URS

KILKENNY CITY

PEDESTRIAN BRIDGE

ENVIRONMENTAL IMPACT REPORT

October 2012

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Prepared for:
Kilkenny County Council

UNITED KINGDOM & IRELAND

REVISION SCHEDULE					
Rev	**Date**	**Details**	**Prepared by**	**Reviewed by**	**Approved by**
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1	October 2012	EIR Report	Final	AW	SM	SM

NON-TECHNICAL SUMMARY

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INTRODUCTION

This Environmental Impact Report (EIR) has been prepared by Malone O'Regan Environmental Services on behalf of URS Scott Wilson for Kilkenny Borough Council (KBC) in order to determine the likelihood of significant impacts arising from a proposed pedestrian bridge crossing of the River Nore in Kilkenny City, Co. Kilkenny. In summary, the proposed pedestrian bridge will be a single span structure spanning the River Nore between Bateman's Quay and John's Quay.

The EIR has been completed in support of planning application to obtain permission for the construction of the bridge in accordance with Part 8 of the Planning and Development Regulations, 2001.

ANALYSIS OF THE NEED FOR THE DEVELOPMENT

The proposed bridge will be used by pedestrians and cyclists alike as part of the '*Smarter Travel Plan'* for the city. The location of the bridge between Bateman's Quay and John's Quay on the River Nore will provide a practical and direct route which will be regularly used by people, linking areas west of the River Nore, including High Street and Kieran Street, to areas east of the river including John's Street, John's Green, Michael Street and M^{c}Donagh Junction.

The proposal complies with key action points identified in the Government's *Sustainable Development – A Strategy for Ireland,* the European Charter of Pedestrian Rights and the policies set out in the *Kilkenny City and Environs Development Plan 2008-2014.*

PROJECT DESCRIPTION

All elements of the design have been evaluated based on best practice urban design principles. The bridge will be a single span structure, comprising a steel lattice truss. The bridge deck will be 3m wide and it will span the river approximately 35m from either side. There will be no in-stream works, the bridge will clear the existing flood wall on John's Quay and will be located above the 1 in 100 year design flood levels.

There will be ramped approaches varying up to 40m in length for pedestrians, cyclists and wheelchair access.

Lighting designed to prevent light spillage will be provided on both banks, the bridge ramps and approaches and across and underneath the bridge.

The proposed pedestrian bridge will not have a formal drainage system in place across the main bridge structure and any rainwater will evaporate or drip off the structure into the river below.

There will be no vehicular access allowed across the proposed bridge.

The total area of land required for the bridge is approximately 0.052ha.

Construction Phase
The general phasing of construction works will more than likely comprise the following:

- Pre-earthworks: Fencing of the site boundary, site clearance and topsoil strip. A small temporary compound will be required during the proposed construction works. This will be located to the rear of the library at John's Quay.
- Realignment of existing services where required at John's Quay.
- Earthworks: Piling, excavation, capping.

- Installation of walkways, access ramps.
- Structures: Installation of the bridge (crane), finishing.
- Finishing: Landscaping, hand and guard rails, and lighting.

It is estimated that the proposed bridge will be completed fully within 16 weeks. The foundation works are expected to be completed within 3-5 weeks while the finishing abutment, including piling works, is expected to be completed within 1-2 weeks.

It is likely that the bridge will be constructed in two individual prefabricated sections and transported to site for lifting into position using a crane on each bank. John's Quay will be closed to traffic while the crane is in position over a 1 day period.

ALTERNATIVES ADDRESSED

Alternative Bridge Designs

A feasibility report prepared by Kilgallen & Partners Consulting Engineers, in 2011 identified four options for the proposed bridge: Steel lattice truss; Steel beams/girder; Steel arch and Cable-stayed. URS Scott Wilson then determined the final preferred design choice.

Following an initial evaluation process, the steel arch and cable stayed bridge design was considered inappropriate for this sensitive and prominent location within the historic core of Kilkenny. The steel beams/girder design was ruled out given the constraints of keeping the bottom chord above the flood level and designing a truss with sufficient structural depth to support the deck above without further significant increases in ramp heights and landing levels either side. Overall the steel lattice truss was considered the preferred design option due to better aesthetics and avoidance of impact on existing flood relief measures.

The 'Do Nothing' Alternative

If the construction of the pedestrian bridge does not go ahead then the policies outlined in the *Kilkenny City and Environs Development Plan 2008-2014* will not be fully realised. The proposal represents a valuable addition in the development of a more environmentally sustainable transport infrastructure.

IMPACTS ON THE ENVIRONMENT

HUMAN BEINGS - SOCIO-ECONOMIC

The assessment of impact on human beings in terms of socio-economic aspects focused on the following:

- Local economy and employment;
- Tourism;
- Community services and recreational activities;
- Community severance, and,
- Benefits for pedestrians and cyclists.

During the construction phase, there may be indirect disruption to local business arising due to traffic restrictions which may be necessary during certain times of construction such as delivery of construction materials *etc*. However, such impacts will be short term and temporary in nature and mitigated insofar as possible with traffic management measures and diversions where necessary.

Pedestrians or cyclists will not be authorised to traverse through the designated work areas that will be required on each bank of the River Nore to facilitate the proposed pedestrian bridge construction. This exclusion is considered necessary to ensure the safety of the public. However, temporary diversions will be in place for accessing the riverside walk and amenities throughout the construction programme and access will be maintained at all times.

Construction of the proposed bridge will provide a minor positive temporary impact

on employment through the generation of jobs within the construction sector.

It is acknowledged that during the construction stage visitors to the City may be aware of the construction works proceeding when in close proximity to the works, however it is not envisaged that the works will have any significant impact due to the short duration of the works and the distance between the works and the main tourist attractions. St. John's Priory is the closest attraction to the construction compound however it will be screened by adjacent trees and vegetation.

In the long term, it is considered that the proposed pedestrian bridge will have a positive impact on locals and tourists alike in that it will make the city more accessible to pedestrians and cyclists and will serve to increase the connectivity between communities located to the east and west of the River Nore by offering an alternative crossing point with dedicated pedestrian and cycle access.

FLORA AND FAUNA

The River Barrow and River Nore Special Area of Conservation (SAC) and River Nore Special Protection Area (SPA) represent the habitats of high conservation importance in the study area due to their international conservation status. However, at the proposed crossing point, the banks are artificially maintained and without natural riparian vegetation. There are no Red Data Book species or legally protected plant species within the vicinity of the proposed pedestrian bridge.

A summary of the habitats present in the vicinity of the proposed bridge and their importance to fauna are presented below:

1. Urban built-up areas - of negligible ecological interest for fauna.
2. The River Nore is utilised by otters and several species of bat. The river and its corridor may be classified as of International Importance for kingfisher however breeding kingfisher is not evident in the vicinity of the proposed pedestrian bridge.
3. The salmonid habitat between the proposed pedestrian bridge location and Kilkenny weir located approx. 715km downstream constitutes salmonid habitat of mediocre quality although it has good water quality (Q4), and is an important river corridor for upstream and downstream migration of salmon and lamprey, both of which are protected as Habitats Directive Annex II species within the SAC.
4. Marginal silts suitable as lamprey nursery habitat are of limited extent in the potentially affected section of river, although juvenile River/Brook Lamprey (*Lampetra* sp.) have been recorded during previous surveys in the study area.

Impacts on Flora and Fauna

Terrestrial Ecology

There will be a direct loss of non-listed habitat i.e. amenity grassland along the riverbanks. The loss of this habitat is classified as permanent slight negative. Three semi-mature non-native trees on the west side and up to 8 on the east side of the River Nore will be removed. This represents a permanent slight negative impact.

Potential impacts on terrestrial ecology are listed as follows:

- Introduction of non-native invasive species;
- Temporary disturbance to foraging otter and kingfisher during construction works, and,
- Disturbance to bats through lighting the proposed bridge during the operational phase.

Aquatic Ecology

Potential impacts on aquatic ecology are listed as follows:

- Indirect through impact on water quality arising from release of suspended solids and other contaminants;
- Noise from pile driving potentially affecting fish, although this is unlikely as works including piling will be in soils as opposed to the river channel, and,
- Introduction of non-native invasive species.

Measures to be employed in accordance with good practice e.g. steam cleaning of equipment, replacement planting with native species, implementation of Southern Regional Fisheries Board (SRFB, 2007) guidelines etc. will ensure that potential impacts will not be avoided or minimised.

Overall Assessment

The location of the proposed pedestrian bridge has relatively low terrestrial ecology interests. Following the implementation of best design practice and mitigation measures, the residual impacts on the habitats and species that occur in the vicinity of the proposed bridge are considered to be slight negative to neutral in the long-term with minor positive impacts likely to accrue from any proposed landscaping using native trees/shrub species in the vicinity of the proposed pedestrian bridge.

Specifically there will be no significant impacts on the qualifying interests of the Natura 2000 sites in the area.

GEOLOGY, HYDROLOGY & HYDROGEOLOGY

Soils and Geology

The drift geology for Kilkenny City and Environs including the proposed bridge location is predominately underlain by an extensive sequence of glaciofluvial sands and gravels underlain by boulder clay of varying thickness. Limestone bedrock underlies the boulder clay.

There are no geological heritage sites in the vicinity of the proposed pedestrian bridge.

Near surface soil types shown on the Teagasc subsoil data at the proposed bridge location include relatively narrow strips of alluvial deposits along the River Nore and made ground underlying the developed urban areas of Kilkenny City.

Hydrology & Hydrogeology

The study area is defined as the surface water resources potentially impacted by the proposed pedestrian bridge, namely the River Nore. Recent water quality data for the River Nore in the vicinity of the proposed bridge show that the parameters analysed are within the relevant Water Quality Standards (WQSs) indicating good water quality.

The proposed pedestrian bridge location is underlain by two aquifer systems: ‘Shallow Sand and Gravel Aquifer’ and a ‘Fractured Bedrock Aquifer’. Both aquifers are regionally important. As the proposed pedestrian bridge location is underlain by an unconfined sand/gravel aquifer with an unsaturated zone typically greater than 3m, the groundwater vulnerability rating is "High".

Impacts on Geology, Hydrogeology and Hydrology

It is not expected that rock excavation will be required. Earthworks required for the proposed pedestrian bridge are minor in nature.

During the construction phase potentially significant contamination of soils and groundwater and surface water by waste oil, fuel, chemical spillages etc. could occur. However mitigation measures will be implemented during the construction phase to avoid this potential impact.

For example, the implementation of a comprehensive Environmental Operating Plan (EOP) will ensure good construction management practices and appropriate handling and spill response procedures are followed as part of the implementation of the Mitigation strategy. Good construction management practices to be followed will be in line with the National Roads Authority (NRA) and SRFB guidance, as well as the UK Construction Industry Research and Information Association (CIRIA).

Dewatering of groundwater to facilitate construction activities has the potential to lower groundwater levels thereby potentially impacting on nearby building foundations and/or nearby groundwater users. However, the construction of the proposed pedestrian bridge will not involve deep excavations or cuttings greatly below the water-table and as such significant dewatering of groundwater will not be required. Furthermore groundwater will not be utilised as a temporary water supply during construction nor will there be any significant obstruction to flow during the construction phase.

Overall, due to the mitigation measures and factors outlined above, the proposed pedestrian bridge is considered to have a negligible impact on soils, geology, hydrology and hydrogeological resources.

AIR QUALITY

Existing ambient air quality at the location of the proposed bridge is likely to be good and well within Air Quality Standards. Overall it is considered that the proposed bridge, as part of the *Smarter Travel Plan* for Kilkenny will contribute towards a potential long term slight beneficial impact on ambient air quality. However the construction phase can potentially give rise to fugitive dust emissions that could cause temporary localized impacts on air quality and nuisance to nearby residential receptors located within 15m of the proposed works. Typical construction activities such as site clearance, stockpiling of materials, transport of site vehicles along access roads etc. have the potential to result in dust emissions across the site. Accordingly, a dust minimisation plan will be developed by the contractor and included in the EOP as part of the Mitigation Strategy. The Plan will serve to minimise any impacts on sensitive receptors and designated areas.

In addition to dust nuisance, the operation of mobile plant and equipment will give rise to emissions to atmosphere of combustion gases, sulphur dioxide, oxides of nitrogen and particulates.

Overall however it is envisaged that construction phase emissions will have a negligible impact on the ambient air quality.

NOISE & VIBRATION

The existing ambient noise environment at the location of the proposed bridge is typical of an urban location. Given the nature of the proposed bridge for pedestrian and cyclist use, an operational phase impact assessment was not deemed necessary. Therefore the assessment of impacts on the ambient noise environment focused on construction phase impacts only.

The equipment likely to be in use during the construction phase is anticipated to temporarily potentially increase the ambient noise levels within the vicinity of the works and at the nearest sensitive receptors (NSRs) located 15m away from the construction site.

In general noise levels in excess of the acceptable noise levels outlined in the NRA Guidelines may be experienced therefore mitigation measures will be required. Likewise construction activities which include piling will have the potential to cause vibrational impact in the absence of mitigation.

Mitigation proposed will include consultation with KBC and the general public as to the timing of works. BS 5228 (2009) Code of Practice for Noise and Vibration Control on Construction and Open Sites: Part 1: Noise; NRA Noise Guidelines and the NRA Guidelines for the Creation, Implementation and Maintenance of an EOP will be adhered to.

Vibration monitoring will conducted during critical periods at sensitive buildings.

Noise monitoring will be undertaken in the event of a complaint.

Mitigation measures will ensure that the maximum daily noise levels as a result of construction will be controlled as much as possible by the good practice of the contractor. However there may be activities where noise levels in excess of the recommended construction noise limits will be unavoidable for short periods of time. Overall however it should also be noted that the bridge construction programme is short i.e. 16 weeks in duration.

LANDSCAPE & VISUAL

The proposed bridge will be located within an urban landscape character area. The landscape effects are therefore considered to be generally low as the intensely urban character will not be significantly altered although medium landscape effects are likely in a localized area.

The River Nore is an important feature in the texture of Kilkenny City and forms a key visual axis between the existing historic John's Bridge and Green's Bridge and sets the scene for Kilkenny Castle located above its walled banks south of John's Bridge. There are five relevant protected views or prospects within the study area comprising a 600m radius from the proposed bridge location. These include views north from Green's Bridge, views from Michael St. and from John's Bridge to Kilkenny Castle. Generally there will be no effect on these views however the proposed bridge will be visible in views of Kilkenny Castle from Bateman's Quay but it will not obstruct views due to its scale and location.

The scale and location of the proposed bridge has the potential to have visual effects over a limited area, mainly affecting neighbouring areas along the riverbanks between Green's Bridge and John's Bridge. The majority of visual effects resulting from open views of the proposed development will be moderate within the wider vicinity. The bridge and its ancillary structures will introduce a new, modern and immediate apparent feature into the urban landscape of Kilkenny City. The scale, gentle arch, colours and materials used will not be visually intrusive.

Views from a closer distance will result in significant visual impact particularly when seen from John's Quay where the ramped access will contrast the existing footpath layout.

Mitigation has been considered throughout the design stage in terms of preferred location, scale and materials used. Therefore while the proposed development will be a permanent and distinctive part of the infrastructure, adherence to the mitigation measures to reduce identified landscape and visual effects will ensure that the residual impacts associated with the proposed bridge will be generally low to moderate which will gradually reduce further with the establishment of familiarity and use of the bridge by visual receptors. The proposed bridge will also open up new views along the River Nore, south towards John's Bridge and Kilkenny Castle, west to St. Mary's Cathedral and north of the proposed Kilkenny Inner Relief Bridge and Green's Bridge.

Potentially moderate to substantial landscape and visual impacts can occur during the temporary construction phase. However construction phase impacts will be

minimized through reducing the construction area to the absolute minimum, minimising site lighting and avoidance of site compounds impacting on areas outside the bridge construction area especially when in the vicinity of the pocket park on John's Quay and along residential and commercial areas. Damaged or removed semi-mature trees will be replaced with native species where required.

CULTURAL HERITAGE

The proposed bridge site is located within the heart of Kilkenny and therefore in the historic town. There are a number of potential impacts on cultural heritage described below.

Archaeological Impacts

In total, 3 sites of archaeological potential have been identified as being potentially affected by the proposed development:

- A1-Historic City (Kilkenny City Gardens (St. Mary's Parish)).
- A9- Town Defences (Kilkenny City Gardens (St. John's Parish)).
- A12- Mill Stream (Friarsinch/ Newpark Lower/ Gardens (St John's Parish)/ Collegepark)

One of these potential impacts is direct (A1), and two are indirect (A9 & A12).

The extent of the potential impact on sub-surface archaeological deposits, prior to investigation, is unquantifiable. Recent archaeological investigations in Kilkenny City and other literary sources would suggest that any ground works associated with the proposed bridge development within Kilkenny City will have a potential direct impact on the archaeological heritage of Kilkenny City Centre (A1).

The proposed development will have an indirect potential impact on the (lost) location of the circuit of the medieval defences for the suburb of St. John (A9), roughly parallel to the River Nore, extending from Peace Park to Carnegie Library Car park. Parts of the town defences in the medieval suburb have been established from cartographic and literary sources and recent limited excavation and assessment.

The proposed development will have a potential indirect impact on the site of a 12th century mill stream (A12) at John's Quay. The location of the mill stream (back-filled) in this area has been established from cartographic sources and recent limited test-trenching assessment.

Architectural Heritage Impacts

In total, no sites of architectural heritage have been identified as either being directly or indirectly impacted.

Industrial Archaeology and Cultural Heritage

Two sites of industrial archaeology or cultural heritage significance have been identified. Site IA1, the right bank river frontage, late-medieval quay and post-medieval / early modern jetties, tea houses and walls, which is potentially directly affected, and IA2, the post-medieval quay, slips and river-front which is also potentially directly affected.

Impacts on Underwater Archaeology within the River Nore

As no in-water construction is proposed for this development, the bridge will span the entire width of the river from two bank-side abutments. Dredging of the River Nore, undertaken in 2002, has resulted in removal of the river gravels which form the surface deposits in this section of the River Nore no longer appear to retain material of archaeological interest. Previous archaeological testing and monitoring of the river dredging works undertaken as part of the Kilkenny City (River Nore) Drainage Scheme in 2001-2003, demonstrated most of the archaeological and artefactual potential once associated with the river as it flows through the heart of the medieval city has been removed. 'It is therefore

concluded that the proposed bridge will have an indirect impact on the immediate environs and setting of the River Nore, but will have no impact on any material, deposits or structures of archaeological significance.'

The following mitigation measures will be put in place:

- Controlled Trial Trenching in conjunction with Site A1 (Zone of Archaeological Potential), which includes the areas impacted at sites IA1 and IA2, and in conjunction with areas where the proposed development impinges on the vicinities of Sites A9 and A10.
- Artefact Retrieval Strategy.
- Archaeological monitoring of all bank side impacts relating to the insertion of the proposed bridge structure will be undertaken in advance of construction works taking place and archaeological monitoring during all groundworks and demolition associated with the proposed development, The archaeological monitoring will undertaken by a suitably qualified archaeologist.

Any architectural fragments from the medieval and post-medieval period, deemed worthy of salvage by the pre-construction monitoring and/ or investigative archaeologist, will be retained for potential reinstatement within appropriately designed development(s) within the City.

In the event of archaeological features or material being uncovered during the construction phase, machine work will cease in this immediate area to allow the archaeologist(s) to inspect any such material.

Where it is established that archaeologically significant material is present, full archaeological excavation and recording of such will take place.

Fencing of any areas of archaeological significance will be necessary once discovered and during excavation works. Fencing during construction will also be carried out to avoid vibration damage and unintentional physical damage during construction for Site AH2.

No site offices, depots, or storage facilities will be placed on or near any of the selected sites or areas of archaeological potential. Machinery traffic during construction will be restricted so as to avoid any of the selected sites and their environs.

When fully implemented the mitigation measures outlined above will serve to resolve any archaeological issues in accordance with all current guidelines and best practice.

MATERIAL ASSETS

The assessment of impacts on material assets deals with potential impacts on services, landtake and traffic and parking arrangements.

Land Use

There will be temporary landtake from a carpark behind John's Quay where a construction compound will be situated, approximately 0.0145ha in size. Lands which are zoned as open space (amenity grassland) will be permanently converted to hardstanding equating to 0.052 ha.

Services

Following consultation with the relevant service providers, the following was found to be potentially affected by the proposed bridge.

ESB

It is unlikely the over head cables will be impacted for the area of the proposed bridge. On the John's Quay side there are a number of ESB ducts within the existing footway. These will be realigned outside of the proposed abutment foot print to allow for

future access, this impact can be classified as a slight negative temporary impact.

Phone and Internet Providers

There are Eircom services in the area of the proposed Pedestrian Bridge with an underground network on the east side of the river (Library side). The existing Eircom services in the area of the proposed Pedestrian Bridge will be avoided, where possible, with a slight negative temporary impact likely to occur if these services require relocation.

Public Water Mains Supply

A public watermain is located on the east side of the river at the proposed pedestrian bridge location. The bridge site and foundations will be design to avoid impacting on this area. Impacts on water supplies will be avoided where possible but may be required for a short period during the relocation and installation of services.

Foul Drain

A pumping station is located on the east side of the river at the proposed pedestrian bridge location.

Based on the baseline information it is considered that the existing pumping station should be outside of the main bridge foot print. Notwithstanding this, the bridge site and foundations will be designed to avoid impacting on this area where possible. With regard to foul drains, impact will be avoided as much as possible, however there will be a slight temporary impact if temporary relocation is required.

Parking and Traffic Disturbance

The carparking spaces outside dwellings along St. John's Quay during construction may be inaccessible at times during the construction phase however alternative arrangements will be put in place.

During the installation of the main bridge structure large scale lifting equipment will require significant space to operate safely. During this short term stage of the traffic diversions and management will be required on both quays.

Any necessary traffic diversions put in place along St. John's Quay and Bateman's Quay during construction may cause a slight temporary negative impact. However it is envisaged that the impact on Bateman Quay will be low while the road along John's Quay is a cul de sac and therefore traffic disturbance is likely to be minimal on this quay. Overall it is envisaged that general traffic management will be used in the majority of cases as an alternative to diversions.

EIR

Environmental Impact Report

Proposed Pedestrian Bridge, Kilkenny City, Co. Kilkenny

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1.0 Introduction

Malone O' Regan (MOR) was commissioned by URS Scott Wilson on behalf of Kilkenny Borough Council (KBC) to prepare an Environmental Impact Report (EIR) in order to identify, assess and develop mitigation measures where necessary with regard to potential significant impacts arising from a proposed pedestrian bridge crossing of the River Nore in Kilkenny City, Co. Kilkenny. In summary, the proposed pedestrian bridge will be a single span structure spanning the River Nore between Bateman's Quay and John's Quay. The site location is indicated on Figure 1.1 and the site boundary is shown on Figure 1.2.

This EIR has been completed in support of a planning application to obtain permission for the construction of the bridge in accordance with Part 8 of the Planning and Development Regulations, 2001.

1.1 Structure of the EIR

The structure of this EIR broadly follows the sequence described below.

- Introduction.
- A description of the proposed development.
- Need for the proposed development.
- Alternatives addressed.
- Assessment and mitigation of impacts of the proposal on the environment.
- Figures, plates and appendices containing copies of relevant specialist reports detailing studies undertaken.

A non-technical summary has also been prepared.

The EIR will address the following environmental aspects:

- Human Beings – Socio Economic;
- Flora and Fauna;
- Geology, Hydrology and Hydrogeology;
- Air Quality;
- Noise and Vibration;
- Landscape and Visual;
- Cultural Heritage; and,
- Material Assets.

Each of the environmental aspects will be addressed in individual chapters set out as follows:

- A brief **Introduction** to the Chapter;
- An outline of the **Methodology** employed in undertaking the specialist assessment;
- A description of the receiving **Existing Environment** relevant to the environmental topic under consideration;
- A description of the **Characteristics and Predicted Effects/Impacts of the Proposed Development** on the receiving environment;
- A description of the reductive or **Mitigation Measures and/ or Factors** that reduce or eliminate any significant adverse environmental impacts identified;
- A description of **Residual Impact** of the proposed development. Residual impacts are the remaining impacts that will occur after the proposed mitigation measures have taken effect;

- A description of **Interactions with other Environmental Attributes**;
- Details of any **Monitoring** required;
- Details of any **Reinstatement** required; and,
- **Difficulties Encountered** in undertaking the assessment.

1.2 EIR Methodology

This EIR has been undertaken in full accordance with EU and national planning and environmental legislative requirements. Where appropriate, reference will be made to legislation and best practice guidelines such as the following shown below:

- Part 8 Planning and Development Regulations, 2001.
- European Communities (Environmental Impact Assessment) Regulations, 1989 and Amendments to 2001.
- Environmental Impact Assessment of National Road Schemes, A Practical Guide, Rev 1, NRA, 2008.
- Guidelines for the Assessment of the Ecological Impacts of National Road Schemes, National Roads Authority (NRA) Rev 2, 2009.
- Guidelines on the information to be contained in EIS, EPA, 2002
- Advice Notes on Current Practice in the Preparation of EIS, EPA, 2003.
- A Guide to Geology in Environmental Impact Statements, 2002 published by the Institute of Geologists of Ireland.
- Assessment of Plans and Projects Significantly Affecting Natura 2002 Sites Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, published by the European Commission, Environment DG November 2001.
- Guidelines on Procedures for Assessing and Treatment of Geology, Hydrology and Hydrogeology, NRA, 2008.
- Guidelines for the Crossing of Watercourses during Construction of National Road Schemes, NRA, 2005.
- Maintenance and Protection of the Inland Fisheries Resource during Road Construction and Improvement Works, SRFB (now subsumed into Inland Fisheries Ireland), Rev. 4, 2007.
- NRA Design Manual for Roads and Bridges, 2010.

Additional relevant Guidance documents used in the preparation of this report are listed in the relevant chapters.

1.3 Consultation

In April 2012 a consultation letter was issued to a number of stakeholders. The letter invited the stakeholders to provide comment on the proposed pedestrian bridge. The letter was issued to the following consultees:

- An Taisce;
- Birdwatch Ireland (BWI);
- Bord Gáis;
- Eircom;
- Electricity Supply Board (ESB);
- Fáilte Ireland,
- The Department of the Arts, Heritage and the Gaeltacht (DAHG);
- Geological Survey of Ireland (GSI);
- Kilkenny Chamber of Commerce;
- Kilkenny Archaeological Society;

- Office of Public Works (OPW);
- Inland Fisheries Ireland (IFI), and,
- The Heritage Council.

To date the IFI, Fáilte Ireland, Bord Gáis, Eircom, BWI, GSI, and the DAHG have responded.

In addition to the above consultees, URS Scott Wilson also contacted a number of additional service providers other than those listed above, to determine if they had services in the area that may potentially be impacted.

Copies of correspondence received from the consultees including letters and emails are included in Appendix A. Drawings received as a result of consultation regarding services are contained in Appendix E. A summary of information provided by the consultees and the main concerns and mitigation factors/measures identified are detailed in Table 1.1 overleaf.

1.4 Project Team

MOR undertook the preparation of this EIR in conjunction with the following consultants:

- Valerie J. Keeley Ltd. – Cultural Heritage Assessment;
- URS-Scott Wilson – Consulting Engineers, and Landscape and Visual Specialists.

