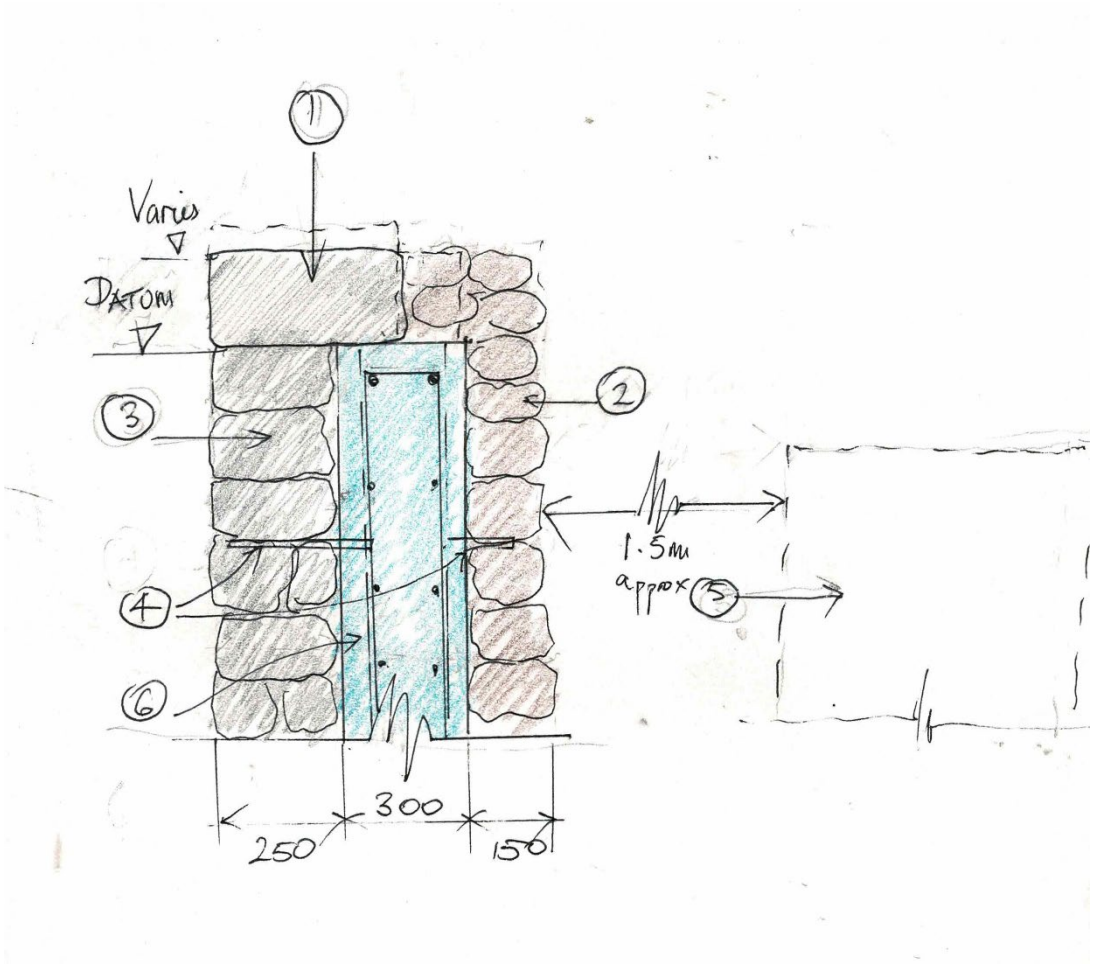
Key

1. Capping stones squared on exposed side to be reclaimed and reuse. Notice datum is tge u/s of stone and the height and width varies.

2 The existing stone is prioritised fof tge exposed wall and some stones are full thickness and will require splitting by mason on site. Flat bedding is to be avoided.

3. The wall thickness varies. Approx 450mm

Sketch SA 202413/CR3 Existing Mall wall



Key

1. Capping to be reused and set with squared edge on exposed side.

2. Imported stone to match existing 150mm wide zone.

3. Reuse existing stone which will require splitting on exposed side. Allow 250mm to maximise reuse of stone with minimum presplitting.

4.Allow a Halfen style channel with horizontal ties at 450mm vertical and 750 horizontal centres.

5. Careful dismantling of original wall and consideration of significance as follows:-

Location

Reconstruction is proposed in a revised location. This allows up to 2m excavation to prevent seepage without impact to the SAC.

Form

The form of the original wall will be respected on exposed side.

Stone texture will be replaced on river side.

Fabric

Existing fabric will be retained and reused on roadside and split to avoid face bedding. The original texture of the wall will be retained and bedded in 1 1 6 mortar with 5 to 7mm grit and pinnings. A sample panel is required.

Function

The function of the wall requires upgrading for flood.

Flood loading and seepage require a new RC retaining wall with deep foundations.