MOR's in-house team comprises of engineering, chemistry, ecology and acoustic specialists who were involved in the assessment of impacts and design of mitigation measures.

1.5 Desk-Based Studies

In January 2011 a revised EIS was prepared by Malone O'Regan Scott Wilson (MORSW) on behalf of Kilkenny County Council for the Kilkenny Central Access Scheme (KCAS). The studies and surveys included in the KCAS EIS have been used where relevant in the preparation of this EIR.

Table 1.1 Summary Points from Correspondence Received from Consultees

Consultee	Summary of Responses
BWI	BWI noted that the River Nore is designated as a Special Protection Area (Site Code 004233) and is important for Kingfisher, which is listed in Annex I of the European Birds Directive The section of the River Nore with which the proposed works will occur is adjacent to an area where Kingfisher was previously recorded and a nesting territory was estimated to be present upstream of the proposed works. BWI have concerns in relation to any proposed works undertaken that would disturb birds during the nesting season, remove or alter their nesting banks and required habitats, or alter the flow of the river in such a way that they would be prevented from foraging. According to BWI the following should be assessed: • The dynamic nature of river systems and habitat requirements and availability for Kingfisher in terms of breeding and wintering requirements. • The 'cumulative or in-combination effects'. • The long term species conservation requirements both within the designated sites and also in the wider countryside. ***Action: An assessment of the impact on this species is presented in Chapter 6.0 of this report.***
Fáilte Ireland	The Fáilte Ireland Guidelines for the treatment of tourism in an EIS should be taken into account in preparing the EIS. ***Action: The above guidelines have been taken into account, where relevant, in Chapter 5.0 which deals with socio-economic impacts.***
DAHG	No comments or objections were submitted on the Screening Statement submitted to the DAHG in April 2012.
GSI	The GSI noted that there are no geological heritage sites in the vicinity of the proposed development. The closest site of geological interest "Archersgrove quarry" lies (251900, 154800) about 1.7km to the south. ***Action: The above information was taken into consideration when compiling Chapter 7.0 dealing with Geology.***

Consultee	Summary of Responses
IFI	The IFI noted that the following should be taken into account during the construction phase of the project: • When cast in place concrete is required, all work must be done in the dry effectively isolated from any water that may directly or indirectly enter surface water sewers or surface waters for a period of time sufficient to cure the concrete. • Incorporate best practices into construction methods and strategies to minimise discharge of silt and suspended solids to water. • All oils and fuels to service plant and machinery during the construction phase should be stored in secure bunded areas, and particularly care and attention taken during refuelling and maintenance of machinery/ equipment. • Where site works involve discharge to drainage waters, either to surface water sewers or to surface waters, temporary oil interceptor facilities should be installed and maintained. • Drilling equipment and construction plant and vehicles that are likely to be used during construction may potentially have been used in waters containing invasive species. This could have long term adverse impacts on native flora and fauna and should be addressed in the EIR. High pressure steam cleaning is one of the methods considered acceptable so as to prevent the spread of hazardous invasive species and pathogens. ***Action: The above mitigation measures have been included in Chapter 6.0 of this report.***
Bord Gáis	Bord Gáis noted that service pipes are not shown but their presence should be anticipated. ***Action: Chapter 12.0 deals with mitigation measures proposed with respect to existing infrastructure.***
ESB	The ESB noted that there are number of ESB cables likely to be impacted in the area of the proposed bridge and also queried as to whether two existing duct lighting poles located approximately approx. 60m upstream could be accommodated through the construction of the new pedestrian bridge. ***Action: Chapter 12.0 deals with mitigation measures proposed with respect to existing infrastructure.***
Eircom	There are Eircom services in the immediate location on the east and west bank. In this regard Eircom submitted a drawing by email indicating the locations. ***Action: Chapter 12.0 deals with mitigation measures proposed with respect to existing infrastructure.***

Consultee	Summary of Responses
BT Ireland	There is no BT Ireland network at this location.
Vodafone	Vodafone have no services located in the vicinity of the proposed bridge location.
UPC	UPC have no services adjacent of the proposed bridge location.
Kilkenny County Council (KCC)	A public watermain, foul pumping station and foul sewers are located on the east side of the river at the proposed pedestrian bridge location. ***Action: Chapter 12.0 deals with mitigation measures proposed with respect to existing infrastructure.***

2.0 Description of the Proposed Pedestrian Bridge

This chapter describes the proposed pedestrian bridge in detail under the following headings:

- Urban planning and design;
- Pedestrian bridge design;
- Cyclist and pedestrian facilities;
- Lighting;
- Drainage;
- Earthworks;
- Services;
- Landtake, and,
- Construction.

The proposed general layout for the proposed pedestrian bridge is shown in Figures 2.1 and 2.2 while Appendix C contains Computer Generated Images (CGIs) of the proposed bridge.

2.1 Urban Planning and Design

All elements of the design have been evaluated based on best practice urban design principles. The standards used will include Irish and EU design standards and guidance notes for design of facilities for urban environment particularly in relation to design for mobility impaired users.

The bridge structure and associated abutment foundations will be designed to the following design codes:

- IS EN 1990 - Basis of structural design;
- IS EN 1991 - Actions on structures;
- IS EN 1992 - Design of concrete structures;
- IS EN 1993 - Design of steel structures;
- IS EN 1997 - Geotechnical design, and,
- Their relevant national annexes.

The following guidance documents will also be consulted in relation to the pedestrian/cyclist features of the proposed bridge, and their integration into existing infrastructure:

- National Cycle Manual (June 2011);
- Traffic Signs Manual 2010, and,
- Traffic Management Guidelines.

Other relevant local, national, and international standards will also be referenced where appropriate.

The bridge will be a single span structure, comprising a steel lattice truss. The bridge deck will be 3m wide and it will span the river approximately 35m from either side.

There will be no instream works, the bridge will clear the existing flood wall on John's Quay and will be located above the 1 in 100 year design flood levels.

2.2 Cyclist and Pedestrian Facilities

There will be ramped approaches varying up to 40m in length for pedestrians, cyclists and wheelchair access.

It is proposed to provide a switch back ramp arrangement to minimise the overall impact and length of ramp and associated walls on the John's Quay side. Suitable turning zones and landing areas will also be provided as necessary.

2.3 Lighting

On both the John's Quay and Bateman's Quay abutment and bridge entrance areas adjustments to the location of existing lighting column will be necessary. On both banks the main lighting of the bridge ramps and approaches will be provided by similar lighting stands to those currently provided.

Lighting will be required across the proposed bridge to provide a suitable level of lighting for users during the hours of darkness. A combination of discreet lighting in both the deck (uplights) and within handrails/parapets (down lights, designed to prevent light spillage) will be provided.

Discrete lighting may also be installed underneath the bridge to light the bridge structure at night, and for special events associated with Kilkenny City. This will be designed to limit lighting to bridge parapets and approaches only, preventing direct light spillage.

2.4 Drainage

The proposed pedestrian bridge will not have a formal drainage system in place across the main bridge structure and any rainwater will evaporate or drip off the structure into the river below as droplets. There will be no vehicular access allowed across the proposed bridge.

Drainage will be provided on both banks and will tie into existing road and street drainage on Bateman's Quay and John's Quay.

2.5 Earthworks

Augered pile foundation will be required for each abutment to provide adequate bearing for the bridge and to prevent disruption to the existing flood wall. Piling will be completed over a 3 – 5 day period for each abutment. Any unsuitable excavated material will be removed from the site and disposed of in accordance with all relevant Waste Management Legislation.

Further ground works will be required along the footprint of pedestrian ramps required on the John's Quay entrance to the bridge.

2.6 Sevices

Underground services in the vicinity of the proposed works will be avoided where possible. Based on consultation with KCC, there should not be a need for relocation of foul and combined sewers although some surface water drains may require relocation on John's Quay. Relocation of services on the Bateman's Quay side if required will be relatively straightforward in comparison given the existing verge widths and the minor works required on this bank of the river.

2.7 Landtake

The total area of land required for the bridge is approximately 0.052ha and is illustrated in the proposed site layout, see Figure 2.1.

2.8 Construction

2.8.1 Pre-Construction Works

Service diversions where necessary will be completed initially. Some further preparatory surveys and investigations in relation to the existing river wall ground anchors may also be required prior commencing the main bridge abutment foundation works.

2.8.2 Main Construction Works

Construction Compounds and Working Space

A small, temporary construction compound will be required during the construction works. This will take up approximately 0.0145ha and will be located to the rear of the library on John's Quay as indicated on Figure 1.2. All construction phase mitigation measures outlined in this EIR will also apply to the construction compound area.

A programme of works associated with the proposed pedestrian bridge is as follows:

- Realignment of existing services to John's Quay;
- Protection of existing services;
- Relocation of electrical works to foul pump station;
- Abutment foundations including Piling;
- Primary Steel Fabrication to pedestrian footbridge;
- Craneage for Bridge installation;
- Stainless Steel parapet and railings to bridge;
- Finishes to Deck Surface;
- Finishes to Parapets;
- Lighting incorporated into bridge deck;
- Forming and construction of retaining wall to support ramps with stone cladding to external surface (to match existing);
- Construction of fill material to ramps and landings including block paving finish to surface to match existing;
- Installation of guardrails to ramps, steps and landings;
- Localised Landscaping to grass verges, and,
- Signage and marking.

The works will be completed over a 16 week period.

2.8.3 Environmental Management during the Construction Phase

During the construction phase the methods of working will comply with all relevant legislation and best practice in reducing the environmental impacts of the works. Although construction phase impacts are generally of a short-term duration and are localised in nature, the impacts will be reduced as far as practicable through compliance with the mitigation measures stated in this EIR, current construction industry guidelines (such as CIRIA C502 Environmental Good Practice on Site, *etc*.) and current NRA Environmental Construction Guidelines.

The relevant guidance and best practice requirements will be formalised in an Environmental Operating Plan (EOP) which will be prepared in accordance with "*Guidelines for the Creation, Implementation and Maintenance of an EOP, 2007*" published by the NRA as part of the overall mitigation strategy. The EOP will assist in preventing, managing and/or minimising significant environmental impacts during the construction phase. To achieve this objective the EOP will:

- Incorporate all Environmental Commitments/Mitigation Measures set out in the Contract documents which will include conditions of any Approval as may be granted and any further requirements of Statutory Bodies;
- Provide a method of documenting compliance with these Environmental Commitments/Mitigation Measures;
- List all relevant environmental legislative requirements and provide a method of documenting compliance with these requirements, and,
- State methods by which construction work will be managed to avoid, reduce or remedy potential adverse impacts on the environment.

Details of the predicted impacts and mitigation associated with the construction of the proposed pedestrian bridge are included within the relevant chapters of this EIR (Chapters 5 – 12). In general, disturbance arising from construction may result from various activities including preparatory works, diversion of services where necessary, noise and vibration from plant, excavation and fill operations, stockpiling and handling, construction traffic, severance of accesses and walkways and the duration and timing of the construction phase. The Contractor will be required to appoint a specific member of staff to liaise with landowners, householders and the general public throughout the construction phase.

Although spoil material removed will be negligible given the scale of the works, a Project Construction and Demolition Waste Management Plan will also be prepared and maintained in respect of the proposed pedestrian bridge and the NRA guidelines entitled *'Management of Waste from National Road Construction Projects, 2008'* will be followed.

3.0 Need for the Proposed Development

KBC proposes to construct a pedestrian footbridge in Kilkenny City as part of the '*Smarter Travel Plan'*. The location of the bridge between Bateman's Quay and John's Quay on the River Nore will provide a practical and direct route which will be regularly used by people, linking areas west of the River Nore, including High Street and Kieran Street, to areas east of the river including John's Street, John's Green, Michael Street and McDonagh Junction. Figures 1.1 and 1.2 both show the location of the proposed pedestrian bridge.

Kilkenny City is a relatively flat and compact city with a significant proportion of its population living within two kilometres of the city centre. These characteristics contribute towards making Kilkenny City an ideal location for commuting to work or school by bicycle. The proposed pedestrian bridge will provide new linkages to both pedestrian and cyclists on both the east and west bank of the river serving as both amenity routes and access routes to the city centre. It will provide ideal short and longer distance walking routes along the river and will open up new vistas of the City.

The increased provision of cycle lanes and safer facilities for pedestrians is identified as a key action in the Government's *Sustainable Development – A Strategy for Ireland* and has been enshrined in the European Charter of Pedestrian Rights. The *Kilkenny City and Environs Development Plan 2008-2014* lists the following policy for cyclists:

Policy IE1 - Implement the recommendations of the Kilkenny City & Environs Cycle Routes Study as resources and finances permit as part of the transport strategy for the City & Environs.

Action - To complete a mobility and traffic management plan dealing with issues such as modal shift accessibility.

The Council recognise the importance of walking and that an essential element of any integrated transport system is to provide for the needs of cyclists and pedestrians. The increased provision of cycle lanes and safer facilities for pedestrians is identified as a key action in the Government's '*Sustainable Development – A Strategy for Ireland'* and has been enshrined in the European Charter of Pedestrian Rights. The following policy in the city development plan incorporates this:

Policy IE2 - To improve facilities for pedestrians and access facilities for people with special mobility needs in line with the aims of the European Charter of Pedestrian Rights.

Currently approximately 90% of trips generated within Kilkenny City have origins or destinations in the City. Consequently journey speeds are slow through the City, and delays are frequent, particularly in peak times. The existing footpaths are crowded and narrow, and there is conflict between car users and pedestrians/ cyclists.

4.0 Alternatives

A feasibility report by Kilgallen & Partners Consulting Engineers in July 2011, gave four options for the proposed bridge and are as follows:

1. *Steel, lattice truss, incorporating parapet*
   - Truss within depth of parapet;
   - Popular traditional option;
   - Most economic and simple option.

2. *Steel beams/girder (truncated toblerone truss)*
   - Steel frame below deck level;
   - Increased landtake of landing levels and ramps either side of river;
   - Potential for decorative parapet.

3. *Steel arch*
   - Landmark structure;
   - Expensive due to steel hollow sections forming truss & more complex fabrication.

4. *Cable-stayed*
   - Landmark structure;
   - Complex analysis and construction sequence;
   - Most expensive option.

Following an initial evaluation process, Options 3 and 4, the steel arch and cable stayed bridge design were considered inappropriate for this sensitive and prominent location within the historic core of Kilkenny. Option 2 was ruled out given the constraints of keeping the bottom chord above the flood level and designing a truss with sufficient structural depth to support the deck above without further significant increases in ramp heights and landing levels either side. Option 1, the Steel lattice truss, was therefore considered the preferred design option mainly due to better aesthetics. Appendix B contains the Computer Generated Images for the preferred option. The aesthetics and avoidance of impact on flood defences were the main considerations in terms of considering alternatives from an environmental perspective.

The 'Do Nothing' Alternative

If the construction of the pedestrian bridge does not go ahead then the policies outlined in the *Kilkenny City and Environs Development Plan 2008-2014* will not be fully realised. The proposal represents a valuable addition in the development of a more environmentally sustainable transport infrastructure.

5.0 Human Beings – Socio Economic

5.1 Introduction

This chapter of the EIR identifies and presents an assessment of the potential impacts on human beings in terms of socio-economic considerations. The impacts of the proposed pedestrian bridge on human beings will be influenced by many issues which are discussed in separate chapters of this EIR. These topics include Air Quality (Chapter 8), Noise and Vibration (Chapter 9), Landscape and Visual (Chapter 10) and Material Assets, (Chapter 12). There may be overlap although this chapter of the EIR focuses mainly on the potential impacts of the proposed pedestrian bridge on the remaining aspects of the human environment which are:

- Local economy and employment;
- Tourism;
- Community services and recreational activities;
- Community severance, and,
- Benefits to cyclists and pedestrians.

5.2 Assessment Methodology

The study methodology followed is that outlined in the *Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 6 – Land Use, and Part 8 – Pedestrians, Cyclists, Equestrians and Community Effects*.

The study methodology involved a desk based review of all relevant publications as well as a site visit and walkover survey of the study area. The following documents and information sources were reviewed:

- Data available from the Central Statistics Office (CSO), including Census 2011;
- National Spatial Strategy for Ireland, 2002-2020;
- National Development Plan, 2007-2013;
- Kilkenny County Development Plan, 2008-2014;
- Kilkenny City and Environs Development Plan, 2008-2014;
- www.kilkennytourism.ie, and,
- Failte Ireland South East Regional Tourism Plan 2008-2010.

5.3 The Existing Environment

5.3.1 Local Economy and Employment

Employment figures are not available from the CSO specifically for Kilkenny City and Environs, therefore the figures for County Kilkenny are outlined as an indication of employment status in the area. The total number of persons over the age of 15 in the labour force in County Kilkenny for 2011 was 46,265, an increase of 7% from 2006 census data, however the total for persons aged 15 and over not in the labour force also increased (8%) as the labour force grew by 5,514 persons over the age of 15. Overall approx. 20% of persons over age 15 were not working in 2011 ('retired' and 'permanent sickness' persons are removed from the calculation) which is higher than the national unemployment average for the last quarter of 2011 (approx. 14.4%) and the first and second quarters of 2012 (approx. 14.8%).

Live Register figures for Kilkenny City in September 2012 showed unemployment standing at 5,987 which is a decrease of 78 persons in comparison to the September 2011 data, and a decrease of 11 persons when compared with the September 2010 statistics.

In 2011, employment within the County was predominantly based on administrative occupations (7.2%) and skilled agricultural and related trades (6.8%) Table 5.1, derived from the 2011 census data (www.cso.ie) shows the total breakdown for the occupational group.

Table 5.1 Occupations groups for County Kilkenny in 2011

Occupation Category	Total
Other/not stated	3,406
Administrative occupations	3,331
Skilled agricultural and related trades	3,142
Elementary administration and service occupations	2,836
Sales occupations	2,741
Skilled construction and building trades	2,735
Skilled metal, electrical and electronic trades	2,340
Caring personal service occupations	2,271
Corporate managers and directors	2,268
Teaching and educational professionals	2,228
Health professionals	2,196
Business and public service associate professionals	1,951
Process, plant and machine operatives	1,759
Transport and mobile machine drivers and operatives	1,713
Textiles, printing and other skilled trades	1,491
Elementary trades and related occupations	1,368
Business, media and public service professionals	1,273
Other managers and proprietors	1,201
Science, research, engineering and technology professionals	1,082
Leisure, travel and related personal service occupations	960
Secretarial and related occupations	788
Unemployed - looking for first regular job	610
Science, engineering and technology associate professionals	597
Protective service occupations	558
Culture, media and sports occupations	518
Health and social care associate professionals	487
Customer service occupations	415
Overall Total	**46,265**

5.3.2 Tourism

In 2010, Co. Kilkenny attracted more than 206,000 overseas visitors of which the highest proportion were from Mainland European. Tourism in Co. Kilkenny generated more than €30m in revenue (www.failteireland.ie/). The tourist potential of Co. Kilkenny focuses sharply on its distinctive architectural and historic heritage. The tourist resources of Kilkenny City can be summarised as follows:

- The overall character of the City and in particular the heritage townscape of the historic centre.
- Kilkenny offers a unique selection of historic sites and buildings from the 7th century onwards reflecting a tradition of monastic settlement, and has a number of

high quality buildings of historic and architectural significance such as Kilkenny Castle, St. Canice's Cathedral, Rothe House, St. Francis Abbey and Black Abbey.
- The City is compact enough for tourists to explore on foot.
- The natural beauty of the River Nore Valley.
- The services provided in the City hotels, guesthouses, restaurants, shops, design centre, theatre, galleries and cultural events.
- The reputation of the City for arts, culture and crafts.

It is a specific tourism objective of the Kilkenny Local Authorities to promote and encourage tourism development, and to facilitate improved access to and from the City and Environs.

5.3.3 Community Services, Industry, Retail and Recreational Facilities

The main community services, industry, large retail outlets and recreational facilities in close proximity to the proposed bridge are listed below. The River Nore is used for a variety of leisure activities including canoeing (run by the Kilkenny Aqua Canoe Club and the Noreside Adventure Centre), boating and game angling.There are also numerous dwellings, smaller shops and carparking facilities as expected for an urban centre location.

- River Nore Linear Park located in the immediate vicinity;
- Kilkenny County Library located approx. 45m southeast;
- St John's Junior School located approx. 70m north east, and,
- Dunnes Stores Retail outlet located approx 100m southwest.

5.3.4 Community Severance

There is currently limited access from the east to the west of the city centre for cyclists and pedestrians given that the two existing bridge crossings (Green's Bridge and John's Bridge) do not have appropriate pedestrian and cycle access.

5.4 Potential Impacts of the Proposed Pedestrian Bridge

5.4.1 Construction Impacts

Local Economy and Employment

There may be indirect disruption to local businesses during the construction phase, arising due to traffic restrictions which may be necessary during certain times of construction such as delivery of construction materials *etc*. However, such impacts will be short term and temporary in nature and mitigated insofar as possible. Mitigation measures in this regard are outlined in Section 5.5.

Construction of the proposed bridge will provide a minor positive temporaryimpact on employment through the generation of jobs within the construction sector.

Tourism

It is acknowledged that during the construction stage visitors to the City may be aware of the construction works proceeding when in close proximity to the works, however it is not envisaged that the works will have any significant impact due to the short duration of the works and the distance between the works and the main tourist attractions. St. John's Priory is the closest attraction to the construction compound however it will be screened by adjacent trees and vegetation.

During the construction phase, access will be maintained to all tourist attractions in close proximity to the proposed pedestrian bridge. Further mitigation measures are outlined in Section 5.5.

Community Services and Recreational Activities
Pedestrians or cyclists will not be authorised to traverse through the designated work areas that will be required on each bank of the River Nore to facilitate the proposed pedestrian bridge construction. This exclusion is considered necessary to ensure the safety of the public. Temporary diversions will be in place for accessing the riverside walk and amenities throughout the construction programme however overall access will be maintained. Users of the river channel may temporarily be excluded from using the river when the bridge sections are being put in place by crane. This will be necessary due to health and safety considerations.

5.4.2 Operational Impacts

Tourism
It is considered that the proposed pedestrian bridge will have a long-term positive impact on tourism in that it will make the city more accessible on foot/bicycle for tourists and visitors alike.

Community Services and Recreational Activities
The provision of the proposed pedestrian bridge will improve the accessibility of schools and other facilities by foot/ bicycle, and will provide an alternative route to access existing facilities.

The design of the proposed pedestrian bridge will facilitate the River Nore linear park, allowing access to the river bank for pedestrians and cyclists.

Community Severance
Community severance can be defined as the separation of residents from facilities and services they use within their community caused by new or improved roads or by changes in traffic flows.

The proposed pedestrian bridge will serve to increase the connectivity between communities located to the east and west of the River Nore by offering an alternative crossing point with dedicated pedestrian and cycle access. In addition, it will facilitate the policy of KBC to improve pedestrian accessibility within the City Centre, reducing community severance.

Benefits for Pedestrians and Cyclists
The proposed pedestrian bridge will result in a quicker, more pleasant, attractive and safer environment for pedestrian visitors and cyclists to access the city centre.

5.5 Mitigation Measures

Construction Phase Mitigation Measures
The following construction phase mitigation measures will be put in place:

- The EOP will include measures for the provision of information to the public, communication and complaints procedures, maintenance of access, and traffic management procedures. This will serve to minimise potential impacts on existing commercial activities, tourism and residential areas.

- Local businesses, amenity groups and residents will be informed in advance of the date of commencement of construction works and will be provided with information on the intended construction programme where appropriate.
- Access to businesses will be maintained at all times during the construction phase, and temporary footways and appropriate signage *etc*. will be put in place.
- Diversions around construction areas will be provided throughout the construction phase.

Operation Phase Mitigation Measures
Not applicable.

5.6 Residual Impacts
It is considered that the improved accessibility for pedestrians and cyclists within Kilkenny City as a result of the proposed pedestrian bridge will lead to a long-term positive impact for local communities, businesses and tourism.

5.7 Interaction and Inter-relationships with other Environmental Effects
Impacts on Human Beings will interact and/ or interrelate with:

- Water: There will be no adverse impacts to users in terms of water quality or water supply as described in Chapter 7 – Geology, Hydrology and Hydrogeology and Chapter 12- Material Assets.
- Air: Exposure to wind blown dust, other particulates and emissions of pollutants from the construction phase are important considerations for human health. Air quality issues and construction abatement measures described in Chapter 8 are important to ensure residents have a pleasant and safe living environment.
- Noise: Abatement measures to reduce the impact of noise on nearby residents during the construction phase of this project are discussed in Chapter 9.
- Landscape: Careful consideration to avoid impact on residential property/buildings of interest through the design of the bridge as set out in Chapter 10 is paramount to this project.
- Material Assets: The issue of the impact on landtake and services and parking affecting human beings is addressed in detail in Chapter 12 – Material Assets.

5.8 Monitoring
General monitoring of the usage and impacts of the proposed pedestrian bridge on human beings will be undertaken by KBC through the receipt of feedback on the development from the elected representatives of KBC and from the public.

5.9 Reinstatement
Not applicable.

5.10 Difficulties Encountered in Compiling this Information
No difficulties were encountered.

6.0 Flora and Fauna

6.1 Introduction

This chapter of the EIR presents the results of an ecological impact assessment of the proposed pedestrian bridge on both terrestrial and aquatic flora and fauna.

A standalone Stage I Screening for Appropriate Assessment has also been prepared in respect of the proposed pedestrian bridge although details where relevant are also included in this chapter for completeness.

6.2 Assessment Methodology

A number of methodologies were employed in completing this chapter of the EIR including detailed desk-based studies, consultation and general site visits. Further details are provided below.

6.2.1 Guidance Documents

The following guidance documents were utilised in the impact assessment on ecology:

- EPA (Rev 1, 2008) Guidelines on the Information to be contained in Environmental Impact Statements.
- NRA (2008) The Management of Noxious Weeds and Non-Native Plant Species on National Road Schemes.
- Guidelines obtained using the Invasive Species Ireland website (www.invasivespecies.com).
- NRA (2009, Rev 2) Guidelines for the Assessment of the Ecological Impacts of National Road Schemes.
- NRA (2005) Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes.
- NRA (2006) Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes.
- NRA (2006) Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes.
- NRA (2006) Guidelines for the Treatment of Bats during the Construction of National Road Schemes.
- NRA (2005) Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes.
- Institute of Environmental Assessment, 1995. Guidelines for Baseline Ecological Assessment. E&FN Spon, London.
- Royal Society for the Protection of Birds (RSPB). (1995). Wildlife Impact: The Treatment of Nature Conservation in Environmental Assessment. The RSPB, Sandy, UK.
- Regini, K. (2000). Guidelines for Ecological Evaluation and Impact Assessment. In Practice, Bulletin of the Institute of Ecology and Environmental Management. No. 29: 1-7.
- Highways Agency (2007). Design Manual for Roads and Bridges. Vol. 10 Environmental Design.
- Highways Agency (2007). Design Manual for Roads and Bridges. Vol. 11 Environmental Assessment.
- SRFB (now subsumed into IFI) Maintenance and Protection of the Inland Fisheries Resource during Road Construction and Improvement Works, 2007.

In line with NRA Guidelines, the following terms are defined when quantifying duration of impact:

- Temporary - Up to 1 year.
- Short-term - From 1 to 7 years.
- Medium-term - From 7 to 15 years.
- Long-term - 15 to 60 years.
- Permanent - Over 60 years.

6.2.2 Consultation

Consultations took place with the DAHG, the IFI and BWI in order to inform the assessment of the proposed pedestrian bridge on ecology. Written correspondence received is included in Appendix A and summarised in Table 1.1 of this report.

6.2.3 Desk Based Studies

Prior to conducting any site surveys a desk-based review of information sources was completed. The revised KCAS EIS report was reviewed (MORSW, 2010) as well as information contained on the following websites:

- National Parks & Wildlife Services (NPWS) www.npws.ie
- National Biodiversity Data Centre (NBDC) www.nbdc.ie
- Envision (EPA) http://gis.epa.ie/
- Water Framework Directive http://watermaps.wfdireland.ie
- Kilkenny County Council website http://www.kilkennycoco.ie/eng/Services/Roads/Roads_Projects/Central_Access_Scheme/

An aquatic assessment was compiled by Conservation Services in October 2010 for the revised KCAS EIS (MORSW 2010). This report is attached in Appendix B and referenced throughout the Aquatic Ecology section of this chapter. Publications utilised in this assessment are referenced throughout the chapter and a full bibliography is contained the attached report.

6.2.4 Site Surveys

Previous Field Surveys

Field surveys were first carried out in the area of the proposed pedestrian bridge with regard to the revised KCAS EIS (MORSW 2010)[1]. New terrestrial ecological surveys have been carried out in 2012 to verify the habitats understood to be present, document any changes and to provide supplementary information where necessary.

Previous terrestrial surveys carried out for the KCAS EIS include the following:

- Habitats and flora survey;
- Bird survey;
- General mammal survey;
- Reptile and amphibian survey;
- Otter survey, and,
- Bat survey.

[1] Malone O'Regan Scott Wilson (MORSW) (2010) *Revised Environmental Impact Statement for the Central Access Scheme for the City of Kilkenny*.

Detailed aquatic ecology surveys were carried out 23rd & 25th October 2006 and 28th May 2007 for the original KCAS EIS (MORSW 2010). For the purpose of this assessment, following the review of available field data, and following consultation with relevant bodies, it was considered that those surveys previously carried out were still representative of the receiving environment and therefore no new macroinvertebrate surveys were deemed necessary. The baseline aquatic ecological assessment is available in Appendix B and includes a detailed description of the field survey methodology used.

6.2.3 Field Surveys

A general site walkover was carried out on the 29th March 2012 while bird and mammal surveys were done on the 30th May 2012. The specific habitat stretches assessed previously for the KCAS EIS (MORSW 2010) were also re-examined during the May 2012 site visit.

Terrestrial and Aquatic Habitat Survey

The area of habitat assessment completed as part of the KCAS EIS (MORSW, 2010) and reassessed during May 2012 is shown in Figure 6.1. Habitats were identified and classified according to Fossitt (2000)[2]. The terrestrial and aquatic habitats along the River Nore were divided into three sections, N(i), N(ii) and N(iii) as for the KCAS EIS (MORSW 2010). N(i) extended from the location of the proposed bridge (Plates 6.1-6.4) to approximately 700m downstream, near a treeline of mature oak trees, see Plate 6.5. A corridor width of approximately 100m was covered, though this width varied according to interests present. The section N(i) is mainly rock armoured, see Plates 6.12-6.15 compared to section N(ii) which has a more natural riverside vegetation see Plates 6.16-6.17. Section N(iii) is called the 'Mill Race' and is a stream that diverts from the main River Nore, see Figure 6.1. This is a heavily shaded stream resulting from all the mature trees that were planted to landscape the castle grounds, see Plates 6.18-6.19.

Each river habitat section was rated for the different life stages of salmonid fish.

Bird Survey

Birds were recorded by sight and call, with the aid of binoculars where necessary.

Mammal Survey

The presence of mammals was indicated principally by their signs, such as dwellings, feeding signs, or droppings. The survey also included a search for habitats suitable for amphibians and reptiles. The nature and type of habitats present are also indicative of the species likely to be present; the habitats present were assessed in general accordance with techniques adopted for the Badger & Habitat Survey of Ireland[3]. Habitats listed by Fossitt (2000)[4] and by the Nature Conservancy Council[5].

An otter survey involved checking for otter signs and holts in the vicinity of the proposed pedestrian bridge location. Survey extended c.150m upstream and downstream of the proposed pedestrian bridge crossing.

A specific bat survey was not carried out as there are no roosts in the vicinity of the proposed bridge that would be affected, however the area was assessed for bat potential.

[2] Fossitt, J. (2000). A *Guide to Habitats in Ireland*. The Heritage Council, Kilkenny.
[3] Smal, C.M. (1995). *The Badger and Habitat Survey of Ireland*. The Stationery Office, Dublin.
[4] Fossitt, J. (2000). A *Guide to Habitats in Ireland*. The Heritage Council, Kilkenny.
[5] Nature Conservancy Council. (1990). *Handbook for Phase I Habitat Survey - a Technique for Environmental Audit.* Nature Conservancy Council, UK.

6.3 The Existing Environment

6.3.1 Designated Conservation Areas in the Vicinity of the Proposed Pedestrian Bridge

The River Barrow and River Nore (site code 02162) is a Special Area of Conservation (SAC) under the EU Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (Directive 92/432/EEC); known as the Habitats Directive. The River Nore (site code 004233) is also a Special Protection Area (SPA) designated under the Conservation of Wild Birds Directive (2009/147/EEC) (better known as "The Birds Directive").

The area covered by the SPA includes parts of the grass verge and hardstanding areas while there are also some houses inside its boundary along John's Quay (refer to Figure 6.2). The chosen boundaries of the SAC and SPA are likely to be due to the use of older historic maps when setting the site boundaries as the banks at the location of the proposed pedestrian bridge do not contain any habitats of interest or Annex I habitats.

A summary of the qualifying habitats and species are shown in Tables 6.1, 6.2 and 6.3 below:

Table 6.1 Qualifying Habitats for the River Barrow & Nore SAC

Qualifying Habitats (* denotes Priority Habitat)	Code
Old sessile oak woods with *Ilex* and *Blechnum* in British Isles	91A0
*Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)	91E0
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	3260
Salicornia and other annuals colonizing mud and sand	1310
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	1330
Mediterranean salt meadows (Juncetalia maritimi)	1410
European dry heaths	4030
*Petrifying springs with tufa formation (Cratoneurion)	7220
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	6430
Spartina swards (Spartinion maritimae)	1320
Mudflats and sandflats not covered by seawater at low tide	1140
Estuaries	1130

Table 6.2 Qualifying Annex II of Directive 92/43/EEC (the Habitats Directive)

Species	Species Name
Mammals listed on Annex II of the Habitats Directive	*Lutra lutra* (Otter)
Fish species listed on Annex II of the Habitats Directive	*Salmo salar* (Atlantic salmon)
	Petromyzon marinus (Sea lamprey)
	Lampetra planeri (Brook lamprey)
	Lampetra fluviatilis (River lamprey)
	Alosa fallax (Twait shad)
	Alosa alosa (Allis shad)
Invertebrates listed on Annex II of the Habitats Directive	*Austropotamobius pallipes* (White clawed crayfish)
	Margaritifera margaritifera (Freshwater pearl mussel)
	Margaritifera durrovensis (Nore freshwater pearl mussel)
	Vertigo moulinsiana (Desmoulin's Whorl Snail)

Table 6.3: Annex I of Directive 79/409/EEC (the Birds Directive)

Species	Species Name
Bird species listed as Annex I of the Birds Directive	*Alcedo atthis* (Breeding Kingfisher)

The River Nore

General Catchment Information

The River Nore rises on the eastern slopes of the Devil's Bit Mountain in County Tipperary and, at first, flows east through Borris-in-Ossory and Durrow, then turns south through County Kilkenny, passing through Ballyragget, Kilkenny City, Bennetsbridge and Thomastown, before meeting the tide at Inistioge. It is 87 miles long and drains a total catchment of approximately 977 square miles[6].

Fishery Value of the River Nore

The River Nore is a designated salmonid river under the EU 1978 Freshwater Fish Directive. It was once one of the finest salmon fishing rivers in the country, but has declined dramatically recently.

In 2005, the estimated number of rod caught salmon on the River Nore was 593 of which 88 were spring salmon (Central Fisheries Board (CFB), 2005). By comparison the total number of rod-caught salmon[7] in the River Nore and its tributaries in 1996 was 1,402. The SRBB[8] states that the upper main channel of the Nore and many of the tributaries contain extensive areas of potential good salmon and trout spawning and nursery grounds.

O'Grady & O'Sullivan (1994)[9], reporting on a CFB survey carried out between 1990 and 1992, state that: '*The Nore is one of the most valuable salmonid catchments in Ireland.*' Juvenile salmon were recorded in all sections of the River Nore main channel electrofished by O'Grady & Sullivan (1994).

In 1990, a survey carried out by the CFB revealed an excellent stock of brown trout, with huge numbers found in some areas, and the situation has not altered in the meantime.

Biological and Physio-Chemical Water Quality of the River Nore

The Water Framework Directive gives the River Nore a Physio-Chemical status of 'Good' and a Ecological Status of 'Poor'[10] at the St.John's Bridge monitoring station, however the latest biological Q-Values supplied by the EPA give a Q4 result - 'Good Status.'[11] to the closest monitoring stations upstream and downstream of the proposed bridge location.

Habitat Mapping

The principal habitats in the vicinity of the proposed pedestrian bridge include; Buildings and Artificial Surfaces (BL3), Amenity Grassland (GA2) and Treelines (WL2). Riparian Grassy verges (GS2) begin to appear approximately 500m downstream of the proposed bridge location, see Plate 6.6. The River Nore itself is a depositing/lowland river (FW2).

Annex I qualifying habitats for the SAC are not present in the vicinity of the proposed pedestrian bridge. The nearest recorded listed habitat close to the site, is floating river

[6] O'Reilly, P. (2002). Rivers *of Ireland – A Fly fisher's Guide*. Merlin Unwin Books. 5th edition.
[7] Lucey, J. (1998). *The Barrow, The Nore and The Suir*. Studies of Irish Rivers & Lakes ed. C. Moriarty. Marine Institute.
[8] SRFB was amalgamated into Inland Fisheries Ireland on 1st July, 2010
[9] O'Grady, M. & Sullivan, T. (1994) *A Fishery Survey of the Nore Catchment and a Development Plan for this Resource*. Central Fisheries Board unpublished report.
[10] Nore Main Water Management Unit Action Plan (2010).
[11] EPA via email consultation.

vegetation, which was shown to be present downstream of the site beyond Kilkenny Castle (MORSW, 2010), although it was poorly developed. There was no sign of floating river vegetation at the proposed pedestrian bridge location during the site visit in May 2012.

Non-native invasives are species that have been introduced, generally by human intervention, outside their natural range and whose establishment and spread can threaten native ecosystems. Invasive plants species observed downstream of St. John's Bridge were Red Valerian (*Centranthus rubra*) and Butterfly bush (*Buddleija davidii*), see Plates 6.20-6.21. Red valerian was also growing at the margins of the brewery approx. 150m upstream of the proposed pedestrian bridge location, see Plate 6.22.

General Birds

The following bird species were noted at the proposed pedestrian bridge location in May 2012 were: Magpie (*Pica pica*), Blackbird (*Turdus merula*), Robin (*Erithacus rubecula*), Jackdaw (*Corvus monedula*), Pigeon (*Columba livia*) and Barn swallow (*Hirundo rustica*) while five Mallard (*Anas platyrhynchos*) were observed swimming in the river at the proposed bridge location. A moorhen (*Gallinula chloropus*) was spotted in the branched bur-reed (*Sparganium erectum*) margin at the brewery less than 150m upstream. Grey heron (*Ardea cinerea*) was observed feeding at habitat sections N(i) and N(ii), see Plate 6.7 while Song thrush (*Turdus philomelos*), Dunnock (*Prunella modularis*) and Tree creeper (*Certhia familiaris*) were sighted downstream of St. John's bridge in the mature trees of the N(iii) habitat section. The nature and type of habitats present were deemed indicative of the bird species likely to be present at other times of the year.

Kingfisher

The River Nore SPA is designated for breeding Kingfisher. Kingfisher is a species of conservation importance as it is listed in Annex I of the EU Birds Directive. It is noted that all bird species (with exceptions of pest species *etc*.) receive legal protection under the Wildlife Acts. The consultation response from BWI (see Appendix A) noted concerns regarding potential impacts on kingfisher arising from the proposed pedestrian bridge however it is unlikely that breeding kingfisher are present at or adjacent to the proposed bridge location for the following reasons.

- Kingfisher was not sighted at the proposed bridge location during a survey carried out in 2010 ((Cummins *et al.,* 2010)[12]. Instead they were sighted approximately 1km upstream and 5km downstream of the proposed bridge location.
- Older records found using the National Biodiversity Data Centre Mapping system http://maps.biodiversityireland.ie confirm that there are no records of kingfisher at the proposed bridge location and records from 1988-1991 of kingfisher approx. 2km downstream of the proposed location of pedestrian bridge.
- This species was not recorded at the proposed bridge location during the Kilkenny Central Access Scheme (KCAS) EIS bird survey (MORSW, 2010).

The above desk-based information was corroborated during the site surveys. Sightings of Kingfisher were not recorded during the site visit of the 29th March 2012 or during the detailed bird survey on the 30th May 2012. As the SPA is designated for breeding kingfisher the habitat was also assessed. The habitat was found to be not suitable at or immediately adjacent to the proposed pedestrian bridge as there are no natural banks present. While there are more naturalised banks located approximately 100m upstream of proposed bridge it is highly unlikely to be suitable for breeding kingfisher as they tend to

[12] Cummins, S., Fisher.J., McKeever,R.J., McNaghten, L. & Crowe, C. (2010) *Assessment of the distribution and abundance of Kingfisher Alcedo atthis and other riparian birds on six SAC river systems in Ireland*. Report for the national Parks and Wildlife Services.

use nesting banks which are tall (1-2 metres high) and vertical, with soft material into which they can dig their burrows. Fringing vegetation is also preferred (Cummins *et al.,* 2010). The banksides 100m upstream of the proposed bridge location are sloping on both sides and mostly covered with grasses and shrubby vegetation. There are also no perches available for fishing which kingfishers have a preference for when choosing breeding sites. Kingfisher is also unlikely to occur in the area as it is highly populated by people given that kingfisher numbers per kilometre were lowest in areas with high percentage of 'paths & tracks', 'roads' and 'human trampling' (Cummins *et al.,* 2010).

General Mammals

Badgers are protected under the Wildlife Acts (Wildlife Act, 1976; Wildlife Amendment Act, 2000) and also protected under Appendix III of the Berne Convention.

No badgers or signs of badger activity were found within the vicinity of the proposed pedestrian bridge. Signs of brown rats (*Rattus norvegicus)* long-tailed fieldmouse (*Apodemus sylvaticus*) and fox (*Vulpes vulpes)* were observed. The house mouse (*Mus musculus)*, pygmy shrew (*Sorex minutes)* and hedgehog (*Erinaceous europaeus*) are also certain to be present.

Otters

Otters are protected under the Irish Wildlife Acts and are also listed under Annex II and Annex IV of the EU Habitats Directive. Otters are also listed as requiring strict protection in Appendix II of the Bern Convention.

The otter survey undertaken in May 2012 showed signs of otters (*Lutra lutra*) on the River Nore downstream of the proposed pedestrian bridge crossing under the existing St John's bridge in Kilkenny city. These included fresh and old spraints. There was a positive sighting of an otter approximately 500m downstream of the proposed bridge location, see Plates 6.8-6.9 and otter prints were observed at a muddy slipway approximately 750m downstream of the proposed pedestrian bridge. It is therefore highly likely that otter pass through the area of the proposed bridge.

A possible otter holt was uncovered >1km downstream of the proposed pedestrian bridge in May 2012, however there is not suitable habitat to make holts in the immediate vicinity of the proposed pedestrian bridge. This was also the case for the previous KCAS surveys (MORSW, 2010) with no holts being recorded. More natural banks occur approx. 100m upstream of the proposed bridge location, see Plate 6.10. This section of bank was fenced off and not accessible at time of site survey, however close-up observations made with binoculars from the eastside of the river revealed no obvious holts.

Bats

All Irish bat species are protected under the Wildlife Act (1976) and Wildlife Amendment Act (2000). Also, the EC Directive on The Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. Across Europe, they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions. All bats are listed in Annex IV of the Habitats Directive.

Four of the ten known Irish bat species were confirmed on site during the KCAS EIS surveys in 2010. These included the common pipistrelle (*Pipistrellus pipistrellus)*, the

soprano pipistrelle (*P. pygmaeus),* Daubenton's bat (*Myotis daubentonii)* and Leisler's bat (*Nyctalus leisleri*).
The pipistrelles observed fed over the water bodies of the River Nore and associated areas of vegetation. They were also present within the amenity area to the immediate east of the River Nore and hunted there along the avenue of mature lime trees west of the proposed pedestrian bridge location. Leisler's bat, which forages over agricultural landscapes, scrub and woodland, was detected flying high over the River Nore in June 2010 but was absent during the September 2010 visit, and no mating sites of this species were noted. Daubenton's bat was also present on the River Nore.

During the survey it was noted that the proposed pedestrian bridge location is a similar habitat type for bats as those described for the revised KCAS EIS report (MORSW 2010) with mature sycamore present close to the proposed pedestrian bridge crossing on the east side of the River. This cluster of mature trees may provide foraging opportunities for bat species, see Plate 6.11.

Fish Habitat Assessment
During the site visit of May 2012 a salmonid fish species was observed in the water at the location of the proposed pedestrian bridge.

There was no floating river vegetation in the vicinity of the proposed bridge during the site visit of May 2012 but submerged vegetation was evident. Branched bur-reed was evident approximately 200m upstream at the brewery, see Plate 6.21.

Table 6.4 below summarises the results of the habitat assessment for salmonids and lampreys from the River Nore during the survey of May 2012. The habitat sections used are depicted in Figure 6.1.

Table 6.4 Habitat Section N(i) – N(iii) River Nore Main Channel

	N(i) – River Nore Main Channel	N(ii) – River Nore Main Channel	N(iii) – Mill Race
Length	c. 715m	c. 540m	c. 550m
Description	Wide deep muddy glide (water turbid). Banks mostly stone and stone wall with a short section of oak trees on the right hand bank upstream of weir.	Deep glide with Riffle and run just downstream of the weirs. River side trees such as willow spp, alder and sycamore well developed.	Mostly muddy glide well shaded by planted trees such as lime, ash, horsechestnut and sycamore.
Salmonid Adult Habitat	Fair	Good	Poor
Salmonid Nursery Habitat	None – Poor	Poor – Fair*	Poor – Fair*
Salmonid Spawning Habitat	None - Poor	Fair*	Poor - Fair*
Lamprey Nursery	Poor – Fair	Poor – Fair*	Fair
Lamprey Spawning	None - Poor	Fair*	Poor - Fair*

*Tentative assessment as water was turbid when sampling took place.

6.3.4 Overall Assessment of Scientific Interest/ Conservation Value

Habitats
The River Barrow and River Nore SAC and River Nore SPA represent the habitats of high conservation importance in the study area due to their international conservation status. However, at the proposed crossing point, the banks are artificially maintained and without natural riparian vegetation. There are no Red Data Book species or legally protected plant species within the vicinity of the proposed pedestrian bridge.

Fauna
The importance of the habitats affected by the proposed pedestrian bridge for fauna in terms of extent, diversity, naturalness, rarity, fragility, typicalness, recorded history, position, potential value and intrinsic appeal[13] are outlined below.

1. Urban built-up areas - of negligible ecological interest for fauna.
2. River Barrow and River Nore SAC and River Nore SPA - The River Nore is utilised by otters and several species of bat. The river and its corridor may be classified as of International Importance for kingfisher however breeding kingfisher is not evident in the vicinity of the proposed pedestrian bridge.

Aquatic Ecology
The potentially affected section of river is within the River Barrow and River Nore SAC however not all listed Annex II species are present due to their distribution and habitat requirements. These include the Nore pearl mussel, white clawed crayfish, Killarney fern, twaite shad, and Desmoulin's whorl snail.

The salmonid habitat between the proposed pedestrian bridge location and Kilkenny weir located approx. 715km downstream constitutes salmonid habitat of mediocre quality although it has good water quality (Q4), and is an important river corridor for upstream and downstream migration of salmon and lamprey, both of which are protected as Habitats Directive Annex II species within the SAC.

Marginal silts suitable as lamprey nursery habitat are of limited extent in the potentially affected section of river; nevertheless juvenile River/Brook Lamprey (*Lampetra* sp.) were recorded during the previous survey (MORSW 2010), see also Appendix B.

On the basis of its status as a SAC and on the basis of the presence of lamprey and migrating salmon, the potentially affected waters are classified as of International Importance.

6.4 Potential Impacts of the Proposed Pedestrian Bridge

6.4.1 Potential Impacts - Terrestrial Ecology

The following outlines the potential impacts on terrestrial ecology in the absence of mitigation measures where necessary:

- Non-native invasive species such as red valerian and butterfly bush were noted to be growing in the vicinity of the proposed pedestrian bridge. The construction activities of the proposed bridge may potentially help the further spread these species or may aid the introduction of new invasive species such as Japanese

[13] Regini, K. (2000). *Guidelines for ecological evaluation and impact assessment*. In Practice, Bulletin of the Institute of Ecology and Environmental Management no. 29: 1-7.

knotweed (*Fallopia japonica)* to the area. The potential impact of invasive species being spread or introduced by construction activities would be a moderate longterm negative impact on the SAC and SPA.

- There will be a direct loss of non-listed habitat (amenity grassland) where the abutments and ramps are to be built, which occur within the River Nore SAC and SPA boundaries. The habitats are of low conservation interest so their removal will result in a slight negative, permanent longterm impact.
- There may be potential disturbance to foraging otter during construction works, for example from pile driving. There are no expected impacts to breeding otter as no breeding holts were found, or are expected, in the vicinity of the proposed pedestrian bridge. The impact to foraging otter is expected to be a temporary minor negative during the construction phase.
- There may be potential disturbance to foraging Kingfisher, however no suitable overhanging branches for foraging/ and or resting kingfishers present in the vicinity of the proposed pedestrian bridge. There may be a temporary slight negative impact to passing kingfisher during the construction phase but no expected impacts to breeding kingfisher as there is no suitable habitat for nesting in the vicinity of the proposed pedestrian bridge.
- No buildings/ structures (possible bat roosts) will be demolished as a result of the proposed pedestrian bridge.
- The proposed pedestrian bridge will result in the removal of 3 semi-mature trees on the west side and up to 8 on the east side of the River Nore resulting in a permanent slight longterm impact. These semi-mature trees have potential to accommodate nesting birds however this is unlikely given the height and young age of the trees. The trees to be removed do not include bat roosts.

6.4.2 Potential Impacts - Aquatic Ecology

During the construction phase there is a potential for release of contaminants to the River Nore as follows:

Release of Suspended Solids and Other Contaminants

Suspended solids and other contaminants e.g. cement or oil, affecting water quality may be released due to run-off of silt-laden surface water during construction. This is however easily mitigated by good construction site management. Release of sediment in sufficient quantities could blanket the bottom and possible smothering of macroinfauna. It could also damage the gills of fish locally. Cement released into the river could also result in an extremely serious fish kill due to the high pH.

However, the potential impact of suspended solids in the River Nore is reduced by the impoverished habitat quality and the absence of suitable habitat for salmonid spawning or salmonid juveniles c. 1km downstream of proposed pedestrian bridge.

Notwithstanding these factors, mitigation outlined in Section 6.5 will be implemented to prevent further pollution during construction phase.

Noise from Pile Driving Affecting Fish

The effects of sound on fish are not fully known and further studies are needed to address areas of uncertainty such as the response of fish and the measurement of sound (Hastings and Popper, 2005)[14]. Some authors have reported fish deaths and other injuries due to the impact of piling although these have been drawn into question by some authors in the area (Hastings and Popper, 2005). The majority of studies are preliminary in nature

[14] Hastings, M. C., and A. N. Popper (2005) *Effects of sound on fish.*

and only well designed studies can provide clear scientific support should any criteria be established.

The fish that will potentially be affected by the noise from pile driving are both adults and juvenile stages of Atlantic salmon and sea/river/brook lamprey.

Both salmon and lamprey would be classified as hearing generalists because they lack specialisations to enhance their hearing. In particular, lampreys do not have a swim bladder, an organ that has been shown in other species (e.g. gold fish and herring) to be important in increasing a species sensitivity to sound. While salmon and trout do have a swim bladder there are no particular mechanisms linking it to the inner ear and it is thought not to play a role in hearing in these species.

It is not known whether salmon migrations can be halted by pile driving sounds, however some sources believe not (Carlson *et al,* 2001)[15]. They point out that salmonids respond primarily to particle motions in the very near field (a few meters – Mueller *et al,* 1998) [16]rather than propagated sound pressure and further point out that the very short duration of impact piling sound (milliseconds) is less than the minimum 5-6 seconds exposure shown in experiments to be required to elicit an avoidance response in salmonids (Carlson *et al,* 2001). Juveniles straying into the near field of pile-driving operations would be susceptible to auditory and non-auditory tissue damage. This may be more likely to affect lamprey, which have the habit of halting their migratory movements during the day and resting under rocks and riverbanks.

Auger pile driving will be carried out as part of the works. This type of piling is not as noisy as some other types. Furthermore it will not occur in the river channel. Accordingly the piling noise will be attenuated in the soils and would have to transfer over the air to water and soil to water interfaces in order to impact on fish species. Taking the precautionary principle into account where it is assumed that some piling noise could be transferred to the water column it is considered unlikely to significantly halt migration of species as piling will only be carried out over a 3-5 day period and on an intermittent basis during the daytime thus allowing any fish present to pass by unimpeded. As fish will be on the move they will not be subject to prolonged exposure to noise which could affect hearing. This does not however apply to lamprey species which are reported to migrate at night time only however as noted above the noise will be intermittent and attenuated in the soils and would have to transfer over the air to water, and soil to water interfaces. Accordingly it is not considered that there will be a significant impact on fish species.

Non-Native Invasive Species

The number of non-native freshwater species recorded in Irish watercourses increased significantly in the 20th century. The presence of a truly invasive species is evidenced by a demonstrable adverse impact on native communities or habitats.

Invasive species represent one of the greatest threats to biodiversity, second only to that caused by direct habitat destruction. They do this by competitively excluding or out-competing our less robust native species, by preying on native species or by altering the natural aquatic or riparian habitat in which they reside.

[15] Carlson, T.J., Ploskey, G., Johnson, RL., Mueller, R.P., Weiland, M.A. (2001*) Observations of the Behavior and Distribution of Fish in Relation to the Columbia River Navigation Channel and Channel Maintenance Activities*. Report for the U.S. Army, Corps of Engineers, USA.

[16] Mueller, R.P., D.A. Neitzel, W.V. Mavros, and T.J. Carlson (1998) *Evaluation of Low and High Frequency Sound for Enhancing Fish Screening Facilities to Protect Outmigrating Salmonids.* Report to the Bonneville Power Administration by the Pacific Northwest National Laboratory, Richland, Washington.