Sketch SA 202413/CR4 -Proposed Mall wall

13 Landscape and Visual Impact Assessment Appendices

13.1 Verified Photomontages and CGIs

Proposed Castleconnell Flood Relief Scheme

Photomontages

Views to support landscape and visual impact assessment

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Castleconnell Flood Relief Scheme

Viewpoint Location Map

Visuals prepared by
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Viewpoint Location & Capture Information	Camera Information	Visuals prepared by
Location (ITM): 566192.50, 663144.53 Camera Level (Metres Above Ordnance Datum): 25.7 Date & Time: 09/08/2023, 11:55am	Camera: Canon 5D Mark IV Lens: Canon EF 50mm f/1.4 USM Focal Length: 50mm	innovision Sligo Airport Business Park Strandhill Sligo www.innovision.ie +353(0)71 - 912 8220

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View from The Mall Looking North at entrance to Scanlon Park

Viewpoint Location & Capture Information	Camera Information	Visuals prepared by
Location (ITM): 566104.02, 662902.56 Camera Level (Metres Above Ordnance Datum): 25.0 Date & Time: 09/08/2023, 12:08pm	Camera: Canon 5D Mark IV Lens: Canon EF 50mm f/1.4 USM Focal Length: 50mm	innovision Sligo Airport Business Park Strandhill Sligo www.innovision.ie +353(0)71 - 912 8220

Castleconnell Flood Relief Scheme

View from The Mall Looking North at entrance to Scanlon Park

VRP No. 2

Viewpoint Location & Capture Information	Camera Information	Visuals prepared by
Location (ITM): 566104.02, 662902.56 Camera Level (Metres Above Ordnance Datum): 25.0 Date & Time: 09/08/2023, 12:08pm	Camera: Canon 5D Mark IV Lens: Canon EF 50mm f/1.4 USM Focal Length: 50mm	innovision Sligo Airport Business Park Strandhill Sligo www.innovision.ie +353(0)71 - 912 8220

Viewpoint Location & Capture Information	Camera Information	Visuals prepared by
Location (ITM): 566109.38, 662916.83 Camera Level (Metres Above Ordnance Datum): 24.9 Date & Time: 09/08/2023, 12:16pm	Camera: Canon 5D Mark IV Lens: Canon EF 50mm f/1.4 USM Focal Length: 50mm	innovision Sligo Airport Business Park Strandhill Sligo www.innovision.ie +353(0)71 - 912 8220

PHOTOMONTAGE VIEW

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EXISTING VIEW

Viewpoint Location & Capture Information	Camera Information	Visuals prepared by
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Viewpoint Location & Capture Information	Camera Information	Visuals prepared by
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PHOTOMONTAGE VIEW

Viewpoint Location & Capture Information	Camera Information	Visuals prepared by
Location (ITM): 566101.70, 662736.84 Camera Level (Metres Above Ordnance Datum): 25.2 Date & Time: 09/08/2023, 12:35pm	Camera: Canon 5D Mark IV Lens: Canon EF 50mm f/1.4 USM Focal Length: 50mm	innovision Sligo Airport Business Park Strandhill Sligo www.innovision.ie +353(0)71 - 912 8220

Viewpoint Location & Capture Information	Camera Information	Visuals prepared by
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Viewpoint Location & Capture Information	Camera Information	Visuals prepared by
Location (ITM): 566064.29, 662593.21 Camera Level (Metres Above Ordnance Datum): 24.5 Date & Time: 09/08/2023, 2:22pm	Camera: Canon 5D Mark IV Lens: Canon EF 50mm f/1.4 USM Focal Length: 50mm	innovision Sligo Airport Business Park Strandhill Sligo www.innovision.ie +353(0)71 - 912 8220

Viewpoint Location & Capture Information	Camera Information	Visuals prepared by
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Viewpoint Location & Capture Information	Camera Information	Visuals prepared by
Location (ITM): 565936.30, 662431.79 Camera Level (Metres Above Ordnance Datum): 24.0 Date & Time: 09/08/2023, 2:06pm	Camera: Canon 5D Mark IV Lens: Canon EF 50mm f/1.4 USM Focal Length: 50mm	innovision Sligo Airport Business Park Strandhill Sligo www.innovision.ie +353(0)71 - 912 8220

Viewpoint Location & Capture Information	Camera Information	Visuals prepared by
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Location (ITM): 566004.26, 662436.42 Camera Level (Metres Above Ordnance Datum): 24.6 Date & Time: 09/08/2023, 1:58pm	Camera: Canon 5D Mark IV Lens: Canon EF 50mm f/1.4 USM Focal Length: 50mm	innovision Sligo Airport Business Park Strandhill Sligo www.innovision.ie +353(0)71 - 912 8220

14 Interactions

No appendices.

15 Cumulative Effects Appendices

No appendices.

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