In addition to their biological effects, invasive species can adversely impact the recreational and amenity use of infested watercourses by restricting angling, boating, swimming and other water-based leisure pursuits. They can impact on industry by clogging engines, turbines and water intake pipes. These adverse effects have resulted in significant costs to the economy.

Non-native invasive species during this project have the potential to be introduced by drilling equipment and construction vehicles that are likely to be used during bridge construction may potentially have been used in waters containing invasive species.

Mitigation outlined in section 6.5 will be implemented to prevent introduction of invasive species during the construction phase.

6.4.3 Operational Phase - Potential Impacts of Proposed Pedestrian Bridge

Lighting
On both the John's Quay and Bateman's Quay abutment and bridge entrance areas adjustments to the location of existing lighting column will be necessary. On both banks the main lighting of the bridge ramps and approaches will be provided by similar lighting stands to those currently provided.

Lighting will be required across the proposed bridge to provide a suitable level of lighting for users during the hours of darkness. A combination of discreet lighting in both the deck (uplights) and within handrails/parapets (down lights, designed to prevent light spillage) will be provided.

Discrete lighting may also be installed underneath the bridge to light the bridge structure at night, and for special events associated with Kilkenny City. This will be designed to limit lighting to bridge parapets and approaches only, preventing direct light spillage.

Disturbance to bats through lighting the proposed bridge is expected to be negligible negative in the long term. The bat species in the area are already habituated to city lights and are expected to persist.

Drainage
The existing surface drainage in the vicinity of the proposed pedestrian bridge presently discharges into the River Nore. In the long term, rainfall on the bridge will evaporate or also run diffusely off the bridge structure directly into the river. In comparison to road run-off, any rainfall run-off from this bridge will not contain typical contaminants arising from vehicles such as products of combustion. Grit (halite) may be used to de-ice the bridge during icy weather however this is likely to be infrequent and furthermore, the volume of runoff is insignificant in the context of existing urban discharges to the river and the river volume alone.

Accordingly routine surface water run-off and low concentration of chloride in water arising on an infrequent basis will not have a significant impact on existing water quality.

Overall
There are no expected long term impacts to the aquatic species and habitats associated with the River Nore during the operation phase. The potential and predicted impacts in the vicinity of the proposed pedestrian bridge on other aspects are considered to be slight negative to neutral in the longterm as the structure will be located in a busy urban area where there is already a presence of people. Accordingly species passing through the area will already be used to this aspect.

6.5 Mitigation Measures

6.5.1 Construction Phase Mitigation Measures – Terrestrial Ecology

- Measures will be put in place to order to mitigate against the introduction of alien invasive species such as red valerian and butterfly bush. The measures outlined in *The Horticulture Code of Good Practice*[17] and the *IFI Biosecurity Protocol for Field Survey Work*[18] will be adhered to for example High-pressure steam cleaning, with water > 40 degrees C for machinery.
- Removed trees will be replaced with native shrubs and/or trees species.
- Where feasible, construction works will be limited to daylight hours in the vicinity of the River Nore in order to allow otters and other wildlife to forage along the watercourses at dawn, dusk and during the night. A pre-site otter survey will be carried out as a precautionary measure.
- All excavations will be carefully stockpiled away from watercourses and back-filled immediately into the void on completion of the investigation.
- Although not currently the case, on completion of the relevant work, natural bankside vegetation will be introduced if compatible with flood relief requirements.

6.5.2 Construction Phase Mitigation Measures – Aquatic Ecology

Reduction & Prevention of Suspended Solids Pollution
Southern Regional Fisheries Board (2007) guidelines will be followed by the contractor. Release of suspended solids to the River Nore will be kept to a minimum. The key factors in erosion and sediment control are to intercept and manage on-site runoff. This limits the potential for soils to be eroded and enter the river in runoff.

Measures will be put in place to ensure that suspended solids in any runoff into the River Nore from the construction area, machinery access routes or any other land based source does not exceed 25mg/l. These measures may include the following:

- Existing vegetation will be retained where possible.
- Within the proposed construction site the extent of ground stripped of existing cover/ vegetation will be kept to the absolute minimum required for construction.
- The proposed construction site will be stripped on a phased basis to minimise the area of soil exposed at any one time.
- Eroded sediments will be retained on site with erosion and sediment control structures such as sediment traps, silt fences and sediment control ponds.
- Run-off will be diverted away from stripped areas.
- Temporary stockpiled material located in close proximity to the River Nore will be covered to prevent run-off entering the watercourse.
- Cut-off ditches will be constructed to prevent surface water run-off from entering excavations.
- Temporary access routes will be fully stoned to prevent erosion of fines and/ or rutting by site traffic.

Reduction or Elimination of Pollution from other Substances
The following guidelines which are generally based on Chilibeck *et al* (1992), NRA (2005) and SRFB (2007) will be followed by the contractor where required:

[17] Kelly, J. 2012. Horticulture code of good practice to prevent the introduction and spread of invasive non-native species. V2.0. Prepared as part of Invasive Species Ireland.
[18] IFI (2010) *IFI Biosecurity Protocol for Field Survey Work. Inland Fisheries Ireland.*

- Raw or uncured waste concrete will be removed from the construction site and disposed of in accordance with the relevant waste management legislation.
- Wash down water from concrete trucks, cast in place concrete etc. will be collected in a suitable containment structure and then taken off-site for appropriate disposal.
- Fuels, lubricants and hydraulic fluids for equipment used in the construction site will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to current best practice (Enterprise Ireland, 2012)[19].
- Fuelling and lubrication of equipment will be carried out in bunded areas.
- Appropriate spill control equipment, including oil booms and oil soakage pads, will be kept within the construction site to deal with any accidental spillage.
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contaminated soil removed from the construction site and disposed of in accordance with all relevant waste management legislation.
- No vehicle or equipment maintenance work will take place within the construction site.
- Prior to any work commencing all construction equipment will be checked to ensure that it is mechanically sound, to avoid leaks of oil, fuel, hydraulic fluids and grease.
- All pumps using fuel or containing oil will be locally and securely bunded when situated within 25m of waters or when sited such that taking account of gradient and ground conditions there is the possibility of discharge to waters.
- Foul drainage from site offices etc. to be removed to a suitable treatment facility.
- Measures will be implemented to minimise waste and ensure correct handling storage and disposal of waste.
- Emergency response procedures to prevent water pollution will be put in place.

For any construction work directly adjacent to surface waters the following specific mitigation measures also apply:

- Ready-mix suppliers will be used in preference to on-site batching where possible.
- Hydrophilic grout and quick-setting mixes or rapid hardener additives will be used, to promote the early set of concrete surface exposed to water.
- It is proposed to construct a localised containment structure, to be removed on completion, within which any excavation works and the pouring of concrete would take place, thereby facilitating the control and collection if necessary of water displaced or impacted by the works to ensure no release of uncured concrete to the River Nore.
- "*The pH of any and all discharges made from and during construction work shall be in the range 6.0 – 9.0 units, and shall not alter the pH of any receiving fisheries waters by more than +/- 0.5 pH units*" (SRFB 2007).[20]

Noise from Pile-driving

During the piling works, measures will be taken to reduce the noise levels as much as practicable in accordance with BS5228:2:2009 – Code of Practice for Noise and Vibration Control on Construction Sites.

[19] Enterprise Ireland (2012) *Best Practice Guide* (BPGCS005) Oil storage guidelines.

[20] Southern Regional Fisheries Board (2007) *Maintenance and protection of the inland fisheries resource during road construction and improvement works*. Southern Regional Fisheries Board

Non-Native Invasive Species

Guidance given by the website www.invasivespeciesireland.com will be implemented. Vehicles, machinery and any other equipment that may be in contact with the River Nore either directly or indirectly will be washed using high-pressure steam cleaning, with water >40 degrees Celsius, at the onset and the end of works so as not to introduce or spread invasive species to or from the River Nore If it is not possible to steam clean the equipment, a normal power hose will be used. After cleaning the vehicles, machinery and equipment will be visually inspected to ensure that all adherent material and debris has been removed.

6.5.2 Operational Phase Mitigation Measures

Lighting

A combination of discreet lighting in both the deck (uplights) and within handrails/parapets (down lights, designed to prevent light spillage) will be provided.

6.6 Residual Impacts

6.6.1 Designated Areas

The location of the proposed pedestrian bridge has no qualifying Annex I habitats although Annex II species may pass through the area. The mitigation measures outlined in Section 6.5 will ensure that there will not be any significant impacts during the construction phase on existing water quality which could indirectly affect Annex II species and Annex I habitats further downstream in the River Nore. Furthermore the intervening distance to known sites of Annex I habitats will ensure that there are no conceivable impacts on these habitats as a result of construction works.

6.6.2 Other Ecology

The location of the proposed pedestrian bridge has relatively low terrestrial ecology interests. Following the implementation of best design practice and mitigation measures, the residual impacts on the habitats and species that occur in the vicinity of the proposed bridge are considered to be slight negative to neutral in the long-term with minor positive impacts likely to accrue from any proposed landscaping using native trees/shrub species in the vicinity of the proposed pedestrian bridge.

6.7 Interactions and Inter-relationships with other Environmental Effects

Impacts on Aquatic and Terrestrial Ecology will interact and/ or interrelate with:

- Water quality: There are clear interactions between ecological receptors and surface and ground water resources. Further measures for the protection of water quality are outlined in Chapter 2, Description of the Proposed Pedestrian Bridge and Chapter 7, Geology, Hydrology and Hydrogeology.

6.8 Monitoring

No monitoring required.

6.9 Reinstatement

Not applicable.

6.10 Difficulties Encountered in Compiling this Information

No difficulties were encountered.

7.0 Geology, Hydrology and Hydrogeology

7.1 Introduction

This chapter of the EIR addresses the potential likely impacts of the proposed pedestrian bridge on soils, geology, hydrology and hydrogeological resources within the study area.

7.2 Assessment Methodology

7.2.1 Geology, Hydrology & Hydrogeology Desk Based Study

The following documents and information contained therein were reviewed in preparing this chapter of the EIR:

- Nore Main Water Management Unit Action Plan (2010);
- Nore Estuary Water Management Unit Action Plan (2010);
- The South Eastern River Basin District (SERBD) River Basin Management Plan (RBMP) 2009-2015;
- Guidelines on Procedures for Assessing and Treatment of Geology Hydrology and Hydrogeology, 2008, NRA;
- 2011/2012 water quality data for the St John's River provided by the EPA regional laboratory in Kilkenny;
- Institute of Geologists in Ireland (2002), Geology in Environmental Impact Statements – a Guide;
- Published and unpublished literature pertaining to the geological and hydrogeological setting of the study area;
- Available geological and hydrogeological map data obtained from the GSI including bedrock geology, quaternary deposits, River Basin District sub-soils, aquifer classification and groundwater vulnerability;
- Search of the GSI well database to identify registered groundwater wells in the study area and collate relevant data (use, depth, yield, *etc*);
- GSI 1:100,000 Bedrock Geology of Ireland map series (Sheet 18 - Geology of Tipperary and Sheet 19 - Geology of Carlow – Wexford);
- Published Ordnance Survey mapping and aerial photography, and,
- GSI (2007) An audit of County Geological Sites in Kilkenny, The Geological Heritage of Kilkenny.
- Geotechnical and Environmental Services (2012) Kilkenny Central Access Scheme, Pedestrian Bridge, Kilkenny City, Co. Kilkenny, Site Investigation, Factual Report.

The impact assessment methodology was adapted from the NRA publication Guidelines on *Procedures for Assessing and Treatment of Geology Hydrology and Hydrogeology*, (2008). The study area extends approximately 250m from the proposed pedestrian bridge location in accordance with NRA guidelines.

7.2.2 Flood Impacts

As there will be no instream works and the bridge will clear the existing flood wall on John's Quay and will be located above the 1 in 100 year design flood levels it is not considered likely that there will be flood impacts. Accordingly this aspect is not assessed further in this section.

7.3 The Existing Environment

7.3.1 Geology

Drift Geology
The drift geology for Kilkenny City and Environs is illustrated in Figures 7.1a and 7.1b and is based on the GSI 1:25,000 Quaternary Map for Kilkenny and the Teagasc Subsoils data. Figure 7.1a - Quaternary Geology, shows the wider area, including the proposed bridge location, to be predominately underlain by an extensive sequence of glaciofluvial sands and gravels - GLs (limestone sands and gravels deposited by meltwater streams flowing from glaciers during the last ice age). The sand/gravel deposits filled the pre-existing valley along the River Nore and vary in thickness from 10m near the outer edges to 30m closer to the river. These deposits are underlain by boulder clay (till) of varying thickness deposited by glacial ice.

Near surface soil types shown on the Teagasc subsoil data at the proposed bridge location include relatively narrow strips of alluvial deposits along the River Nore and made ground underlying the developed urban areas of Kilkenny City, see Figure 7.1b.

This desk-based information is supported by a geotechnical site investigation carried out by Geotechnical and Environmental Services (GES) in September 2012. The following geotechnical properties of the soil and rock strata were encountered within 29.5m of the existing ground level:

- MADE GROUND: Loose grey, grey brown and black silty gravelly SAND/silty sandy GRAVEL/soft sandy gravelly CLAY with low cobble content. Also containing brick, glass, crockery and timber remnants;
- Soft to firm, low to medium strength, grey silty slightly sandy slightly gravelly CLAY containing roots and rootlets;
- Medium dense grey silty gravelly fine to coarse SAND;
- Stiff to very stiff high to very high strength grey silty slightly sandy slightly gravelly CLAY with low cobble content;
- Medium dense grey silty gravelly fine to coarse SAND with low cobble content;
- Dense to very dense grey silty sandy fine to coarse GRAVEL with low cobble content;
- Stiff light brown very silty slightly sandy CLAY;
- Strong to very strong, locally weak, light grey and grey coarse grained LIMESTONE.

The above description represents the general order of occurrence of the soil strata below the ground surface. However, it should be noted that at specific locations one or more strata may be absent.

Laboratory testing of one soil sample was undertaken as part of the site investigation works carried out by GES in October 2012. The parameters measured in the soil sample were within the typical ranges[21]of a sample taken in 'made' ground in a busy urban centre.

Bedrock Geology
The bedrock underlying the quaternary sediments at the proposed pedestrian bridge location comprises of Lower Carboniferous limestones of the Ballyadams formation, see

[21] Brogan, J., Crowe, M., and Carty, G. (2002) Setting Environmental Quality Objectives for Soil Developing A Soil Protection Strategy For Ireland - A Discussion Document. Environmental Protection Agency.

Figure 7.2. Also as noted above, the site investigation revealed limestone as the underlying bedrock.

Geological Heritage Sites

There are no geological heritage sites in the vicinity of the proposed pedestrian bridge. The closest site of geological interest is "Archersgrove quarry" (grid ref 251900, 154800) approx. 1.7km southwards of the proposed pedestrian bridge location.

7.3.2 Hydrology

The study area is defined as the surface water resources potentially impacted by the proposed pedestrian bridge, namely the River Nore.

Existing Surface Water Quality

Water quality can be monitored by chemical or biological means or, preferably, by a combination of both. In general, physicochemical analysis measures the causes of pollution (*i.e*. the pollutants), biological analysis is a means whereby the ecological effects of pollution can be measured. Biological sampling for the River Nore is carried out routinely by the EPA as discussed in Chapter 6.0, Section 6.3 –The Existing Environment.

Physio-chemical water quality data for the River Nore at John's Bridge in Kilkenny City has been obtained from the EPA and is tabulated overleaf in Table 7.1. The results show that the parameters analysed are within the relevant Water Quality Standards (WQSs) indicating good or high water quality. The status for physio-chemical parameters is rated as 'Good'.The biological Q-Value Status rating for the River Nore nearest the location of the proposed bridge (approx. 240m downstream) is also classified as 'Good' Q4.[22]

Flow Data

While the hydrometric station at John's Bridge, Kilkenny is currently inactive, the mean annual flow recorded for the River Nore at this location from 1965 – 2001 was 27.1m^3/s [23]. The Dry Weather Flow (DWF) for the same period was recorded to be 2.0m^3/s [24].

7.3.3 Hydrogeology

The proposed pedestrian bridge location is underlain by two aquifer systems which are described below and illustrated in Figures 7.3a and 7.3b.

<u>Shallow Sand and Gravel Aquifer</u>

The quaternary glacio-fluvial sands and gravels form an extensive regional unconfined aquifer[25] ranging in thickness from 10m to 30m, with flow predominately occurring through voids between grains and particles (primary porosity). The unconfined aquifer is predominately rainfall recharged and is generally high yielding. Based on the limited available desk-based information the water table within the sand/gravel sediments is located from approximately 3 to 7mbgl with the water table closer to the surface in low lying areas and topographic depressions. The sand/gravel aquifer may provide additional storage for underlying and adjacent limestone aquifers.

Examination of 4 exploratory boreholes by GES revealed that groundwater was generally encountered within 5.5m of existing ground level on the west bank of the River Nore and within 2.5m of existing ground level on the east bank of the River Nore. Monitoring of a

[22] EPA via email consultation.
[23] Hydrodata.ie - The Hydrometric Website of the OPW, (2007).
[24] Register of Hydrometric Stations, EPA, May 2007.
[25] GSI (1994), Geology of Carlow – Wexford.

standpipe installation on a single occasion subsequently revealed equilibrium groundwater levels of 1.9m and 0.6m below existing ground level.

Fractured Bedrock Aquifer

A regional fractured rock aquifer exists in the Ballyadams limestone formation which lies beneath the study area, and the Clogrenan limestone formation which lies approximately 1km north proposed bridge location, with groundwater flow predominant along fractures, faults, and voids (secondary porosity). The karstified limestone aquifer formed by these two formations is the most extensive aquifer in the region[26]. Secondary porosity within the Ballyadams formation is well developed and solutional karst features such as swallow holes, turloughs, springs, caves and conduit flow are common. The Clogrenan formation is more thinly bedded and cherty and generally has a lower hydraulic conductivity. However, the hydraulic conductivity in both fractured rock systems can vary considerably depending on the size, density, persistence, infilling and orientation of fractures, openings and voids. Where present, the low permeable boulder clay unit would act as an aquitard limiting hydraulic connection between the shallow sand/gravel and bedrock aquifer.

Aquifer Classification

The GSI have classified aquifers in Ireland based on resource value *i.e*. regionally important aquifer (R), locally important aquifer (L) and poor quality aquifer (P). Resource value refers to the scale and production potential of the aquifer. Based on the GSI aquifer map data the quaternary gravel aquifer is classified Rg (regionally important, extensive sand/gravel aquifer) (Figure 7.3a) and the fractured rock limestone aquifer is classified Rkd (regionally important, diffuse karst aquifer with good development potential) (Figure 7.3b). These types of aquifer are considered sufficiently productive to be able to yield enough water to boreholes or springs to supply major regional water schemes.

Groundwater Vulnerability

The GSI groundwater vulnerability classification is primarily based on the permeability and thickness of subsoils overlying the aquifer or in the case of sand/gravel aquifers the depth of the unsaturated zone. As the proposed pedestrian bridge location is underlain by an unconfined sand/gravel aquifer with an unsaturated zone typically greater than 3m, the groundwater vulnerability rating is "High", see Figure 7.4.

Groundwater Use

A search of the GSI groundwater well database was conducted to identify registered wells within 1km of the proposed pedestrian bridge location (Figure 7.5). A total of 13 wells were identified, of which 7 were registered for industrial use and one was registered for agricultural use only and two were registered for both agricultural and domestic use. Three wells were of unknown use. Well depths ranged from 3.1m to 90.0m. Yield results were provided for three wells and ranged from $10m^3$/day to $2,182m^3$/day. The yield class ranged from good to excellent.

The GSI also provides a framework for protection of groundwater source zones (*e.g*. areas of contribution to water supply bores). According to the GSI data there are no designated Source Protection Zones within the study area.

Groundwater Discharge Features

Groundwater discharge in the study area occurs to rivers, streams and lakes with the sand/gravel aquifer contributing important baseflow to these surface water features[27]. The most significant groundwater discharge feature within the study area is the River Nore.

[26] Ibid.
[27] GSI (1994), Geology of Carlow – Wexford.

Groundwater Quality

Laboratory testing of one groundwater sample was undertaken for site investigation works carried out by GES in October 2012. The results of the water sample were compared to the same standards as set out in the Groundwater Regulations (2010). The Drinking Water Standards and IGVs were used in the absence of the groundwater threshold values for particular parameters. All parameters were below the threshold except for Ammoniacal Nitrogen (NH_4) and Polycyclic Aromatic Hydrocarbons (PAHs). In the case of the former this result is not unusual for a busy urban centre. The result for the PAHs must be viewed with caution as the results state the sample holding time was exceeded prior to receipt although it is likely that some PAHs would be above their threshold values as pollution from anthropogenic sources can occur.

Table 7.1 Surface Water Quality – River Nore

		River Nore Station No. 1900 – John's Bridge										
			2011						2012			
Parameter	**Water Quality Standard (WQS)**	**Units**	**Jan**	**Mar**	**May**	**Jul**	**Sept**	**Nov**	**Jan**	**Mar**	**Jul**	**Sept**
Ammoniacal Nitrogen as N	*Salmonid* <1mg/l NH_4* (0.78mg/l as N) *Surface Water Objective* High ≤0.040 (mean) or ≤0.090 (95%ile)** Good ≤0.065 (mean) or ≤0.140 (95%ile)**	mg/l	0.03	0.02	0.02	0.04	0.02	0.03	0.03	0.03	0.03	<0.01
BOD (Unfiltered)	*Salmonid* ≤5mg/l* *Surface Water Objective* High ≤1.3 (mean) or ≤2.2 (95%ile)** Good ≤1.5 (mean) or ≤2.6 (95%ile)**	mg/l	1.2	0.7	0.8	1.0	1.9	1.2	1.0	1.2	1.8	2.3
Nitrate as NO_3	-	mg/l	1.87	3.46	3.22	2.86	1.75	2.56	3.08	3.49	2.28	3.34
Nitrite as NO_2	≤0.05mg/l*	mg/l	0.009	0.008	NR	0.010	0.003	0.014	0.013	0.01	0.015	0.008
Conductivity	-	μS/cm	384	618	642	618	424	537	566	633	555	644
pH	*Salmonid* 6<pH<9* *Surface Water Objective* Soft Water 4.5<pH<9.0** Hard Water 6.0<pH<9.0**	-	7.9	8.0	8.1	8.0	7.9	8.1	8.0	8.1	8.0	8.2
Orthophosphate as P	- High status 0.025 (mean) or 0.045 (95%ile) Good status 0.035 (mean) or 0.075 (95%ile)**	mg/l	0.04	0.04	0.04	0.08	0.02	0.03	0.03	0.02	0.03	0.06
Dissolved Oxygen (DO)	80% saturation < 95%ile < 120% saturation**	% sat	94	96	101	90	89	92	95	96	89	99
Chloride	-	mg/l	15	17	26	24	21	16	17	21	17	20

* European Communities (Quality of Salmonid Waters) Regulations 1988.
****** European Communities Environmental Objectives (Surface Water) Regulations 2009.

7.4 Potential Impacts of the Proposed Pedestrian Bridge

7.4.1 Potential Impacts - Soils and Geology

Construction Impacts

Rock Excavation
It is not expected that rock excavation will be required and as a result no construction impacts on the solid geology of the area are anticipated, therefore the impact can be described as neutral.

Excavation of Soil
Earthworks required for the proposed pedestrian bridge are minor and are described in Chapter 2, Section 2.5 – Earthworks.

Soils have the potential to be adversely impacted during the construction phase as a result of the following:

- Contamination of soils with substances such as, fuels, lubricants, waste oil, waste concrete, waste water from site toilet and wash facilities;
- Exposure of fresh soil slopes which would be susceptible to erosion;
- The presence of heavy plant equipment and machinery;
- The presence of fuel and oil storage facilities; and,
- Soil compaction.

Contamination of soils by fuels, chemicals, etc. has the potential to be a long term significant negative impact while the other impacts listed are only likely to be temporary and slight to minor negative impacts.

Mitigation measures as set out in Section 7.5 will prevent or reduce the likelihood of soil contamination occurring.

Operational Impacts
It is not considered that the operational phase will have any negative impacts on soils therefore the overall impact can be described as neutral.

7.4.2 Potential Impacts – Surface Water
The potential impacts of the proposed pedestrian bridge on surface water resources during both the construction and operational phases are outlined below.

Construction Impacts
Chapter 6.0, Section 6.4.2 deals with potential impacts of the construction phase of the proposed pedestrian bridge on surface water. The following additional potential construction phase impact may also arise:

- Changes in run-off, peak flows or low flows due to earthworks, site drainage and increased impermeable areas. This will not occur given the scale of development proposed.

Overall the potential impact of the proposed pedestrian bridge on the surface water quality of the River Nore during the construction phase in the absence of mitigation measures may be potentially temporary moderate negative.

Operational Impacts

There will be no long term impacts on the River Nore therefore operational impacts can be described as neutral.

7.4.3 Potential Impacts - Groundwater

Construction Phase Impacts

Groundwater Quality

There is the potential for contamination of groundwater as a result of localised point sources of pollution during the construction phase such as fuel storage tanks, workshop facilities, drums of machinery oil and leaks from plant or machinery. Overall this impact can be described as potentially moderate negative and short-term in the absence of mitigation.

Groundwater Quantity

Dewatering of groundwater to facilitate construction activities has the potential to lower groundwater levels thereby potentially impacting on nearby building foundations and/or nearby groundwater users. However, the construction of the proposed pedestrian bridge will not involve deep excavations or cuttings greatly below the water-table and as such it is highly unlikely that significant dewatering of groundwater will be required. Furthermore groundwater will not be utilised as a temporary water supply during construction.

Groundwater Flow

It is unlikely that construction excavations will greatly penetrate the water-table as noted above. Furthermore, works are beside the river. Therefore, groundwater flow will not be significantly obstructed as a result of the construction of the proposed pedestrian bridge.

Operational Phase Impacts

Groundwater Quality

The shallow sand/gravel aquifer underlying the study area is regionally important with a relatively shallow water-table, which is highly vulnerable to pollution. However there will be no direct discharge of surface water run-off to groundwater therefore the impact on groundwater quality can be described as neutral.

Groundwater Quantity

The area of land on which the two ends of the proposed pedestrian bridge will be constructed is approximately 0.052ha. It is therefore not considered that there will be a reduction in rainfall recharge as a result of the proposed pedestrian bridge.

Groundwater Flow

The proposed pedestrian bridge will not extend greatly below the water-table and lateral groundwater flow is not expected to be significantly obstructed. In addition, it will not have any significant embankments which could result in a barrier to groundwater flow. Therefore the impact on groundwater flow can be described as imperceptible.

7.5 Mitigation Measures

7.5.1 Construction Phase Mitigation Measures

The implementation of a comprehensive EOP will ensure good construction management practices and appropriate handling and spill response procedures are followed as part of the implementation of the Mitigation strategy.

Mitigation measures outlined in Chapter 6.0, Section 6.4.4 in relation to aquatic ecology are also applicable for the protection of soils, geology, hydrology and hydrogeology and therefore have not been repeated in this chapter. Further mitigation measures are outlined below.

Soils and Geology

If contaminated soil is encountered in any areas during construction, the extent of the contamination will be established. If necessary, it will be removed off-site and disposed of in accordance with the requirements of all relevant Waste Management Legislation and guidance provided in the NRA document entitled 'Guidelines for the Management of Waste from National Road Construction Projects, 2008'.

7.6 Residual Impacts

Due to the scale and nature of the development and the mitigation measures outlined above, the proposed pedestrian bridge is unlikely to have any significant impact on soils, geology, hydrology and hydrogeological resources during either the construction or operational phases.

7.7 Interactions and Inter-relationships with other Environmental Effects

Soils and geology will interact and/ or interrelate with the following:

- Ecology: There can be clear interactions between ecological receptors and water resource features. This issue is discussed in more detail where relevant in Chapter 6 – Flora and Fauna.

7.8 Monitoring

Soils removed will be tested for contamination and disposed of in accordance with the requirements of waste legislation.

7.9 Reinstatement

Not applicable.

7.10 Difficulties Encountered in Compiling this Information

No difficulties were encountered.

8.0 Air Quality

8.1 Introduction

This chapter of the EIR addresses the potential likely impacts of the proposed pedestrian bridge on ambient air quality within Kilkenny City.

Given the nature of the proposed bridge for pedestrians and cyclists, it is not considered that an operational phase impact assessment for air is required. Therefore the assessment focuses on construction phase impacts only.

8.2 Study Assessment & Methodology

The assessment of the impact of the proposed development on air quality carried out was desk-based. The existing environment is described taking account of literature sources such as the EPA publication 'Air Quality in Ireland 2011 (Key Indicators of Ambient Air Quality)'. The relevant air quality legislation was also consulted.

Air Pollution Standards

Assessment of the significance of a particular level of pollution is made with reference to limit values established in the Air Quality Standards (AQS) Regulations, 2011 (S.I. 180 of 2011) and the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2009 (S.I. 58 of 2009).

The 2011 Regulations came into effect on 12th April 2011 and transpose the Clean Air for Europe (CAFE) Directive 2008/50/EC into Irish law. The 2011 Regulations introduced a new limit value for $PM_{2.5}$ in addition to the existing limit values for PM_{10}, nitrogen dioxide and oxides of nitrogen, sulphur dioxide, lead, ozone, carbon monoxide and benzene. $PM_{2.5}$ has similar effects on health as PM_{10} however $PM_{2.5}$ is a better indicator of anthropogenic (man-made) emissions than PM_{10}.

AQSs are usually based on the effects of pollutants on human health, although other factors such as effects on vegetation are sometimes taken into account. The risk posed by air pollution to vegetation and natural ecosystems is most important in places away from urban areas and compliance with critical levels for the protection of vegetation should therefore focus on places away from built-up areas. The limit values given in the 2011 Regulations for the protection of human health and vegetation are summarised in Table 8.1 overleaf. For each parameter in Table 8.1 a margin of tolerance applies, which is the percentage of the limit value by which that value may be exceeded subject to the conditions laid down in the AQS Regulations. The margin of tolerance for each parameter is also included in Table 8.1.

Table 8.1 AQS Regulations 2011 Limit Values (S.I. No 180 of 2011)

Reference Period	For the protection of:	Limit Value µg/m^3 (1)	Number of times in one year not to be exceeded	Margin of tolerance
Sulphur Dioxide				
Hourly limit value	Human health	350	24	150 µg/m^3 (43%)
Daily limit value	Human health	125	3	None
Annual Limit Value	Vegetation	20	0	None
Nitrogen Oxides				
Hourly limit value	Human health	200	18	None
Annual limit value	Human health	40	0	None
Annual Limit Value	Vegetation	30	0	None
Particulate Matter (PM_{10})				
Daily limit value	Human health	50	35	50%
Annual limit value	Human health	40	0	20%
Particulate Matter ($PM_{2.5}$)				
Annual limit value (STAGE 1)	Human health	25	0	20% on 11th June 2008, decreasing on 1st January 2009 thereafter by equal annual percentages to reach 0% by 1st January 2015
Annual limit value (STAGE 2)	Human health	20 (1) (2)	0	
Lead				
Annual limit value	Human health	0.5	0	100%
Benzene				
Annual limit value	Human health	5	0	None
Carbon Monoxide				
Maximum daily 8-hr mean value	Human health	10,000	0	60%
Ozone				
Maximum daily 8-hr mean value	Human health	120 µg/m^3	25 (averaged over 3 years)	None
May to July	Vegetation	AOT40 (calculated from 1 h values) 18,000 µg/m^3 h averaged over 5 years	0	None

Notes: *(1) Stage 2- indicative limit value to be reviewed by the Commission in 2013 in the light of further information on health and environmental effects, technical feasibility and experience of the target value in Member States.*
(2) Date by which this value limit is to be met: 1st January 2020.

EU legislation on air quality requires that member states divide their territory into zones for the assessment and management of air quality. In Ireland, the following four national air quality zones are defined within the Schedule 18 of the AQS 2011 Regulations:

Zone A — Dublin Conurbation;
Zone B — Cork Conurbation;
Zone C — Other Cities and Large Towns; and,
Zone D — Rural Ireland.

Kilkenny City falls within Zone C. The most up to date and current trends in air quality in Ireland are reported in the EPA publication 'Air Quality in Ireland 2011 (Key Indicators of Ambient Air Quality)', which was published in 2011. Air Quality for Zone C is outlined in the following section (Existing Environment).

Dust Deposition
The German TA-Luft recommends a long term dust deposition rate (expressed as a rate in mass per unit area per day) of 350 mg/ (m^2*day) for Bergerhoff Gauges, as a threshold for significant disadvantages and nuisance for non-hazardous dust. A dust deposition rate of 650 mg/ (m^2*day) is recommended as a 95 percentile value for short term permissible levels.

8.3 The Existing Environment

EPA Monitoring
In 2011, monitoring was carried out by the EPA in a number of Zone C locations. The results were collated and analysed in order to describe Zone C sites in general. Table 8.2 below shows the parameters monitored by the EPA at each of the monitoring locations in zone C.

Table 8.2 EPA Zone C Monitoring Stations for each Parameter

Parameter	Monitoring Locations
SO_2	Ennis (Co. Clare).
NO_2	Limerick Park Road (Co. Limerick).
NO_x	Limerick Park Road (Co. Limerick).
CO	No monitoring was carried out for Zone C.
Ozone	Limerick Park Road (Co. Limerick), and Bray (Co. Wicklow)
AOT 40	No monitoring was carried out for Zone C.
PM_{10}	Celbridge (Co. Kildare), Ennis (Co. Clare), Bray (Co. Wicklow) and Galway (Co. Galway).
Black smoke	Bodkin roundabout in Galway, Galway Waterworks, South Hill, Moyross and Todds (Limerick)
$PM_{2.5}$	Ennis (Co. Clare)
Benzene	No monitoring was carried out for Zone C.
VOCs (benzene, toluene, ethylbenzene, m-p- & o-xylene)	No monitoring was carried out for Zone C.
Lead, Arsenic, Cadmium & Nickel	Galway (Co. Galway).
Mercury	No monitoring was carried out for Zone C.
Metal deposition (Lead, Arsenic, Cadmium & Nickel)	No monitoring was carried out for Zone C.
PAH	Galway (Co. Galway).

The air monitoring results for Zone C with regard to each parameter listed in Table 8.2 are outlined in Table 8.3 below.

Table 8.3 Zone C Annual Average Monitoring Results for 2010 compared with the current AQS (S.I. 58 of 2009 & S.I. 180 of 2011)

Parameter	Units	Annual Mean	AQS Annual Neab Limit Values for Protection of Human Health	No and Location of Exceedances
SO_2	$\mu g/m^3$	3	20*	0
NO_2	$\mu g/m^3$	12	40	0
NO_x	$\mu g/m^3$	20	30**	0
Ozone	$\mu g/m^3$	48 - 53	120 (No more than 25 days)	0
PM_{10}	$\mu g/m^3$	13 - 24	40	0
Black smoke	$\mu g/m^3$	2-14	NA	NA
$PM_{2.5}$	$\mu g/m^3$	14	25	0
Lead	ng/m^3	2.1	500	0
Arsenic	ng/m^3	0.6	6	0
Cadmium	ng/m^3	0.5	5	0
Nickel	ng/m^3	2.3	20	0
PAH benzo(a)pyrene	ng/m^3	0.14	1	0
Other PAHs	ng/m^3	0.01-0.22	NA	NA

*Applies to the protection of vegetation.
**Limit only applies to rural stations in Zone D.

Summary of Ambient Air Quality & Receptors

Overall, it is expected that the ambient air quality at the site of the proposed bridge and in the immediate vicinity is expected to be good and well within the AQSs shown in Table 8.1, given the monitoring results observed in 2011 at stations representative of Zone C. The nearest sensitive receptors are residential units located at John's Quay, approximately 15m from the proposed bridge.

8.4 Potential Impacts of the Proposed Pedestrian Bridge

Construction

The main potential temporary negative impact on air quality during the construction of the bridge will be localised dust deposition, particularly in drier and/or windy weather conditions. Typical construction activities such as site clearance, stockpiling of materials, transport of site vehicles along access roads etc. have the potential to result in dust emissions across the site which could transfer to receptors, located in close proximity to the works. Therefore, mitigation measures outlined below in section 8.5 will be implemented.

The operation of mobile plant and equipment will give rise to emissions to atmosphere of combustion gases, sulphur dioxide, oxides of nitrogen and particulates. However the emissions will have an imperceptible or negligible impact on the ambient air quality.

8.5 Mitigation Measures

Construction Phase

A dust minimisation plan will be developed by the contractor and included in the EOP as part of the Mitigation Strategy. The Plan will serve to minimise any impacts on sensitive receptors and designated areas. The following measures will be implemented:

- Controlled spraying with water of exposed earthwork activities and site haul roads during dry weather;
- Control of vehicle speeds and speed restrictions;
- Sweeping of hard surface roads, and,
- Provision of hoarding where required, where works occur adjacent to sensitive receptors or designated areas.

8.6 Residual Impacts

Air Quality

Overall, good site practice measures to control dust, as listed in Section 8.5, will ensure that the impact of the construction works on nearby sensitive receptors will be negligible.

It is not anticipated that the AQSs listed in Table 8.1 will be approached as a result of the construction activities.

Overall the proposed bridge, as part of the Smarter Travel Plan for Kilkenny is likely to contribute towards a long term slight beneficial impact on ambient air quality.

8.7 Interaction and Inter-relationships with other Environmental Effects

Impacts on Air will interact and/ or interrelate with

- Human Beings: Exposure to wind blown dust, other particulates and emissions of pollutants from road traffic is an important consideration for human health and a pleasant living environment. However, as described above no adverse impacts are predicted.

8.8 Monitoring

No monitoring is envisaged to be required as the construction impact phase will be short term, and mitigation measures will be implemented to suppress dust generation.

8.9 Reinstatement

Not applicable.

8.10 Difficulties Encountered while Compiling this Information

No difficulties were encountered.

9.0 Noise and Vibration

9.1 Introduction

This chapter of the EIR addresss the potential likely noise and vibration impacts of the construction phase associated with the proposed pedestrian bridge.

Given the nature of the proposed bridge for pedestrians and cyclists, it is not considered that an operational phase impact assessment for noise or vibration is required. Therefore the assessment focuses on construction phase impacts only.

9.2 Assessment Methodology

Noise Guidelines

The construction phase has been assessed having regard to the guidance set out in BS5228:2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1. Construction noise has been predicted to the nearest sensitive receptors, assessed against the existing receiving environment and mitigation measures developed as necessary. Criteria for construction noise and vibration have been set having regard to current Good Practice and Guidelines.

Construction Noise Assessment

There is no published Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. In relation to construction noise limits, the NRA Guidelines outline noise levels for road schemes which are deemed acceptable at sensitive receptors during road construction (Table 9.1). These levels are indicative only and it may be appropriate to apply more stringent limits in areas where pre-existing noise levels are low.

Table 9.1 Maximum Permissible Noise Levels at the Façade of Dwellings during Construction

Days and Times	$L_{Aeq(1hr)}$ dB	L_{Amax} dB
Monday to Friday 07:00 to 19:00hrs.	70	80
Monday to Friday 19:00hrs to 22:00hrs	60 [28]	65
Saturday 08:00 to 16:30hrs.	65	75
Sundays and Bank Holidays 08:00 to 16:30hrs.	60	65

Vibration

Vibration can be defined as regularly repeated movement of a physical object about a fixed point. The magnitude of vibration is expressed in terms of Peak Particle Velocity (PPV) expressed in millimetres per second (mm/s).

Construction Vibration – Modern Buildings

In order to ensure that there is no potential for vibration damage during construction, the NRA recommends that vibration from road construction activities be limited to the values set out below in Table 9.2. These values have been derived through consideration of the following standards shown overleaf:

[28] Construction activity at these times, other than that required in respect of emergency works, will normally require the explicit permission of the relevant Local Authority.

- Building Research Establishment (BRE) Digest 353 (July 1990); *Damage to structures from ground-borne vibration*.
- British Standard BS 7385-2:1993 *Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration*.

Table 9.2 Allowable Vibration Velocity (Peak Particle Velocity) at the Closest Part of any Sensitive Property to the Source of Vibration at Specified Frequencies

Less than 10Hz	10 to 50Hz	50 to 100Hz (and above)
8 mm/s	12.5 mm/s	20 mm/s

The values presented in Table 9.2 apply to relatively modern buildings.

Construction Vibration – Historical Buildings

The NRA Guidelines do not specify limit values for older buildings or sites of archaeological interest except to refer to the limit values in the BRE Digest and BS 7385 which are as follows:

"For structures that are of great intrinsic value and are particularly sensitive to vibration, transient vibration should not exceed 3 mm/s at low frequencies. Allowable levels increase to 8 mm/s at 50Hz and 10mm/s at 100Hz and above.

BS 7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15mm/s at low frequencies rising to 20 mm/s at 15 Hz and 50mm/s at 40Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings."

Baseline Monitoring

In order to characterise the receiving noise environment at the subject site, a survey of existing noise levels in the area was conducted by Malone O'Regan personnel on 22nd May 2012.

The methodology followed in undertaking the noise survey was in accordance with the recommendation of the International Standards Organisation Documents: ISO 1996-1:2003 and ISO 1996-2:2007 and where applicable the EPA Guidance Note for Noise (NG4), 2012.

Noise measurements were carried out using a BRÜEL & KJÆR 2250 Hand Held Analyser equipped with Enhanced Logging Software BZ7225. The monitoring equipment was calibrated before measurements were recorded using a BRÜEL & KJÆR sound level calibrator type 4231. The noise levels were measured using the A-weighted network, and a fast sampling interval. At all sample locations the noise metre was positioned at a minimum of 3.5 metres away from any reflecting surfaces, and mounted on a tripod 1.5 metres over ground level.

The survey comprised measurements at 2 locations in the vicinity of the proposed pedestrian bridge. Noise monitoring (NM) locations and Noise Sensitive Receptors (NSRs) are shown on Figure 9.1 and are described in Table 9.3 overleaf.

Table 9.3 Description of Noise Monitoring Locations

Location	Description of Location
NM1	Bateman's Quay, where the proposed bridge will be located.
NM2	John's Quay, approx 5m from NSR 1.

All measurements were as dB(A); i.e. decibels measured using the A-Weighted network, which corresponds to the frequency at which humans perceive noise. The parameters measured were as follows:

- L_{AEQ} is the A – weighted equivalent continuous sound level – the sound level of a steady sound having the same energy as a fluctuating sound over a specified measurement period;
- L_{A10} is the A – weighted noise level which is exceeded for 10% of the specified measurement period. This gives an indication of the upper limit of fluctuating noise such as that from road traffic;
- L_{A90} is the A – weighted noise level exceeded for 90% of the measurement period and is useful in providing an indication of the background noise level experienced over the measurement period;
- L_{AFmax}– The maximum Root Mean Square (RMS) A-weighted sound pressure level occurring within a specified time period. Measured using the "Fast" time weighting.

9.3 The Existing Environment

The results of the baseline noise monitoring carried out at the two noise monitoring locations are shown in Table 9.4 overleaf.

In summary, noise levels are typical of an urban location with noise reducing over time although ambient noise levels appeared to reduce over time from early to late afternoon. Noise sources affecting the locations were generally intermittent given the overall location off the main thoroughfares.

Table 9.4 Summary Table of Baseline Noise Monitoring Results

Location	Time	$L_{Aeq,15min}$	$L_{A10,15min}$	$L_{A90,15min}$	L_{AFmax}	Description Noise Sources
		dB(A)	dB(A)	dB(A)	dB(A)	
NM1	14:42-14:47	63	67	49	81	The main noise source was intermittent traffic at Bateman's Quay including traffic in/out of Dunnes Stores car park and distant traffic on nearby roads (e.g. St John's Bridge) Other noise sources included intermittent clinking noises, cars beeping, loud music in a car, people talking nearby, church bells and intermittent rustling of leaves.
	14:59- 15:14	65	69	49	79	
NM2	15:20- 15:35	60	51	46	84	The main noise source was intermittent traffic at Bateman's Quay (approx 59m from NM2) and St John's Bridge (approx. 187m from NM2). A tow truck passing near the meter and reversing at John's Quay influenced the noise readings during the first monitoring event at NM2. Other noise sources included sporadic traffic in/out of the nearby library (approx 20m from NM2), birds singing, people talking, church bells and intermittent rustling of leaves.
	15:40- 15:55	50	50	45	68	
	15:55- 16:10	47	49	44	59	

9.4 Potential Impacts of the Proposed Pedestrian Bridge

Construction Noise and Vibration

The construction phase is anticipated to potentially increase the ambient noise levels within the vicinity of the works and will have a temporary impact on individual NSRs for the duration of the works. The general phasing of construction works will more than likely comprise the following:

- Pre-earthworks: Fencing of the site boundary, site clearance and topsoil strip. A small temporary compound will be required during the proposed construction works. This will be located to the rear of the library at John's Quay (see Figure 1.2).
- Realignment of existing services at John's Quay: Pre-earthworks, temporary earthworks.
- Earthworks: Piling, excavation, capping.
- Installation of walkways, access ramps.
- Structures: Installation of the bridge (crane), finishing.
- Finishing: Landscaping, hand and guard rails, and lighting.

It is estimated that the proposed bridge will be completed fully within 16 weeks. The foundation works are expected to be completed within 3-5 weeks while the finishing abutment, including piling works, is expected to be completed within 1-2 weeks.

The auger piled foundations should be installed following the services diversion. This will require traffic management on the road during the piling works to facilitate the piling equipment. Piling should be completed within 3 to 5 days for each abutment. The concrete pile caps will be constructed to allow the placement of the steel bridge sections. It is likely that the bridge will be constructed in two individual prefabricated sections and transported to site for lifting into position using a crane on each bank. John's Quay will be closed to traffic while the crane is in position over a 1 day period.

It is noted that the nearest piling activities will be some 15m and 20m distant from the NSR façades, while the nearest construction activities may occur at approx. 8m distant from the NSR façades.

Table 9.5 overleaf details typical noise sources that may be in operation at different times during construction.

It should be noted that for the following reasons, predicting the construction noise impact of any proposed development is very difficult:

- Construction will be subject to a tendering process, therefore the prediction of construction noise can only be an outline of likely sources used;
- The sound power ratings used for each piece of equipment in the assessment, as taken from BS5228, may vary from the actual equipment used on site (Annex C of the Code of Practice outlines various noise levels for each type of equipment);
- It is not possible to outline for definite the type of equipment which will be in use, or the duration of time each piece of equipment will be in use; and,
- Noise emissions from construction vary in intensity and character but also in location and over time as noted above.

Notwithstanding the above, Table 9.5 outlines the likely construction noise levels at the NSRs at John's Quay (NSRs 1,2 and 3) for the likely equipment to be used during construction.
It should be noted that the likely noise levels in Table 9.5 do not specify the time over which the noise source will be active i.e. the noise levels are expressed as $L_{Aeq,t}$ as opposed to $L_{Aeq,\ 15mins}$ or 30mins or 1 hour as the case may be. So, if a crane mounted auger ($L_{Aeq,t}$ is predicted to be 79 dB at 10m) was active over 5mins in a 1 hr assessment period then the $L_{Aeq,1hr}$ would be 68 dB using the following equation:

Eqn 1: $L_{Aeq,\ 1hr} = 10 \log ((t1 \times 10^{L1/10} + t2 \times 10^{L2/10})/T)$

Where t1 is 5x60secs
t2 is 55 x 60 secs
L1 is 79dB
L2 is 50dB (measured ambient level)
T is 60x60secs

Table 9.5 Likely Noise Levels arising from the Construction Works (without mitigation)

Equipment Type	Activity equivalent continuous sound pressure level $L_{Aeq,T}$ @10m
Tracked Excavator	80
Dump Truck	81
Tipper Lorry	79
Piling Crane Mounted auger	79
Compressor	75
Truck mounted concrete pump + boom arm	80
Generator	74
Mobile telescopic Crane	82
Paving	77
Road Roller	80

Based on the predicted noise levels outlined above in Table 9.5, and the acceptable noise levels outlined in the NRA Guidelines (Table 9.2), in general the nearest receptors may experience noise levels in excess of the Guideline values. Compared with the existing ambient noise environment at the NSRs, represented by NM2, construction works without further mitigation are likely to represent a significant temporary negative impact at the nearest NSRs at times during works.

Construction Vibration
Construction activities which include piling will have the potential to cause vibrational impact.

Augercast piles however are known to cause minimal disturbance, and are often used for noise and environmentally sensitive sites. Piles are installed by rotating a continuous flight hollow-stem auger into the ground to the specified pile depth or until refusal criteria is satisfied.

9.5 Mitigation Measures

Construction Noise and Vibration

Table 9.1 sets out the construction noise levels that are deemed acceptable in the NRA Guidelines. However, it is envisaged that mitigation measures will be required in order to adhere to the limits, where feasible, especially for the NSRs.

The BS 5228 (2009) Code of Practice for Noise and Vibration Control on Construction and Open Sites: Part 1: Noise contains guidelines and recommendations which are considered appropriate and good working practice for all construction contracts, as do the NRA Noise Guidelines and the NRA Guidelines for the Creation, Implementation and Maintenance of an EOP. The contractor will use these documents as a guideline for the prevention of noise impacts at sensitive receptors during the construction of the proposed pedestrian bridge. The EOP which will be prepared as part of the Mitigation Strategy will outline in detail the noise mitigation measures which will be put in place by the contractor and will include the following measures:

Consultation/ Communication

- Consultation will be required with KBC in relation to construction activities at certain times.
- A public awareness strategy will be established to promote awareness of measures being taken to restrict noise and vibration to acceptable levels.
- A site representative should be appointed for matters related to noise and vibration. Residents will be informed of the time duration and location of noisy work.
- An on-site documented complaints procedure will be implemented.

Timing of Works

Working hours will be agreed between the contractor and KBC in advance. It is not anticipated that this contract will require any significant construction works to take place outside normal working hours, with the exception of potential emergency works[29]. If this is required such equipment will be sited and enclosed to ensure that noise levels do not exceed 45dB $L_{Aeq,5mins}$ and an L_{Amax} value of 60 dB, outdoors at a distance of 1m from the façade of the NSR.

Measures to Control Noise and Vibration

It is difficult to devise alternative methods of construction however the following noise reduction measures are recommended in order to ensure that the threshold values set out in Table 9.1 are adhered to as much as possible:

- The operation of certain pieces of equipment will be managed through monitoring and timing of use in order to ensure that noise nuisance is reduced as much as possible. Screening/hoarding may be considered. As a general rule of thumb, it is recommended that temporary hoarding break the "line of sight" from the source to the nearest receptor e.g. a second floor window.
- During the construction phase any complaints received will be thoroughly investigated with suitable mitigation measures taken at the time such as restricting the use of noisy equipment during the early hours and late in the evening.

[29] Normal working hours may not be 8 am - 6 pm for construction sites but may vary over a longer period of the day and with earlier starts.

- Noise control measures will be implemented to provide reductions in overall site noise levels. These include the use of sharp saws and drills and screws as opposed to nails where possible. In addition, good practice will be implemented when handling materials, for example lowering rather than dropping materials such as scaffolding poles.
- All equipment will comply with EC Directives relating to noise emissions from construction, plant and equipment used outdoors (Directive 2000/14/EC and Amending Directive 2005/88/EC transposed into Irish law as European Communities (Noise Emission of Equipment for Use Outdoors) Regulations, 2001 (S.I. 632/2001) and Amending Regulations 2006 (S.I. 241/2006). These include compressors, generators, excavators, loaders and dump trucks. All equipment should be CE[30] marked.
- Annexes B and C of BS5228 - 1: 2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise provide details on the noise levels for different types of equipment and mitigation measures which can be employed. It is recommended that equipment with low noise levels be specified where possible.
- Barriers should be erected around particularly noisy pieces of equipment where necessary and acoustic attenuators, enclosures etc employed where required to achieve the limits set out in Table 9.1 above
- Piling activities will be designed to have as low noise emissions as possible at NSRs. Piling in general will be intermittent and will take place over a total of 6-10 days.
- Noisy/ vibratory plant and equipment should be sited as far away as possible from NSR and vibration isolated support structures will be used where necessary.
- Where practicable non-audible warning systems should be utilised. All audible warning systems should be designed where practicable to reduce noise.
- Monitoring vibration should be conducted during critical periods at sensitive buildings. Vibration monitoring will ensure that the vibration guidelines outlined in Section 9.2 above will not be exceeded. Noise monitoring will be undertaken in the event of a complaint.
- During the development the road surfaces to, from and on site should be maintained to ensure vibration from construction traffic travelling over uneven surfaces is minimised.
- A lower speed limit should be enforced on site during the construction phase to further minimise vibration and noise as a result of construction traffic.

9.6 Residual Impacts

Temporary Construction Noise

The inclusion of the mitigation measures recommended in Section 9.5 will ensure that the maximum daily noise levels as a result of construction will be controlled as much as possible by the good construction practices. However there may be activities where noise levels in excess of the recommended construction noise limits will be unavoidable for short periods of time. It should be noted however that the proposed bridge construction works are expected to be completed in full within a 16 week period.

[30] CE has no meaning as an abbreviation but it is thought that it is an acronym for Communaute Europeenne.

9.7 Interactions and Inter-relationships with other Environmental Effects

Impacts on Noise interact and/ or interrelate with:

- Cultural Heritage: The mitigation measures described under Section 9.5 above address the prevention of vibration impacts on architectural heritage.

9.8 Monitoring

- Vibration monitoring should be conducted during critical periods at sensitive buildings. Vibration monitoring will ensure that the vibration guidelines outlined in Section 9.2 above will not be exceeded.
- Noise monitoring will be undertaken in the event of a complaint occurring.

9.9 Reinstatement

Not applicable.

9.10 Difficulties Encountered in Compiling this Information

No difficulties were encountered.

10.0 Landscape and Visual

10.1 Introduction

This chapter assesses the existing landscape and visual character within the study area and evaluates the potential for landscape and visual effects arising from the proposed development.

The chapter is supported by mapping and photomontages, Refer to Appendix C.

10.2 Assessment Methodology

The assessment included a desk study and site surveys (January 2011 and June 2012) and is made having regard to the vulnerability of views to change and to the effects on the visual receptor in relation to its location to the proposed pedestrian bridge.

The study area width comprises a 600m radius around the proposed pedestrian bridge (as indicated in Figure 10.1 – Landscape Designations and Photomontage Locations, contained in Appendix C). The extent of the assessment area is based on a professional judgment on the nature of views available from the immediate and wider vicinity and in the context of the landscape character within the general study area.

The study area contains the majority of Kilkenny City Centre including Kilkenny Castle, St. Canice's Cathedral & Round Tower, St. Mary's Cathedral, Diageo Brewery and green spaces and parks along the River Nore and within the Castle grounds.

The study area was initially assessed in terms of landscape constraints including designated scenic views and prospects, Natura 2000 sites and designated walking and cycling routes. This stage identified areas with particular visual or landscape sensitivity to the proposed development. Likely landscape effects were examined in conjunction with those arising from other factors such as ecology and architectural and cultural heritage in order to determine the pedestrian bridge location.

The preparation of a Visual Envelope Map or better known as Zone of Theoretical Visibility (ZTV) is suitable for rural areas but not for built up urban areas, where potential visibility is depending on the orientation of streets, the density and scale of building structures and by the enclosure. The determination of the visibility of the proposed bridge development and the identification of relevant and representative viewpoints has been carried out during site surveys. Photographs taken from these viewpoints have been used for the production of photomontages, see Appendix C.

Photomontages illustrate the potential landscape and visual effects of the proposed development and are described in detail in Section 10.4 of this chapter.

Definitions of terms used in this Chapter:

Landscape effects are defined as the result of physical changes to the fabric of the landscape resulting from new development. They describe the capacity of the receiving environment to accommodate the proposed development. Such physical changes may include the addition, alteration or removal of structures. Landscape effects can be temporary or permanent and include those caused by temporary access routes, temporary compounds and construction traffic.

Visual effects relate closely to landscape effects but concern changes in views. Visual assessment concerns people's perception and response to visual amenity. Effects may result from new elements located in the landscape that cause visual intrusion (i.e. contrast to existing environment, interference with or interruption of the existing view). The methodology and terms used in this report are derived from options presented in the aforementioned "Guidelines for Landscape and Visual Assessment" and tailored for the assessment of the proposed development under consideration.

The magnitude of effects may be described as follows in Table 10.1 below and Table 10.2 overleaf.

Table 10.1 Criteria for the Assessment of Magnitude of Effects on Landscape Character

Level	Typical criteria
Negligible	Very minor loss or alteration to one or more key developments / features / characteristics of the baseline i.e. pre-development landscape or view, and / or introduction of elements that are not uncharacteristic with the surrounding landscape – approximating the "no change" situation.
Low	Minor loss of / or alteration to one or more key elements / features / characteristics of the baseline i.e. pre-development landscape or view, and / or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving landscape.
Medium	Partial loss of /or alteration to one or more key elements / features / characteristics of the baseline i.e. pre-development landscape or view, and / or introduction of elements that may be prominent but may not necessarily be considered to be substantially uncharacteristic when set within the attributes of the receiving landscape.
High	Total loss of, or major alteration to key elements / features / characteristics of the baseline i.e. pre-development landscape or view, and / or introduction of elements considered as being totally uncharacteristic when set within the attributes of the receiving environment.

Table 10.2 Definition of Magnitude/Degrees of Visual Effects Resulting from the Proposal

Definition of magnitude/degrees of visual effects	Typical criteria
None	No part of the development, or work or activity associated with it, is discernible
Negligible	Only a small part of the proposals is discernible and / or they are at such a distance that they are scarcely appreciated. Consequently they have very little effect on the scene.
Slight	The proposals constitute only a minor component of the wider view, which might be missed by the casual observer or receptor. Awareness of the proposals would not have a marked effect on the overall quality of the scene.
Moderate	The proposals may form a visible and recognisable new element within the overall scene and may be readily noticed by the observer or receptor.
Significant	The proposals form a substantial and immediately apparent part of the scene that affects and changes its overall character.
Severe	The proposals become the dominant feature of the scene to which other elements become subordinate and they significantly affect and change its character.

The potential landscape and visual effects arising form the proposed pedestrian bridge were assessed for the following two stages:

- Construction Stage: Effects arising during the construction period; and
- Operation Stage: Effects arising during normal operation of the proposed bridge.

The duration of effects is defined as:

- **Temporary** (one year or less);
- **Short Term** (one to seven years);
- **Medium Term** (seven to fifteen years);
- **Long Term** (fifteen to sixty years); and,
- **Permanent (**over sixty years).

Guidelines

The following guidelines and documents have determined the methodology, terminology and assessment approach used within this chapter:

- "Advice Notes on Current Practice in the preparation of EIS" (2003), Environmental Protection Agency, Republic of Ireland;
- "Guidelines for Landscape and Visual Assessment", Second Edition (2002), edited by The Landscape Institute and Institute of Environmental Management and Assessment;
- "Landscape and Landscape Assessment; Consultation Draft of Guidelines for Planning Authorities", (2000), DoEHLG;
- Kilkenny County Development Plan 2008-2014;
- Kilkenny City & Environs Development Plan, 2008-2014;
- National Parks and Wildlife Service (NPWS), www.npws.ie;
- Irishtrails, www.irishtrials.ie;
- National Inventory of Architectural Heritage, www.buildingsofireland.ie;
- Department of Arts, Heritage and the Gaeltacht;
- Ordnance Survey Mapping, and,
- Aerial photography.

10.3 The Existing Environment

Landscape Character

The study area is located within the River Nore valley on undulating slopes. The natural landscape character has been invariably transformed into a man-made urban landscape character during the course of centuries since the founding of Kilkenny City.

The east quays of the River Nore are defined by 1 to 3 storey houses with mixed uses as well as a continuous terrace of residential houses north of the proposed bridge location. The overall character is residential complimented by green spaces such as the Linear Park between the River Nore and Michael Street and a small pocket park between John's Quay and Black Lane. The wider area to the east contains cohesive city quarters comprising a variety of house types with a mixed use between residential, community and commercial activities. John's Street Lower and John's Street Upper form hereby one of the main commercial arteries on the east side of Kilkenny City. However, buildings become increasingly residential to the south and north of this artery.

The visual physical fabric along the west quays of the River Nore is dominated by the Diageo Brewery containing large warehouses, silo structures, open yards and the ruins of St. Francis Abbey as well as the warehouse style backside of 'Dunnes Store' Supermarket with an adjacent large car park. Few small scale traditional style 2 and 3 storey houses with commercial premises mark the entrance to John's Bridge Road when turning north from John's Bridge. Kilkenny Castle is the most prominent landmark in views south along the river and visible from both, John's and Green's Bridge. It forms the heart of the city and is the prelude to the medieval core of the city centre, which extends to both sides of High Street, St. Kieran's Street and Parliament Street as well as several lanes and alleys emerging form these main roads in mainly south-western and north-eastern directions.

The medieval city centre contains a dense and mostly architecturally harmonising building pattern, which is bordered by a warehouse style supermarket and the Diageo Brewery to the northeast. Vertical landmarks comprise mainly the bell towers of St. Mary's Cathedral, St. Mary's Church and the lantern clock tower of the Tholsel as well as St. Canice's Cathedral & Round Tower.

Designations / Planning Policies

Policies and objectives are defined in the Kilkenny County Development Plan 2008-2014 and in the Kilkenny City and Environs Development Plan 2008-2014. The proposed bridge development falls within the area covered by the Kilkenny City Centre Local Area Plan. The following relevant designations have been identified within the study area:

Zoning Objectives

The overall study area comprises the following mixture of different zones according to Kilkenny City & Environs Development Plan 2008-2014:

- General Business;
- Recreation, Amenity and Open Space;
- Community Facilities;
- Residential;
- Industrial/Warehousing, and,
- The proposed bridge will be connecting a 'General Business' Zone in the west with a 'Community Zone' in the east which is located between a Residential (Low Density) and a General Business Zone.

Views and Prospects

The River Nore is an important feature in the texture of Kilkenny City and forms a key visual axis between the existing historic John's Bridge and Green's Bridge and sets the scene for Kilkenny Castle located above its walled banks south of John's Bridge. However, **Kilkenny County Development Plan 2008-2014** does not list any protected views and prospects within the study area.

Kilkenny City and Environs Development Plan 2008-2014 identified 13 important views and states that "*There are a number of sites, areas and vantage points within the City and in the Environs, from which fine views of the City can be had. … Of particular importance are views of and from the Castle, Cathedrals and the River Nore*." The Development Plan also states the following relevant policies:

Policy H9 "*To protect views and prospects identified … by requiring new development or extensions to existing development to be designed and located so as to minimise the interruption of view.*"

Policy H11 "*Where the Council believes development has the potential to either diminish or enhance significant views into and/or out of the city and environs, it may require that a visual impact assessment be carried out prior to development being undertaken on any site.*"

Five relevant views lie within the study area (see Figure 10.1 contained in Appendix C) and are listed below:

- View (north) of River Nore and Linear Park from Green's Bridge (3)

- View from Michael Street to Kilkenny Castle (4)
- View of St. Mary's Cathedral, Tholsel and St. Mary's Church from no. 30-35 Michael Street (5)
- View of Castle Park, open countryside from Castle (8)
- View of Kilkenny Castle from John's Bridge (12)

Kilkenny City Local Area Plan states in its Urban Design Framework for Bateman's Quay to protect views of Kilkenny Castle from the north of the site.

Protected Trees
The Kilkenny City and Environs Development Plan 2008-2014 states that there is one Tree Preservation Order (TPO) within the study area, in Castle Gardens (TPO 1/2006). Appendix F of the same document states that the following trees are worthy of protection close/adjacent to the proposed location of the bridge:

- Register No. 454 - John's Quay Green, John's Quay - 22 Sycamore

Areas designated for Ecological Importance – Natura 2000 sites
As set out in Chapter 6.0, there are two Natura 200 sites located within the study area, namely, the River Barrow and River Nore SAC and the River Nore SPA. While these designations are primarily concerned with ecological issues, their potential amenity value warrants assessment in terms of landscape value.

Urban Design Framework
The Urban Design Framework contained in the Kilkenny City Local Area Plan indicates a proposed pedestrian link between John's Quay and Bateman's Quay in the area of the proposed bridge location as part of an overall re-development plan of the Bateman's Quay area. It also proposes the establishment of a river side walk along the western embankment towards Green's Bridge and the upgrade and enhancement of facilities surrounding the Kilkenny City Library.

Nature of existing views
The River Nore valley defines the sloping character of Kilkenny City. The density of building structures in the city centre restricts views to the River Nore from many locations within the study area. The majority of open views of the river can be experienced from Green's Bridge and John's Bridge, along the quays and from the northern side of Kilkenny Castle & Gardens when looking northwest along the River Nore or from publicly accessible elevated points for example the viewing platform of the Round Tower adjacent to St. Canice's Cathedral.

The existing John's Bridge connects the eastern and western part of the inner city, while Green's Bridge further upstream is located at the periphery of the inner city. Kilkenny Castle is a prominent key feature in views south from both bridges.

The main built focus points in views to the northwest from John's Bridge are the back of Dunnes Supermarket including the car park, the Diageo Brewery, the bell tower top of St. Mary's Cathedral and the Round Tower adjacent to St. Canice's Cathedral.

Key features in views south and southeast from Green's Bridge comprise Kilkenny Castle in the background and the Linear Park along the eastern river side. The Diageo Brewery together with the ruins of St. Francis Abbey defines the western river banks. St Canice's Cathedral & Round Tower as well as the Cathedral of St. Mary form main landmarks in the

south-western and western city skyline in the middle distance and background. The visibility of John's Bridge from Green's Bridge is limited to the east side of the bridge due the bend in the river and intervening vegetation at the Diageo site.

10.4 Potential Impacts of the Proposed Pedestrian Bridge

Introduction
The section identifies and describes the magnitude and location where visual effects occur. The assessment allows the consenting authority to determine whether all reasonable efforts have been made to minimise adverse visual effects and whether the residual effects comply with development policies anticipated for the affected area.

Location of proposed development
The proposed pedestrian bridge crossing the River Nore will be situated in the urban centre of Kilkenny between John's Bridge and Green's Bridge, east of the existing 'Dunnes Stores' Supermarket car park and southeast of the Diageo Brewery site connecting Bateman's Quay in the west with John's Quay in the east.

Visual Effects
The scale and location of the proposed bridge has the potential to have effects over a limited area, mainly affecting neighbouring areas along the river banks between Green's Bridge and John's Bridge.

The majority of open views will be experienced from the following locations:

- John's Bridge, in views to the north;
- John's Quay, in views to the north;
- Bateman's Quay including car park, in views to the northeast, east and southeast;
- John's Quay, in views to the northwest, west, and southwest including from the pedestrianised areas along the River Nore within the Linear Park;
- Eastern section of Green's Bridge in views southeast;
- Elevated sections of the Linear Park where vegetation is low;
- Sections of Michael Street looking southwest;
- Lookout within the northern side of Kilkenny Castle Gardens;
- North, north-western facing windows of Kilkenny Castle; and
- A range of properties facing the River Nore and which are located along the streets listed above.

Intermittent views of the proposed development are limited due to the density of building structures and intervening vegetation within Kilkenny City Centre.

Views from publicly accessible elevated areas are currently limited and comprise the viewing platform on top of the Round Tower adjacent to St. Canice's Cathedral. A section of the western part of the proposed bridge will be visible in views to the southeast. The remainder of the bridge would be obstructed by intervening buildings belonging to the Diageo Brewery.

The majority of visual effects resulting from open views of the proposed development will be moderate within the wider vicinity. The bridge and its ancillary structures will introduce a new, modern and immediately apparent feature into the urban landscape of Kilkenny City

Centre. The scale, the gentle arch of the double lattice truss structures, colours and materials used will not be visually intrusive. The form is orientated on the shape of John's Bridge further south and materials used in the vicinity.

Views from close distance will result in significant visual impact particularly when seen from John's Quay, where the ramped access and steps will contrast the existing footpath layout. Due to its scale and the absence of tall vertical structures, the bridge will not interfere with important views of Kilkenny Castle, St. Mary's Cathedral and the general cityscape. Overall, the development would not be substantially uncharacteristic when set within the attributes of the receiving wider landscape.

Landscape Effects

The landscape effects are generally considered low. The intensely urban character of the wider study area would not be significantly altered by the proposed development. While medium landscape effects will be experienced when in close proximity of the bridge on the east side of the river, these effects are the result of the level change between the bridge and the existing footpath and the therefore required ramped and stepped access structures. However, medium landscape effects are limited to a localised area and do not extend to the wider surrounding environment.

Assessment of Photomontages

The following three photomontages represent the most relevant open views from selected viewpoints in the vicinity of the proposed development. Larger scale versions of the photomontages overleaf are enclosed in Appendix C.

Photomontage 1 – View north from John's Bridge	
	
Reason for viewpoint selection	This view represents a prominent viewing axis along the River Nore from John's Bridge. The viewpoint is located on the main connection axis between the eastern and western part of the city centre.
Description of view	Open view north along the River Nore, Bateman's Quay to the west and John's Quay to the east. The proposed bridge development will be visible in the middle distance. The existing Diageo Brewery provides the most dominating structures in this view. The industrial character of the western river bank is underlined by the large car park enclosed by Bateman's Quay. The eastern bank along John's Quay is defined by intermittent terraces of houses. The bridge of the proposed Kilkenny Inner Relief Road has also been superimposed and can be seen in the background.
Visual Effects	The proposed double lattice truss steel bridge corresponds in material and colour with the existing cast iron railings running along the western and eastern quay wall and light poles along John's Quay to the east. The bridge will be an immediately apparent element of the scene but it will not change its character due to its colour and dimension. The visual effects are therefore considered to be **Moderate**.
Landscape Effects	The existing character of the area is man-made and defined by a mixed use between industrial/commercial buildings and residential buildings. The banks of the River Nore are walled in this view. The introduction of the new bridge would therefore not be uncharacteristic when set within the attributes of the receiving landscape. The landscape effects are therefore considered **Low.**

Photomontage 2 – View east from car park along Bateman's Quay	
	
Reason for viewpoint selection	View of the proposed western bridge head from Bateman's Quay, which is a highly frequented area by retail customers and tourists using the adjacent car parking facilities as well as by pedestrians walking along the riverside footpath.
Description of view	Open view east of John's Quay with the proposed bridge in the foreground. The pocket Park between John's Quay and Black Mill Street is visible in the background as well as residential houses to the left and right.
Visual Effects	The proposed development will be openly visible in this or similar views in the area due to a lack of enclosure. The bridge will form an immediately apparent and prominent new structure altering the character of the scene. The use of local limestone at the bridge entrance and the anthracite colour of the double lattice truss structures are consistent with stone materials used for the quay walls and cast iron railings in the vicinity. The proposed dimension of the bridge will not obstruct views to the eastern river banks to any great extent. The visual effects are considered **Significant** within close proximity to the bridge and **Moderate** when seen from a wider area in conjunction with the surrounding urban environment.
Landscape Effects	The proposed bridge will be located in a man-made environment and introduces another man-made object, which will partially alter the existing character due to the increase of urban structures traversing the River Nore. However, due to the scale of the development, it will not be uncharacteristic when set within the attributes of the receiving wider landscape. The landscape effects are therefore considered **Low**.

Photomontage 3 – View south, southwest across John's Quay from within the small pocket park connecting to Black Lane	
	
Reason for viewpoint selection	View of the proposed eastern bridge head from the within a pocket park connecting between John's Quay and Black Mill Street. This is a frequented area by pedestrians and an important axis between the quays and residential development further east. The view illustrates also the effects of the development on views of St. Mary's Cathedral.
Description of view	Open view west of Bateman's Quay and the adjacent car park in the middle distance and the medieval centre of Kilkenny City including St. Mary's Cathedral in the background. The view contains an entirely urban landscape.
Visual Effects	The bridge and the bridgehead with its ramps and steps will form an immediately apparent element in this view and alter the view across the river due to their scale and mass, resulting in a visually less pleasing structure than the western bridgehead. However, the prominent and sturdy architecture of the bell tower of St. Mary's Cathedral as well as parts of the lower building structures of Kilkenny City centre will not be obstructed by the development. The colour of stone materials and railings will be consisting with existing materials used in the vicinity. The visual effects are considered **Significant** within a localised area.
Landscape Effects	As described in Photomontage 2, the proposed bridge will be located in a man-made environment and introduces another man-made object into an urban area. The contrasting shape of the bridgehead will alter the appearance and character of the scene in the foreground on a localised scale but will have little impact on the wider character of the surrounding area. The landscape effects are therefore considered **Medium**.

Effects on Views and Prospects
Effects on relevant views within the study area as stated in the Kilkenny City and Environs Development Plan 2008-2014 are detailed below.

View (north) of River Nore and Linear Park from Green's Bridge (3)
There will be no landscape and visual effects due to the orientation of the view away from the proposed development.

View from Michael Street to Kilkenny Castle (4)
The proposed development will not obstruct views of Kilkenny Castle due to its scale and location on lower ground.

View of St. Mary's Cathedral, Tholsel and St. Mary's Church from no. 30-35 Michael Street (5)
The proposed development will not obstruct views of the above listed building structures due to its scale and location on lower ground.

View of Castle Park, open countryside from Castle (8)
There will be no landscape and visual effects due to the orientation of the view away from the proposed development.

View of Kilkenny Castle from John's Bridge (12)
There will be no landscape and visual effects due to the orientation of the view away from the proposed development.

Effects on views to be protected as stated in Kilkenny City Local Area Plan - Urban Design Framework are described below.

Bateman's Quay - Protect views of Kilkenny Castle from the north of the site.
The proposed development will be visible in views of Kilkenny Castle but it will not obstruct views due to its scale and location.

Effects on Protected Trees
There will be no impact on protected trees and trees worthy of protection. The proposed development will therefore not result in landscape and visual effects due to alterations or removal of these trees.

Effects on the River Channel
The proposed bridge will be located within an area of walled river embankments and will traverse both designations. The development would result in low landscape effects due to the existing urban character of the surrounding area. Visual effects are considered slight to moderate as the bridge will not alter the width of the current canalised river bed.

Construction Phase
The construction of the bridge structures will be undertaken in a number of stages over a 16 week period as described in Chapter 2.0. The landscape and visual effects arising from the construction phase are considered moderate to substantial, and will be temporary in nature.

Vegetation Removal or Pruning
The minimum amount of trees will be removed to accommodate the construction of the bridge with its foundations and the relocation of services. This would result in moderate

visual effects on a localised scale and confined to areas in the immediate vicinity of the proposed bridge on both sides of the river. Removed trees will be replanted with native species where possible resulting in no long term impacts.

Machinery
The machinery proposed for use during the construction stage includes a crane, excavators, trucks and piling rig etc. The machinery required will have temporary moderate to significant landscape and visual effects.

Effects during the Operational Phase
Low level lighting will be used on the proposed pedestrian bridge while only discrete lighting will be installed beneath the bridge structure. The lighting during the hours of darkness will draw some attention to the bridge but will result in low landscape effects and moderate visual effects.

10.5 Mitigation Measures
The following mitigation guidelines were taken into account at the initial design stage and have been followed through in the design and location of the preferred bridge development:

10.5.1 Location, Scale and Material of the Proposed Development
- Avoidance of locating the proposed development where there was a specific conflict with a view or amenity;
- Avoidance of a conflict with developments such as housing schemes and amenity areas;
- Minimising the height and scale of the bridge and associated access ramps and steps in order to retain the following existing views:
    - South along the River Nore and of Kilkenny Castle;
    - West of St. Mary's Cathedral;
    - The medieval city centre;
    - East of Kilkenny City Library, and,
    - From residential properties in the vicinity of the bridge.
- Use stone cladding, surfaces and colours for double lattice truss steel structures which are local to the area in scale and design helping to integrate the proposed bridge into its environment.

10.5.2 Construction Mitigation Measures
- Minimising the area to be taken for the construction to the absolute minimum;
- Minimising site lighting to the required safe operation of the works. Lighting to be used will be directed towards the work and horizontal cut-off light fittings will be used to prevent light spill outside the working area, and,
- Avoidance of site compounds impacting on areas outside bridge construction area, especially when in the vicinity of the pocket park on John's Quay and along residential and commercial properties.

10.5.3 Vegetation
- Minimising removal of existing adjacent vegetation and damage to retained vegetation during the construction phase in particular avoidance of damage to trees located in the nearby pocket park;
- Minimising pruning or removal of road side vegetation during relocation of services prior to the construction of the bridge, and,

- Replacement of damaged or removed trees and shrubs with native species were required thus assisting in the integration of the proposed development into its environment.

10.6 Residual Impacts

The proposed development will be a permanent and distinctive part of the infrastructure of Kilkenny City. Adherence to the mitigation measures to reduce the identified landscape and visual effects will ensure that the residual impacts associated with the proposed pedestrian bridge will be generally low to moderate. Landscape and Visual effects will gradually reduce further with the establishment, familiarity and use of the bridge by visual receptors. The proposed bridge will also open up new views along the River Nore, south towards John's Bridge and Kilkenny Castle, west to St. Mary's Cathedral and north of the proposed Kilkenny Inner Relief Bridge and Green's Bridge.

10.7 Interaction and Inter-relationships with other Environmental Effects

This chapter should be read in conjunction with Chapter 5 – Human Beings-Socio Economic, Chapter 6.0 – Flora and Fauna, Chapter 11.0 Cultural Heritage for a full understanding of the main interactions between these environmental topics.

10.8 Monitoring

Not applicable

10.9 Reinstatement

Not applicable

10.10 Difficulties Encountered in Compiling this Information

No difficulties were encountered.

11.0 Cultural Heritage

11.1 Introduction

This chapter of the EIR describes the receiving environment in terms of cultural heritage, the study assessment methodology used and the potential impact of the proposed development on cultural heritage which includes: archaeological heritage; architectural heritage, industrial archaeology and underwater archaeology. In addition the mitigation measures proposed to ameliorate any adverse impacts are presented. Figures 1 and 2 referred to here are contained in Appendix D.

11.2 Assessment Methodology

11.2.1 Archaeological Heritage, Architectural Heritage, Industrial Archaeology

The study and assessment methodology consisted of a desk study. The following paragraphs set out the elements of each of these stages in more detail.

Desk Based Study

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

The Record of Monuments & Places (RMP) is a list of archaeological sites known to the National Monuments Service, of the Department of the Environment, Heritage and Local Government. Accompanying RMP Maps based on OS 6" Sheets indicate the location of each recorded site. This RMP list is based on the earlier Sites and Monuments Record (SMR) files housed in the National Monuments Services offices. The SMR was derived from cartographic, documentary and aerial photographic sources, revised through fieldwork and forms the basis of the statutory RMP. The record is updated on a constant basis and focuses on monuments that predate AD1700. Excavations that took place within the study area up to 2008 are included in this assessment. Information on excavations that have taken place since 2008 is not currently (September 2010) on public record, but has been made available in this instance by the Department of the DAHG.

Register of Historic Monuments

The Register of Historic Monuments was established under Section 1 of the National Monuments (Amendment) Act 1987. The term 'historic monument' is defined in the National Monuments (Amendment) Act 1987 as, *'a prehistoric monument and any monument associated with the commercial, cultural, economic, industrial, military, religious or social history of the place where it is situated or of the country and also includes all monuments in existence before 1700AD or such later date as the Minister may appoint by regulations'.* As a result of this Act, it is unlawful to carry out work on a Registered Monument, except in a case of urgent necessity and with the consent of the DAHG. Written consent for any development on such a site must be sought.

National Museum of Ireland's Topographical Files

The topographical files are the national archive of all known antiquities recorded by the National Museum. These files relate primarily to artefacts but also include references to monuments and contain a unique archive of records of previous archaeological excavations. The Museum's files present a catalogue of objects reported to that institution. The find-spots of artefacts can also be an important indication of the archaeological potential of the related or surrounding area. A full list of artefacts discovered in the locality is included in Appendix D.

Kilkenny City and Environs Development Plan
Each local authority Development Plan is compiled in accordance with the requirements of the Local Government (Planning and Development) Acts (1963-2000) and is an important source for identifying protected sites and structures. The *Kilkenny County Development Plan 2008-2014*, and the *Kilkenny City and Environs Development Plan 2008-2014* were consulted as part of this assessment.

National Inventory of Architectural Heritage
The purpose of the National Inventory of Architectural Heritage (NIAH) is 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 the Environment, Heritage and Local Government to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS).

Literary Sources
Literary sources are a valuable means of completing the written archaeological and architectural record of an area and gaining insight into the history of the receiving environment. The various sources consulted are listed in Appendix D.

Cartographic Sources
A wide range of maps were consulted, from the 17th century Down Survey, to Ordnance Survey and Estate maps dating from the mid-19th century onwards. A full list of consulted cartographic sources is provided in Appendix D.

11.3 The Existing Environment

11.3.1 Location & Topography
The proposed development is situated in Kilkenny City. The townlands which will be affected include Gardens (St. Mary's Parish) and Gardens (St. John's Parish). The development straddles the River Nore and is situated in the City centre, within the centre of a small plain, the ancient *Mag Roigne*, which forms the fertile heartland of Co. Kilkenny.

The proposed development crosses the River Nore between Bateman Quay and John's Quay.

11.3.2 Archaeological & Historical Background
Kilkenny, the principal town of County Kilkenny, is situated on the confluence of the River Breagagh and River Nore. This location has been of paramount importance to the development of the town, which received its first charter in the 13th century. Two separate derivations have been suggested for the name of the City, the Church of St. Canice, "or the wooded head or hill near the river." Kilkenny originated in the 5th or 6th century as an Early Christian settlement. The first church was St. Patrick's – represented today by a D-shaped graveyard in Patrick Street. By the 7th century, however, the influence of this church was eclipsed by the new church of St. Canice at the northern side of the present day City.

It is likely that St. Canice's followers or disciples introduced his cult to the area. Canice's principal church was at Aghaboe in Co. Laois. Both Aghaboe and Kilkenny were within the territory of an ancient people known as the Osraige ('Deer People'). During the 6th and 7th centuries the tribal grouping that controlled Aghaboe, who became known as Mac Gilla Pátraic or FitzPatrick, expanded their power to Kilkenny and founded a monastery there. In subsequent years a town developed around the monastery. Remains of this monastic period may be identified in the presence of the round tower and the evidence of a previous

Romanesque Cathedral. It has also been suggested that the alignment of Vicar Street, St. Canice's Place, Dean Street and Thomas Street represents an early Christian enclosure surrounding St. Canice's.

After the Norman invasion of 1169, Strongbow established a camp outside the precincts of the Monastery, on the southern bank of the River Breagagh. This fortification was later to form the nucleus for the development of the City of Kilkenny. In 1173, Donald O'Brien forced Strongbow to retreat to Waterford. This was only a temporary setback for the Normans. In 1189, William Marshall came into possession of Strongbow's Leinster lands by marrying Strongbow's daughter. William Marshall was subsequently appointed to the Chief Governorship of Ireland. Through this appointment, Kilkenny was to become one of the most important political towns in Ireland in the medieval period. Marshall began building a castle in Kilkenny in 1195. This became the focal point for Kilkenny Hightown. The original town around the Monastery became known as Irishtown. The principal market place in Irishtown was at the junction of Irishtown and St. Canice's Place where weekly markets were held from at least as early as 1245.

Irishtown and Hightown had different municipal authorities. Irishtown was governed by the Bishops of Ossory, while Kilkenny Hightown was controlled by Marshall. In 1207, Kilkenny received its first charter, which protected its trading rights. During the early part of the 13th century, the town grew dramatically; three monasteries including the Black Abbey were built, as were the Cathedral and a parish church. Throughout the 13th and 14th centuries Kilkenny was one of the major centres of political power, with at least three great councils of nobility assembling there and seven parliaments. The parliament of 1367 decided to enact laws prohibiting intermarriage between the Anglo-Norman population and the Gaelic population. These laws were to become known as the Statutes of Kilkenny.

The medieval suburb of St John's, grew up around St John's Priory, founded by William Marshall, earl of Pembroke and lord of Leinster, who was responsible between 1192 and 1219 for the re-organisation and expansion of Kilkenny and it was probably he who promoted the development of the suburb. William Marshal founded the priory for the Cannons Regular of St Augustine (also called the Brethren of the Hospital of St John). The monks' first foundation, near John's Bridge, continued in use until 1325, when it moved to its present location at the eastern end of the suburb. The suburb was linked to the Hightown via John's bridge which was in place from perhaps as early as c.1202. John Street is the central axis from which the suburb was laid out. This continued into the Tudor period, when large stone houses were built. With the redevelopment of the street over the past 400 years many of these buildings have been removed or altered. However, no.s 78–81, the seventeenth-century residence of a branch of the Fitzgeralds and Shees, survives, as well as no.s 88–9.

Kilkenny prospered as a result of its political involvement. In 1391, James Butler, the third Earl of Ormond bought the Castle and it became the principal seat of the Butlers of Kilkenny. The Butlers were an old Anglo-Norman family who had many links to the King and his family. In 1399, Richard II stayed at the castle for two weeks. This link between the Butlers and the King was to prove beneficial to Kilkenny. In 1419, they received a grant of tolls for murage. The commonage, *i.e*. the land held in common by the burgesses of the town, stretched for two miles outside the town walls. Its use was strictly controlled. Digging was prohibited and tenants were required to keep the land 'playne and grene' so that it could be used for shooting and archery by the townspeople[31]. Grain-growing and

[31] BRADLEY, J., 2000, *Historic Towns Atlas: Kilkenny,* Royal Irish Academy, Dublin.

flour-milling constituted an important part of the medieval economy of Kilkenny and its hinterland.

During the 16th century, Henry VIII dissolved the monasteries and granted Blackfriars to the Corporation of Kilkenny, on condition that they provide accommodation to the Chief Governor. Towards the end of the 16th century, both municipalities in Kilkenny, Kilkenny Hightown and Irishtown, became a single municipal entity. Subsequently in 1690, James I made Kilkenny a free City.

The Confederation of Kilkenny was the title given to the alliance between the native Irish nobility and the Catholic Anglo-Irish lords of the Pale in support of Charles I against the Parliamentarians. The years of the Confederacy were to give Kilkenny enormous prosperity and wealth and it ended unable to come to an agreement, with one faction supporting the Papal Nuncios position of war and the other faction suing for peace. In the aftermath of the collapse of the Confederacy, Kilkenny began to decline in both economic and political powers. This process was further exacerbated by Cromwell's siege of 1650, when the City was ravaged by plague and was only able to put up a limited resistance. Due to the City's involvement with the Confederacy, much of the property was confiscated. On the restoration of Charles II in 1660, some of the property was returned to the citizens.

The late 16th and early 17th centuries had proven to be a time of relative prosperity with an accompanying phase of building. Several of the surviving merchant houses of Kilkenny, such as Rothe House, were built during this period. Economic development during the 16th and 17th centuries was based on Kilkenny's rich agricultural hinterland, and principally upon cattle and grain production. Industrial use of the River Nore and Breagagh River intensified with the construction of several new mills and the development of a brewing industry. Concerted efforts to introduce the linen industry were ultimately unsuccessful given the lack of incentive to grow flax on land where corn flourished.

During the 18th and 19th centuries, Kilkenny remained a large provincial town but did not expand to a large extent. Kilkenny was never to regain the prestige or power that it had experienced during the medieval and later medieval periods. However, the industrial use of the River Nore and River Breagagh continued with the construction of several new mills, the introduction of new treatments for textiles and the development of a brewing industry in the 17th and 18th centuries.

11.3.3 Toponomy

The study area is within the Borough of Kilkenny, which lie on either side of the River Nore. The placename Kilkenny is taken from the Irish *Cill Chainnigh* meaning 'Church [or cell] of [Staint] Canice. Townland names are a valuable source of information on cultural elements of a landscape, including its history, archaeology and folklore. They may also reflect the topography of the environment, land use and ownership. The development lies within the townland of Gardens (St. Mary's Parish/St. John's Parish), reflecting the Anglo-Norman heritage of the City.

11.3.4 Conservation Designations Associated with the Area

A number of zones of architectural and archaeological potential have been identified by Kilkenny County Council in and around Kilkenny City. Three of these, Kilkenny City Centre Conservation Area, Michael Street Conservation Area and John Street Conservation Area will be indirectly affected by the proposed development (See Figure 1 contained in Appendix D). Within an architectural conservation area, planning permission is required for all works affecting the exterior of a building. The preservation of architectural conservation areas is a mandatory function of all Local Authorities.

In addition, the *Kilkenny Development Plan 2008-2014* outlines an Area of Archaeological Potential which closely follows the Record of Monuments and Places outline of the Historic City, RMP ref. KK019-026. As this development proposal lies within a Zone of Archaeological Potential, it was referred to the DAHG for review and recommendation, but no comment was received in relation to Cultural Heritage. These zones and conservation areas are illustrated on Figure 1 contained in Appendix D.

11.3.5 Route Narrative

This section of the report provides a description of the archaeological, architectural and cultural heritage sites in the vicinity of the proposed development. The development commences at Bateman Quay, on the right bank of the River Nore, spanning the river and terminating at John's Quay, on the left bank. Figure 2 contained in Appendix D illustrates the location of all sites described below.

Medieval Walled Town

The proposed bridge is located within the confines of the Zone of Archaeological Potential for the historic town, site **A1** (RMP KK019-026; see Figure 2 in Appendix D) as outlined by the National Monument Section of the Department of Arts, Heritage and the Gaeltacht and Kilkenny County Council. The historical limits of the medieval Kilkenny comprised 'High Town' or 'English Town', located on the right bank of the River Nore extending from Kilkenny Castle to the River Breagagh, on an axial street pattern comprising High Street / Parliament Street, with a branch St. Kieran's Street, and burgage garden plots extending to the river front, perpendicular to the street pattern. The limits of the Zone of Archaeological Potential also include the small medieval suburb of St. John's, on the east bank of the River Nore, extending as far as John's Green and John Street Upper. The proposed bridge lies directly within the Zone of Archaeological Potential for the historic town and will have a direct impact, should archaeological material be uncovered.

Bateman Quay (New Quay)

Bateman Quay is a 20th-century amalgamation of a series of perpendicular garden plots, probably representing medieval burgage plots of houses fronting St. Kieran's Street and Parliament Street, within the medieval town of High Town, site **A1**. There is however, no historical or archaeological evidence for a medieval quay in Kilkenny along the riverfront. The area is depicted as undeveloped on the Down Survey map, 1655, and the pictorial view of Kilkenny City by Henry Pratt, 1708.

By the early 19th century most of the houses fronting St. Kieran's Street had formal garden with plots extending to the riverfront. A series of associated Pleasure Houses, stone jetty's and limestone garden walls at the river edge are depicted on the early Ordnance Survey maps, site **IA1**. Five separate examples were fully-surveyed, and five were archaeologically excavated in 2001, as part of the River Nore Drainage Scheme. Two unaccompanied riverside jetties were also excavated for the same scheme. All sites were post-medieval / early modern in date, with residual or re-used artefactual evidence dating the medieval and later medieval period. The site of a lime yard is also recorded at Bateman Quay (north

end), opened in 1882. The proposed bridge lies directly within the area of archaeological and cultural heritage potential for the post-medieval / early modern riverfront along the length of Bateman Quay.

Of the recorded Pleasure House sites, two survive as upstanding buildings today, one is a restored single-storey 'Tea House', site **AH4** located 70m north of the proposed bridge, and the second is a ruinous two-storey gazebo, 110m north of the proposed bridge. The former probably originated as a toll house for the New Quay. The National Architectural Inventory describes the site as a detached two-bay single-storey rubble stone Gothic-style tea house, c.1800, with square-headed cut-away corner porch to left. This building was restored in 1993, to accommodate commercial use but is now disused. The proposed bridge will have no direct impact on this building.

A 'New Quay' is located 85-90m from the proposed bridge site, site **A2**, at the junction of Parliament Street, St Kieran's Street and High Street. This is clearly marked on Rocque's map of 1758 extending from High Street/St Kieran's Street to the riverbank. The earliest reference to a quay at this location is in 1615, when a New Quay was built to link the river to the fish market. The New Quay is depicted on Rocque's map 1758 as a long linear road extending from Parliament Street to the river. The Quay is shown in greater detail on the 1st edition 1842 and 1872 Ordnance survey maps, and includes a weigh bridge and Toll House (later converted to a Tea House, site AH4, see above).

The Fish Market or 'Shambles' is also the site of an early pre-Norman church site, located 140m from the proposed bridge, site **A3** (RMP ref.: KK019-0260112). The Shambles was first mentioned in the 17th century-grant for a fish market on the now-vacant plot. First mentioned in 1615 and again in 1807, it is shown in detail on the 1st edition Ordnance Survey, 1842.

St. Kieran's Street

St Kieran's Street, formerly known as Back Lane, formed a north–south artery within the medieval town of Kilkenny. This medieval street formerly marked the limits of the flood plain of the river, extending from Parliament Street at the Shambles, to Rose Inn Street. It contains a number of buildings with preserved or recorded earlier medieval or late medieval (Tudor) fabric, In the 13th century, the street was bounded on the west by an elevated ridge, crowned by St Mary's Church and graveyard. Adjacent to the Shambles site are several buildings of archaeological or architectural significance.

Kytler's Inn, no. 25 – 26 St. Kieran's Street (formerly no.s 17 & 18 King Street), is located 140m from the proposed bridge development, site **A4** (RMP KK019-026111). However, the proposed bridge abutment is located within the former garden plot for this property. Excavation of the associated 18th century Pleasure house, stone jetty, and rubble boundary walls, associated with the gardens of Kytler's Inn revealed medieval cut stone similar to that still present in the northern courtyard wall. The proposed bridge will have no direct impact on this site. The building complex, site **AH5**, is a large lime-rubble house and square courtyard, built c.1275, probably originally detached with single-bay single-storey return to east. This was subsequently in use as an inn post-1449, and extensively reconstructed, c.1625.

To the north of the Shambles and Kytler's Inn, no. 27 St. Kieran's Street is a building, containing pre-1700 architectural fabric in the south gable, located 140m from the proposed development, site **A5**.

Two other (former) buildings are located 80–90m from the proposed development site, site **A6.** These buildings, demolished for Dunnes Stores in 1993, also contained pre-1700 architectural fabric, including a stone fireplace and chimney. The proposed bridge will have no direct impact on this site.

Kilkenny Courthouse
Fronting Parliament Street and bounding the northwestern limit of Bateman Quay is the site of the medieval Grace's Castle, and the Gaols, located 120-170m from the proposed development, site **A7**. The area to the rear of this standing buildings complex was excavated in 2007/2008, for the redevelopment of a new Court House at fronting Market Yard & Bateman Quay. Excavation revealed substantial deposits, features and artefacts dating back to the medieval period. The proposed bridge will have no direct impact on this site. The court house building is a protected structure, built in the late 18th century, the Neoclassical building is of national significance, site **AH6**.

St Francis Abbey Brewery
The earliest foundation of medieval town of Kilkenny originally extended as far as Bateman Quay, but was later extended in 1208, to the north as far as the River Breagagh. Within these newly acquired lands, the medieval St Francis' Abbey was founded 1231-4 by Richard Marshall, third earl of Pembroke. The abbey is situated within the grounds of the Diageo St. Francis Abbey brewery, which covers an area between the Rivers Breagagh and Nore, Horse Barrack Lane and Bateman Quay. To the south, medieval deposits were uncovered in excavations within the grounds of the brewery, adjacent area to Bateman Quay, and located 130m from the proposed bridge development, site **A8**.

River Nore
The proposed development site spans the River Nore, site **RC1**, which was subject of intensive archaeological underwater investigation and archaeological monitoring and an intensive finds recovery programme, between 2000–2003 for the River Nore (Kilkenny City) Drainage Scheme. During archaeological testing and monitoring, retrieved approximately 4000 artefacts, including a small quantity of Mesolithic flint, medieval and post-medieval ceramics, metal and glass objects, (including daggers, a rifle, dueling pistols, various live ordnance) and a significant assemblage of cut-stone grave slabs and architectural fragments.

St. John's Suburb
The Zone of Archaeological Potential, site **A1** includes the River Nore and part of the left (east) bank and includes the adjacent medieval walled-suburb of St. John's on the left bank, located 30-40m from the proposed eastern bridge abutment, site **A9** (RMP 019-026001). The medieval suburb of St. John's is located on the left / eastern bank of the River Nore, centred on John Street, extending from an inner gate on John's Bridge, to the outer gate mid-way along John Street. The defences of the suburb are no-longer extant except in isolated places along Maudlin Street and the rear of John Street Lower, elsewhere the line of the defences is believed to follow the lines of Michael Street /Back Lane extending to the River Nore (to the north), and extending from a mural tower at Maudlin Street to the Rover Nore through College park (to the south). The medieval defensive wall and fosse, lies adjacent to the proposed development which indirectly impacts upon the (supposed) location of the town wall. However, despite excavations within the locality, the precise location of this part of the defensive circuit remains uncertain and may, in fact, lie further to the southeast along the southern perimeter of the Carnegie car park.

The medieval suburb of St. John's was founded around 1211, for the Augustinian priory of St. John the Evangelist, by William Marshall. At the heart of the suburb, is the upstanding ruins of the nave and chancel of St. John's church, site **A10** (RMP 019-026068). Archaeological testing within the grounds of Evan's Home, to the east of the ruined church, revealed evidence of the earlier barracks building partially truncated earlier medieval fabric associated with the medieval priory complex, which may share the limits of the precinct with the later barracks.

The Augustinian monk's also constructed a watermill at the priory in the 12th century (location unknown), possibly at the site of an upstanding building, containing pre-1700 dwelling, known as the 'Priory Court' gate lodge, located 70m from the proposed development, site **A11** (RMP 019-0260024; RPS Ref.: B4).

The medieval Augustinian watermill was powered by a long linear mill-stream, commencing at Greens Bridge Weir extending under John's Street (UAS-4c:14) and terminating at Maudlin Mills (UAS-4c:18), passing with 40m of the proposed development site, site **A12** (RMP 019-026077). The line of this mill-stream passes close to the proposed bridge abutment.

John's Quay

John's Quay was first opened in 1764, labelled Mayor's Walk (1842 to 1880) and extended to the north in 1851. A ferry ran from New Quay to John's Quay, from 1857. Two slips are recorded in the 17th century at an unknown location near John's Street, however, no quay is depicted on the Down Survey Map of 1655, Henry Pratt's *View of Kilkenny City,* c. 1708, or Lt. J. Rocque's map of 1758, where the area is shown as an undeveloped flood plain. Excavations as part of the River Nore (Kilkenny City) Drainage Scheme, revealed a pathway to the water's edge, 120m north of proposed development (Figure 2). with post-and-wattle fence and a rows of stakes. Artefacts included 18th–20th-century pottery and glass. The proposed eastern bridge abutment, on the left (east) bank of the River Nore, is located at the northern end of John's Quay, site **IA2**.

Carnegie Library building, on John's Quay is located 45m south of the proposed development, site **AH1**. This protected structure (RPS Ref. B113) was opened in 1910 as an Andrew Carnegie free-library. It is a detached three-bay, single-storey classical-style, including an elegant bowed portico surmounted by a cupola or turret and finely-detailed dressings to the window openings. It is described in the NIAH as forming a distinctive landmark in the streetscape, and presents a positive impression in an historic setting. Parnell Terrace, also on John's Quay, consists of nine two-storey houses divided into one pair of semi-detached and a terrace of seven, located 10-75m from the proposed development, site **AH2**.

11.3.6 Recent Archaeological Finds

Archaeological excavation has taken place across much of the medieval town of Kilkenny and its adjacent areas in recent years. Between 1968 and 2006 this amounted to well over 2000 archaeological investigations, which have been collated with known find spots of artefacts and a range of other information into the Kilkenny Urban Archaeology Database. This shows that the archaeological record stretches from the late Mesolithic period to the 20th century, with the medieval and post-medieval periods being the best represented. Appendix D provides a summary of the thirty-eight investigations which have taken place in the vicinity of the proposed development since 1990. These included testing and monitoring of dredging operations within the River Nore, which yielded prehistoric material as well as late medieval architectural fragments and various artefacts of medieval and later date. Further medieval architectural fragments were found under John's Bridge and at

Bateman Quay. There was evidence of the marshy flood plains of the River Nore being reclaimed from the 13th century, and post-medieval remains such as Pleasure Houses, jetties, and industrial lime-works, slips and toll-houses were found on or close to the River Nore.

11.4 Potential Impacts of the Proposed Pedestrian Bridge

Tables 11.1 to 11.4 below outline the potential impacts on each site of archaeological interest, as well as the mitigation measures required at each affected site.

For the purposes of this study, two impact classifications have been assigned:

- **Direct Impact**: this classification is assigned where sites and their zones of influence are within the limits of the proposed development.

- **Indirect Impact**: this classification is assigned where sites are adjacent to the proposed development and whose setting is potentially compromised.

Table 11.1 Table of Archaeological Sites

Site	Address	Type	Description	Legal Status	Proximity	Impact	Recommendation
A1	Kilkenny City Gardens (St. Mary's Parish)	Historic City	The proposed development is within the historic town and lies inside the Zone of Archaeological Potential, as outlined by DAHG. The extent of KK019-026 also happens to be the approximate extent of the City Centre Conservation Area, as outlined in Kilkenny County Council (Local Area Development Plan 2008-2014). Archaeological potential for burgage plot boundaries, artefacts and associated river-side features.	RMP KK019-026	0m	Direct	1: Controlled trial trenching in vicinity (in conjunction with sites A9. A12, IA1 & IA2) 2: Monitoring of construction 3: Artefact retrieval strategy
A2	Bateman Quay/ Parliament Street	Quay – 17th century	New Quay: earliest reference to a quay at this location is in 1615, constructed to link the river to the fish market, first paved in 1744. Ferry ran from New Quay to John's Quay from 1857.	None	85–90m	None	No ameliorative measures recommended
A3	*Shambles*, St. Kieran's Street	Church (Site)	The Shambles / Fish Market, Kilkenny Corporation granted the lease in 1688 – *waste in St Kieran's well* to William Jackson to build a fish shambles. Site was originally a pre-Norman church site.	RMP KK019-026113	140m	None	No ameliorative measures recommended
A4	*'Kytler's Inn'* No. 25–6, St. Kierans Street, Garden's St Mary's Parish	Medieval House / well / Inn	Attached seven-bay single-storey over part-raised basement rubble stone house with dormer attic, c.1275, probably originally detached with single-bay single-storey return to east. Subsequently in use as inn, post-1449. Extensively reconstructed, c.1625. [Related to 18/19th Century Pleasure House, NOR-9 excavated in 2001.	RMP KK019-026111	120m	None	No ameliorative measures recommended
A5	No. 27, St. Kierans	House – 16th/17th	Tall gable of building is of possible 16/17th century date – south gable, 1st floor level with	RMP KK019-026112	140m	None	No ameliorative measures

Site	Address	Type	Description	Legal Status	Proximity	Impact	Recommendation
	Street,	century	chamfered features (UAS ref: 4b-112).				recommended
A6	*'Dunnes Stores'*, No.17 & 17(rear) St. Kieran's Street	Houses – 16th/17th century	Dwelling demolished in 1985 for 'Dunnes Stores', features a number of Tudor features including a massive chimney and dressed stone fireplace (UAS ref. 4b109). Three-storey building of 17th century date, stone door features lintel with four lozenge-shaped (UAS ref: 4b-110).	RMP KK019-026109 & 026110	80–90m	None	No ameliorative measures recommended
A7	*Courthouse,* Parliament Street	Castle (site) Gaols & environs	Site of medieval '*Grace's Castle*', within the site of the later County Gaol. The Courthouse is a protected structure, and site of industrial archaeological significance. A well is located to the rear of the Courthouse building beside the stone stairway marked on the first-edition 6-inch OS map (1837). Castle built by William Le Gros in the 13th century; in 1566, James Grace gave to the corporation for County Gaol. The Courthouse dates from 1786, with substantial remodelling in the early 19th century. The lower part was converted to the City Gaol by 1824, which served as the Bridewell from 1871 to 1946.	RMP KK019-026093	120–170m	None	No ameliorative measures recommended
A8	St Francis Abbey. Smithwicks Brewery	Medieval Abbey & environs	The medieval St Francis' Abbey, founded 1231-4 by Richard Marshall, third earl of Pembroke, is situated within the grounds of the Smithwicks brewery and between the Rivers Breagagh and Nore, Horse Barrack Lane and Bateman Quay. The Abbey is a national monument. Curtillage of the abbey extends as far as the Bateman Quay.	RMP KK019-026 National Monument 72	130-520m	None	No ameliorative measures recommended

Site	Address	Type	Description	Legal Status	Proximity	Impact	Recommendation
			Medieval deposits uncovered in excavations within the adjacent area to Bateman Quay.				
A9	Kilkenny City Gardens (St. John's Parish)	Town Defences	The proposed development lies north of the (lost) line of the medieval Town Wall of St. John's suburb. Precise line of the medieval Town Wall is still uncertain, despite several archaeological excavations with the Carnegie Library car park, Evan's Home, Barrack Lane and Back Lane.	RMP KK019-026001	30–40m	Indirect	Controlled trial trenching in vicinity (in conjunction with Sites A1 & IA2)
A10	John Street Lower	Abbey	Late thirteenth-century St John's Priory founded by William Marshall The Elder (b. pre-1134), first Earl of Pembroke for the Canons Regular of Saint Augustine. Excavation revealed evidence for outer wall of Lady Chapel, floor tiles.	RMP KK019-026068 National Monument 344	125m	None	No ameliorative measures recommended
A11	*Priory Lodge,* Barrack Lane	House – 16th/17th century	Dwelling (possible) – attached two-bay, single-storey gate lodge, built 1825. Gable contains pre-1700 fabric of an earlier building, including a large stone chimney. Recent work by Walsh has identified this masonry as part of the cloisters of the Abbey precinct associated with the Augustinian Priory.	RMP KK019-026024	70m	None	No ameliorative measures recommended
A12	Friarsinch/ Newpark Lower/ Gardens (St John's Parish)/ Collegepark	Mill-stream	12th century mill-stream runs northwest-southeast, from River Nore at a watermill adjacent to Green's Bridge Weir (KK019-0260041/42), via the 'Little Bridge' over John Street to Mauldlin Mills (KK019-0260076). Known as The Lake (1758),The Slip (1842), Mill-stream (1900). Infilled by 1923.	None UAS: 4a/c 77	40m	Indirect	Controlled trial trenching in vicinity (in conjunction with Sites A1 & IA2)

Table 11.2 Table of Architectural Sites

Site	Address	Type	Description	Legal Status	Proximity	Impact	Recommendation
AH1	John's Quay	Library	Carnegie Library is in the immediate vicinity of the proposed bridge. It is a single-storey building with two gables to the front, separated by a projecting porch supported on Doric columns. The central feature is a cupola in the centre of the building.	RPS: B113 NIAH: 12000227	45m	None	No ameliorative measures recommended
AH2	Parnell Terrace	Terrace	Parnell Terrace consists of nine two-storey houses divided into one pair of semi-detached and a terrace of seven. They are gable-ended and are faced with roughcast render, with red brick detailing to the window and door opes.	NIAH: 12000228 & 12000247–12000256	10-75m	None	No ameliorative measures recommended
AH3	John's Quay	Houses	A pair of semi-detached houses at 5 and 6 John's Quay are each two-bay and three-storey, with a gabled, slated roof. The houses have a pedimented double porch to the front.	NIAH: 12000204	80m	None	No ameliorative measures recommended
AH4	Bateman Quay	Toll House	On the river's edge at the rear of Smithwick's Brewery, and at the edge of the former markets there is a small single-storey tea room. Positioned at an angle to the river, the building appears to have been designed to make the best of the view down the river to Kilkenny Castle. Toll house associated with New Quay (A2). Building not shown on Rocques map 1758. Built 1790–1810. Detached two-bay single-storey rubble stone Gothic-style tea house, c.1800. Restored, 1993, now disused. Surveyed in 2002.	NIAH: 12000204	70m	None	No ameliorative measures recommended

Site	Address	Type	Description	Legal Status	Proximity	Impact	Recommendation
AH5	Kyteler's Inn, St .Kieran's Street,	Medieval Inn	Building complex of significance, and includes building fabric from the late 13th century to the present day. It is at a significant distance from the site of the proposed bridge, and its rear faces the river, with a group of later buildings behind the original structure.	RPS: NIAH: 12000116	125m	None	No ameliorative measures recommended
AH6	Parliament Street	Courthouse	On Parliament Street, but backing towards the river, the Kilkenny Courthouse is a late eighteenth century Neoclassical building of national significance.	RPS: B134 NIAH: 12000084	120m	None	No ameliorative measures recommended
AH7	John's Bridge	Bridge	St. John's Bridge is on the site of a bridge that was destroyed in a flood in 1763, and adjacent to the site of the bridge that replaced it. The present bridge (built 1910) is an early example of a reinforced concrete bridge, and at the time of its construction had the greatest span of any such bridge in these islands	RPS: D3 NIAH: 12000229	200m	None	No ameliorative measures recommended
AH8	Green's Bridge	Bridge	Green's Bridge was built in the 1760s to replace an earlier bridge that had been destroyed in a flood. It is one of several bridges on the Nore that were rebuilt at this time in a Palladian style, incorporating elements of classical architecture. The bridge has five arches in the river channel, each with a Gibbsian arch ring and with pedimented aedicules on the faces of the piers.	NIAH: 12002007	500m	None	No ameliorative measures recommended

Site	Address	Type	Description	Legal Status	Proximity	Impact	Recommendation
AH9	Kilkenny Castle	Castle	Kilkenny Castle is a medieval castle with substantial amounts of reconstruction over the centuries, particularly in the 1820s. It stands on a height above the river in a commanding position and presents an imposing backdrop to the view from the proposed bridge past John's Bridge. The photograph above shows the view from the river bank. The proposed bridge would open new vistas, without adverse effect on the character of the castle	NIAH: 12001066 Nat Mon.		None	No ameliorative measures recommended

Table 11.3 Table of Industrial / Cultural Heritage Sites

Site	Address	Type	Description	Legal Status	Proximity	Impact	Recommendation
IA1	Bateman Quay	River front	18/19th century riverside Pleasure Houses & stone/timber jetties, along Bateman Quay. Subject to multiple previous archaeological excavations in 2001-2002 featuring, ashlar masonry walls, stone flag and timber jettys and limestone rubble boundary walls. Artefactual evidence includes 16th century glass, late medieval cut-stone, metal and ceramics.	None – record only	0m	Direct	Controlled trial trenching in vicinity (in conjunction with Site A1)
IA2	John's Quay /Mayor's Walk	Quay	John's Quay, opened in 1764, extended to the north in 1851; labelled Mayor's Walk (1842 to 1880). Two slips are recorded in the 17th century at an unknown location near John's Street, not on Rocque's map of 1758. A ferry ran from New Quay to John's Quay, from 1857. Excavations as part of the River Nore (Kilkenny City) Drainage Scheme, revealed a pathway to the water's edge, 120m north of proposed development (Site A). with post-and-wattle fence and a rows of stakes. Artefacts included 18th–20th-century pottery and glass.	None – record only	0m	Direct	Controlled trial trenching in vicinity (in conjunction with Sites A1, A9, A12)

Table 11.4 River Crossings Affected

Site	Address	Type	Description	Legal Status	Proximity	Impact	Recommendation
RC1	River Nore, Kilkenny	River crossing	River Nore, 20m north of John's Bridge	RMP KK019-026	0m	Indirect (No instream works although the environs and immediate banks will be impacted)	1: Monitoring of construction 2: Artefact retrieval strategy

Summary of Archaeological Impacts
In total, 3 sites of archaeological potential (A1, A9 & A12) have been identified as being affected by the proposed development, one of these impacts is direct (A1), and two are indirect (A9 & A12). A further nine archaeological sites are not impacted by the proposed development (A2, A3, A4, A5, A6, A7, A8, A10 & A11).

The extent of the potential impact on sub-surface archaeological deposits, prior to investigation, is unquantifiable. Recent archaeological investigations in Kilkenny City and other literary sources would suggest that any ground works associated with the proposed bridge development within Kilkenny City will have a potential direct impact on the archaeological heritage of Kilkenny City Centre (A1).

The proposed development will have an indirect impact on the (lost) location of the circuit of the medieval defences for the suburb of St. John (A9), roughly parallel to the River Nore, extending from Peace Park to Carnegie Library Car park. Parts of the town defences in the medieval suburb have been established from cartographic and literary sources and recent limited excavation and assessment.

The proposed development will have an indirect impact on the site of a 12th century mill stream (A12) at John's Quay. The location of the mill stream (back-filled) in this area has been established from cartographic sources and recent limited test-trenching assessment.

Summary of Architectural Heritage Impacts
In total, no sites of architectural heritage have been identified as either being directly or indirectly impacted.

Summary of Impacts on Industrial Archaeology and Cultural Heritage
Two sites of industrial archaeology or cultural heritage significance have been identified. Site IA1, the right bank river frontage, late-medieval quay and post-medieval / early modern jetties, tea houses and walls, which is directly affected, and IA2, the post-medieval quay, slips and river-front which is also directly affected.

Summary of Impacts on Underwater Archaeology within the River Nore
As no in-water construction is proposed for this development, the bridge will span the entire width of the river from two bank-side abutments. Dredging of the River Nore, undertaken in 2002, has resulted in removal of the river gravels which form the surface deposits in this section of the River Nore and therefore no longer appear to retain material of archaeological interest. Previous archaeological testing and monitoring of the river dredging works undertaken as part of the Kilkenny City (River Nore) Drainage Scheme in 2001-2003, demonstrated most of the archaeological and artefactual potential once associated with the river as it flows through the heart of the medieval city has been removed. It is therefore concluded that the proposed bridge will have an indirect impact on the immediate environs and setting of the River Nore but will have no impact on any material deposits or structures of archaeological significance.

11.5 Mitigation Measures
Mitigation measures, both at pre-construction and construction phases, are required to be undertaken in compliance with national policy guidance and statutory provisions for the protection of the archaeological heritage, including National Monuments Acts 1930-2004, Architectural Heritage & Historic Monuments Act 1999, and Local Government (Planning & Development) Act 2000.

Avoidance of Impact
It is firstly recommended that all archaeological sites and their environs be avoided by the proposed development in order to minimise the impact on the archaeology of the study area.

However as avoidance is not possible in all cases, the following recommendations and mitigation measures are made to fully resolve and record the archaeology in advance of construction.

Pre-Construction Phase Mitigation Measures
It is recommended that the following measures be undertaken well in advance of the beginning of the construction phase. This will allow for a satisfactory timeframe in which the mitigation measures can be conducted and the results assessed without causing delays to construction.

Controlled Trial Trenching
Archaeological investigative excavation, in the form of controlled trial trenching is the recommendation made where a known archaeological site / a site or Zone of Archaeological Potential lies close to or within the area proposed for development. The aim of this initial investigation is to determine the nature, extent and significance of any potential archaeology present. Archaeological investigation is recommended in those areas where the footprint of the proposed development impinges on Site A1 (Zone of Archaeological Potential), which includes the areas impacted at sites IA1 and IA2, and in conjunction with areas where the proposed development impinges on the vicinities of Sites A9 and A10. This work will in effect constitute one location on either bank and will be done under license in accordance with Section 26 of the National Monuments Acts 1930, and with a method statement agreed in advance with the National Monuments Service (Department of the Arts, Heritage & Gaeltacht) and the National Museum of Ireland. The results of this investigation will determine whether redesign to allow for preservation *in situ*, full archaeological excavation and/or monitoring are required. The investigation report will include mitigation proposals for dealing with the discovery of archaeological deposits and material during development:

- Where initial investigation has yielded evidence of archaeologically significant material or structures, preservation *in situ* may be recommended. Strategies for the *in situ* preservation of archaeological remains are conducted in consultation with the statutory authority, and may include avoidance, if possible, of the remains during construction, or preservation through redesign.
- Where initial investigation has yielded evidence of archaeologically significant material or structures that cannot be preserved *in situ*, archaeological excavation and recording, to full resolution, is recommended.
- At a minimum it is proposed that all groundworks / soil stripping and demolition are monitored by a suitably qualified archaeologist, with the provision for full excavation of any archaeologically significant material uncovered at this time.

Architectural Survey and Photographic Recording
No architectural sites are directly affected by this scheme. No pre-construction ameliorative measures are recommended.

NB A full measured building survey of site AH4 has already been completed for a previous scheme.

Bankside Inspection

It is recommended that archaeological monitoring of all bank side impacts relating to the insertion of the proposed bridge structure be undertaken in advance of construction works taking place. The archaeological monitoring should be undertaken by a suitably qualified archaeologist with previous experience of riverine archaeology.

Salvage of Architectural Fragments

It is recommended that any architectural fragments from the medieval and post-medieval period, deemed worthy of salvage by the monitoring and/ or investigative archaeologist, be retained for potential reinstatement within appropriately designed development(s) within the City.

Construction Phase Mitigation Measures

Archaeological Monitoring

It is proposed that archaeological monitoring be undertaken during all groundworks and demolition associated with the proposed development, including soil stripping of all ground areas associated with the proposed development and any associated works, drainage works etc., with the provision for full excavation of any archaeologically significant material uncovered at this time. In the event of archaeological features or material being uncovered during the construction phase, it is crucial that machine work cease in this immediate area to allow the archaeologist(s) to inspect, excavate and record any such material. This work will be done under licence in accordance with the National Monuments Acts 1930-2004, and with a method statement agreed in advance with the National Monuments Service (Department of the Environment, Heritage & Local Government) and the National Museum of Ireland.

With regard to underwater archaeology, should excavation and/ or removal of riverbed deposits from un-tested, sections of the river become necessary, it is recommended that archaeological monitoring of any riverbed disturbances be undertaken, with any archaeological material observed at that point resolved fully.

Discovery of Archaeological Material

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

Once established that archaeologically significant material is present, full archaeological excavation and recording of such will take place.

General

Fencing of any areas of archaeological significance will be necessary once discovered and during excavation works. Fencing during construction is also recommended to avoid vibration damage and unintentional physical damage during construction for Site AH2.

No site offices, depots, or storage facilities will be placed on or near any of the selected sites or areas of archaeological potential. Machinery traffic during construction must be restricted so as to avoid any of the selected sites and their environs.

Post Construction Mitigation Measures

Under Irish Law all new artefactual or architectural stone discoveries and materials discovered during the construction of the proposed development are deemed property of the State, and must be lodged with the National Museum of Ireland, following due process or specialist analysis and conservation (if appropriate).

11.6 Residual Impacts

When fully implemented the mitigation measures outlined above will serve to resolve any archaeological issues in accordance with all current guidelines and best practice. The residual impacts of the proposed development are as outlined in Section 11.4.

11.7 Interaction and Inter-relationships with other Environmental Effects

Noise and Vibration: The impact of noise and vibration associated with the construction and operation of the proposed development on cultural heritage is discussed in Chapter 9.0 on Noise and Vibration.

11.8 Monitoring

Monitoring is discussed in Section 11.5 above.

11.9 Reinstatement

The full nature and extent of each site requiring reinstatement will be established at the construction phase in conjunction with the relevant authorities.

11.10 Difficulties Encountered in Compiling this Information

No difficulties were encountered.

12.0 Material Assets

12.1 Introduction

This chapter of the EIR provides a description and assessment of the potential impact of the proposed works on services provided and traffic and parking arrangements. Previously, Chapter 5.0 dealt with the socio-economic impacts of the proposed works on socio-economic aspects which to a certain extent overlaps with Material Assets.

12.2 Assessment Methodology

In order to assess the impact on services consultation was carried out with the main service providers where applicable (refer to section 1.3 consultation). A Survey for Underground Services and Ground Anchors Report carried out by Minerex (September 2012) was also reviewed for this assessment.

12.3 The Existing Environment

12.3.1 Services

Following consultation the following information was obtained for the various utilities near the proposed pedestrian bridge location. Drawings of the services which were provided via direct consultation and by the GES Site Investigation report are contained in Appendix E.

Public Gas services

Bord Gáis do not have any Gas Transmission infrastructure in the vicinity of the proposed bridge location so there will be no impact to these services (refer to Bord Gáis Networks drawing in Appendix E).

ESB

There are a number of ESB ducts within the existing footway on the John's Quay side and LV overhead ESB lines on the opposite side on the John's Quay along the nearby residents (refer to ESB Networks drawing in Appendix E).

Phone and Internet Providers

Vodafone, UPC and BT Ireland have no services located in the vicinity of the proposed pedestrian bridge location so there will be no impact to these services.

There are Eircom services in the area of the proposed Pedestrian Bridge with an underground network on the east side of the river (Library side).

Public Water Mains Supply

A public watermain is located on the east side of the river at the proposed pedestrian bridge location (refer to KCC drawings in Appendix E).

Foul Drain

A pumping station is located on the east side of the river at the proposed pedestrian bridge location (refer to KCC drawings in Appendix E).The underground pumping station is located directly north of the bridge crossing. A survey for Underground Services[32] in the proposed bridge area carried out during 2012 identified four manholes that contain a foul sewer pumping station with foul sewer running to and from this pumping station in two directions (refer to Minerex Geophysics Ltd drawing in Appendix E).

[32] Minerex Geophysics Ltd Report Reference 5631d-005.doc

It is noted that the survey also identified an unknown trace 0.3m deep along the edge of the footpath/lawn, which could be part of the footpath construction.

12.3.2 Parking and Traffic

The nearest car parking facilities on Bateman's Quay are located in the Dunnes Stores Retail outlet car park. Street parking is provided close to the dwellings of John's Quay and behind the library, see Figure 1.2.

12.4 Potential Impacts of the Proposed Pedestrian Bridge

12.4.1 Land Use

There will be temporary landtake of 0.0145ha from a carpark behind John's Quay where a construction compound will be situated. Permanent landtake from lands which are zoned as open space (amenity grassland) which will be converted to hardstanding and consists of land either side of the River Nore which equates to 0.052 ha.

12.4.2 Services

ESB

It is unlikely the over head cables will be impacted as a result of the proposed bridge. The ESB ducts within the existing footway will be realigned outside of the proposed abutment foot print to allow for future access, this impact can be classified as a slight negative temporary impact.

Phone and Internet Providers

The existing Eircom services in the area of the proposed Pedestrian Bridge will be avoided, where possible, with a slight negative temporary impact if these services require relocation.

Public Water Mains Supply

The bridge site and foundations will be design to avoid impacting on this area. There will be a slight negative temporary impact as the affected services at this location are relocated.

Impacts on water supplies will be avoided where possible but may be required for short period during the relocation and installation of services.

Foul and Combined Sewers

Based on the baseline information it is considered that the existing pumping station should be outside of the main bridge foot print. The bridge site and foundations will be designed to avoid impacting on this area. Impact on the existing foul drain will be avoided as much as possible, however there will be a slight temporary impact if temporary relocation is required.

12.4.3 Traffic Disturbance

Some disturbance of parking facilities is expected on the John's Quay side, with the removal of spaces to provide adequate footpaths and access along side the proposed structure. Impacts to parking will be minimised by limiting the extent of pedestrian ramps.

The road along John's Quay is a cul de sac and therefore traffic disturbance will be minimal however the carparking spaces outside dwellings along John's Quay during construction may be inaccessible at times which will cause a temporary negative impact to occupants although the carpark behind the library will still be accessible for use, see Figure 1.2.

The verges on Bateman's Quay are much wider than John's Quay so disturbance to traffic is not expected to be high. In addition, the site boundary is within the verge area and not the road (see Figure 1.2). Any necessary traffic diversions put in place along John's Quay and Bateman's Quay during construction which will cause a temporary negative impact. It is envisaged that the impact on Bateman Quay will be low and general traffic management will be used in the majority of cases as an alternative to diversions.

During the installation of the main bridge structure large scale lifting equipment will require significant space to operate safely. During this short term stage, traffic diversions will occur and management will be required on both quays. John's Quay will be closed to traffic for one day while the crane is in position.

12.5 Mitigation Measures

Where relocation of services is required on John's Quay this will be done quickly and efficiently with a minimal disturbance to affected users. There is no relocation of services anticipated on the Bateman's Quay side.

At time, parking for residents may temporarily be moved to the car park at the rear of the library until car parking in front of the affected dwellings is reinstated.

The EOP will contain procedures to ensure efficient communication with the residents and the public.

12.6 Residual Impacts

It is considered that the impact of the proposed pedestrian bridge on material assets in the area during construction will be temporary slight negative to neutral. There will be no long-term impacts.

12.7 Interaction and Inter-relationships with other Environmental Effects

Material Assets impacts will interact with:

- Groundwater: Dewatering of groundwater to facilitate construction activities has the potential to lower groundwater levels thereby potentially impacting on building foundations and/or groundwater users. However, it is highly unlikely that significant dewatering of groundwater will be required. Further details are outlined in Chapter 7.0 – Soils, Geology and Hydrogeology.
- Landscape: Landscape proposals that will minimise the visual impacts on properties are discussed in Chapter 10.0 of this document.
- Cultural Heritage: Buildings affected as a result of the construction of the proposed pedestrian bridge have also been assessed from a cultural heritage perspective as described in Chapter 11.0 of this EIR.
- Human Beings: The issue of the impact on businesses and recreational facilities affecting human beings is addressed in detail in Chapter 5.0 – Human Beings.

12.8 Monitoring

Not applicable.

12.9 Reinstatement

Not applicable.

12.10 Difficulties Encountered in Compiling this Information

Not applicable.

PLATES

Plate 6.1

Plate 6.2

Plate 6.1 View of the River Nore looking downstream from the proposed bridge location. Taken on the west side of river.

Plate 6.2 View of where the proposed bridge will cross the River Nore to the East.

Plate 6.3

Plate 6.4

Plate 6.3 View of where the proposed bridge will cross the River Nore to the West.

Plate 6.4 View upstream of the proposed bridge location from the east side looking north.

Plate 6.5

Plate 6.6

Plate 6.5 Treeline of mature oak trees delineating habitat section N(i) from (Nii).

Plate 6.6 Grassy riparian verges evident along habitat section N(ii).

Plate 6.7

Plate 6.8

Plate 6.9

Plate 6.7 Grey heron observed feeding approximately 250m downstream of the proposed bridge location, see centre right.

Plate 6.8/6.9 Otter observed swimming approximately 250m downstream of the proposed bridge location.

Plate 6.10

Plate 6.11

Plate 6.10 Natural bankside vegetation on the west side adjacent to the brewery.

Plate 6.11 Mature sycamore trees are evident to the north of the proposed bridge location.

Plate 6.12

Plate 6.13

Plate 6.12 The Main Nore channel section (Ni) looking upstream towards St. John's Bridge. Rock armouring is evident at this location.

Plate 6.13 The Main Nore channel section (Ni) looking downstream after St. John's Bridge. Mallard observed.

Plate 6.14

Plate 6.15

Plate 6.14 The Main Nore channel section (Ni) approximately 100m downstream of the proposed bridge, taken on the west side.

Plate 6.15 The Main Nore channel section (Ni) with a more natural bankside vegetation.

Plate 6.16

Plate 6.17

Plate 6.16 The Main Nore channel section (Nii) containing weir systems, approximately 750m downstream of proposed bridge location.

Plate 6.17 Small islands of vegetation apparent in section N(ii).

Plate 6.18

Plate6.19

Plate 6.18 The Mill Race habitat section (Niii) approx. 750m downstream of the proposed bridge location.

Plate 6.19 The Mill Race habitat section (Niii) containing a number of weir features.

Plate 6.20

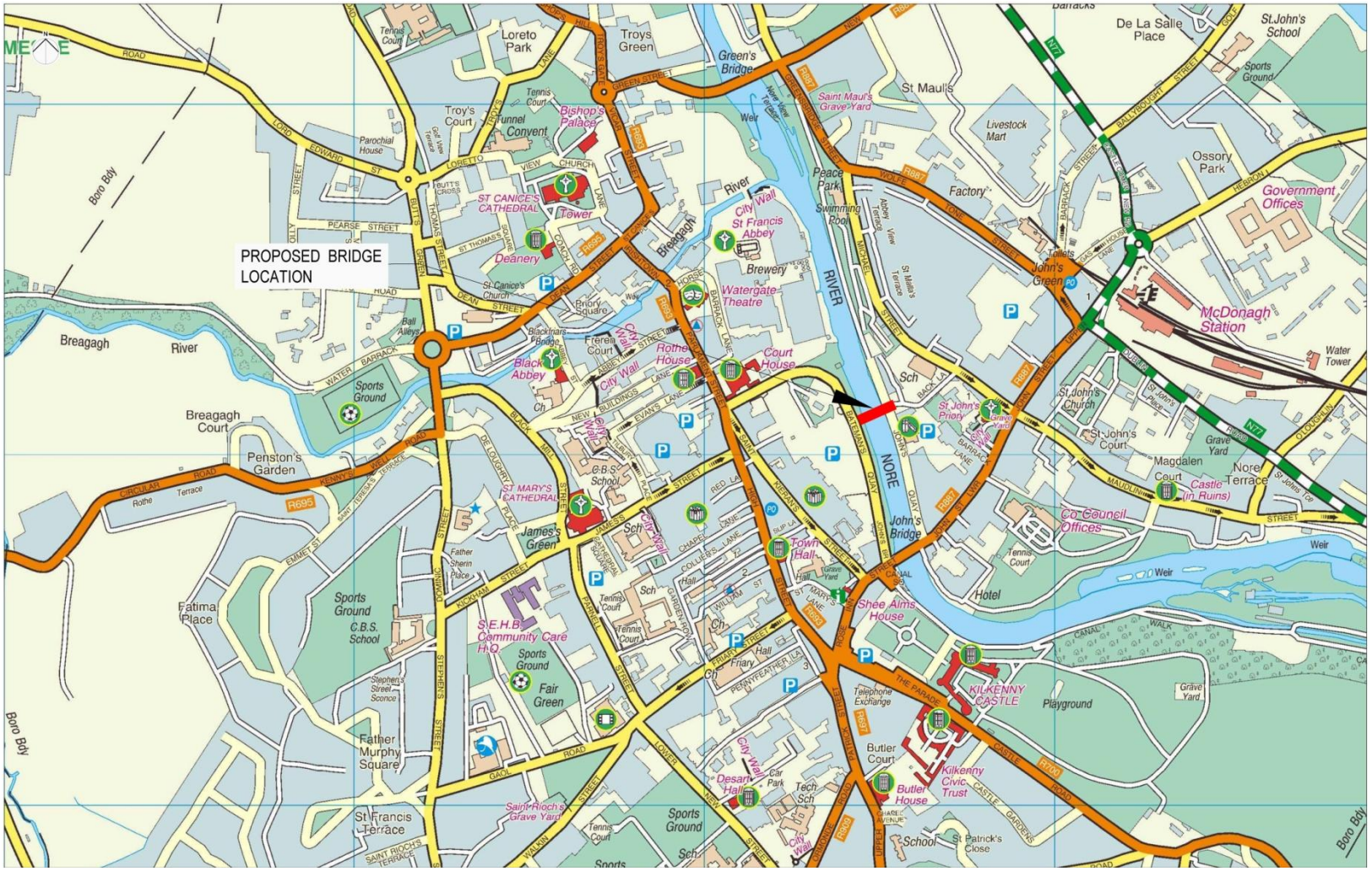
Plate 6.21

Plate6.20 Invasive weed, Red valerian growing on north bank in section N(ii).

Plate 6.21 Invasive weed, Butterfly bush growing on north bank in section N(ii).

Plate 6.22 Marginal branched bur-reed vegetation at Brewery ~150m upstream of proposed bridge location. Red Valerian is also evident on the right.

FIGURES



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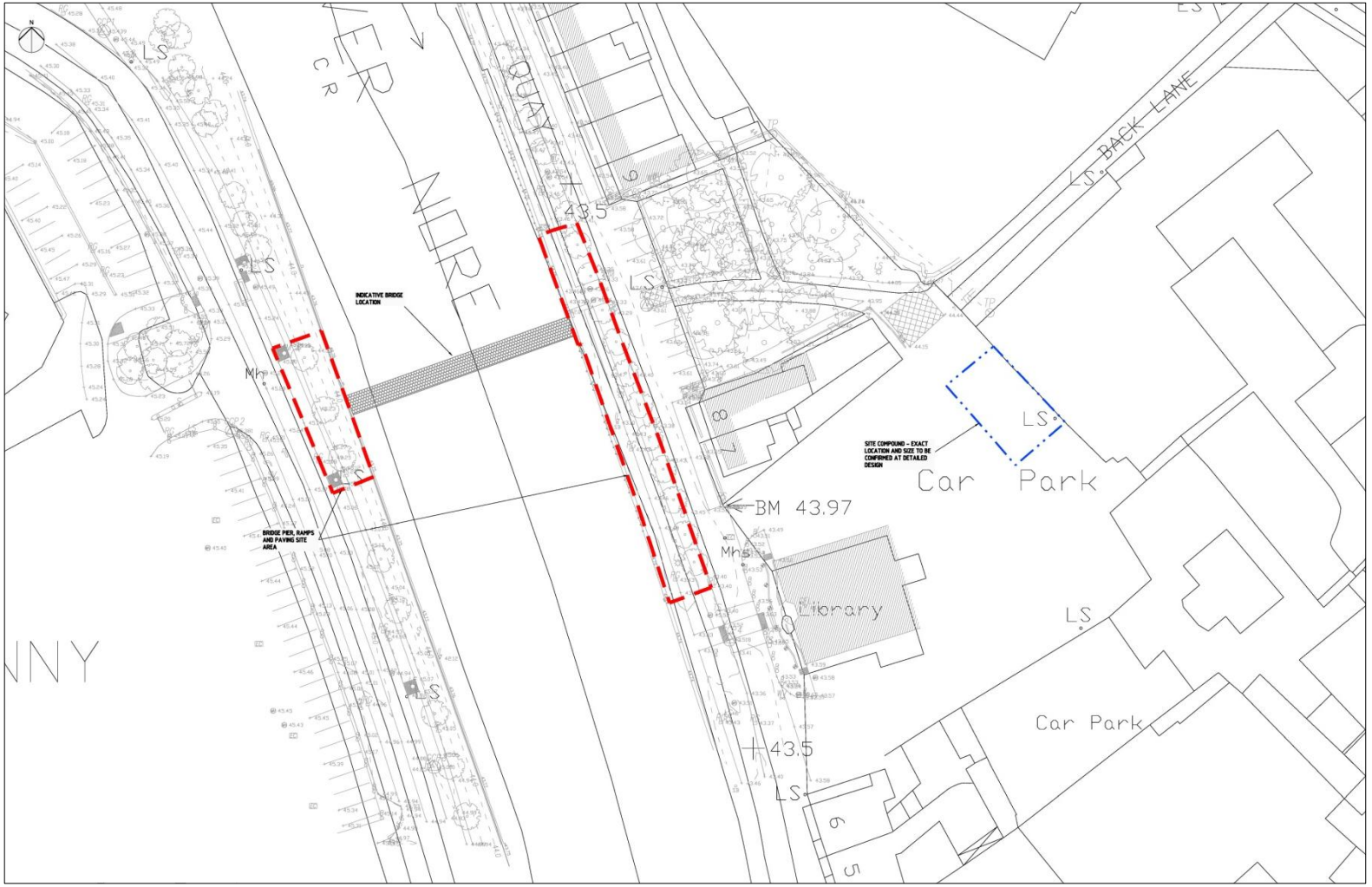
Client	Drawing
Kilkenny Borough Council	Site Location
Job	
Proposed Pedestrian Bridge	

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
E0877	Figure 1.1	Final	A4	NTS	Oct '12	AW



Legend

- Approximate Site Boundary
- Construction Compound

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Kilkenny Borough Council	Proposed Site Boundary
Job	
Proposed Pedestrian Bridge	

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
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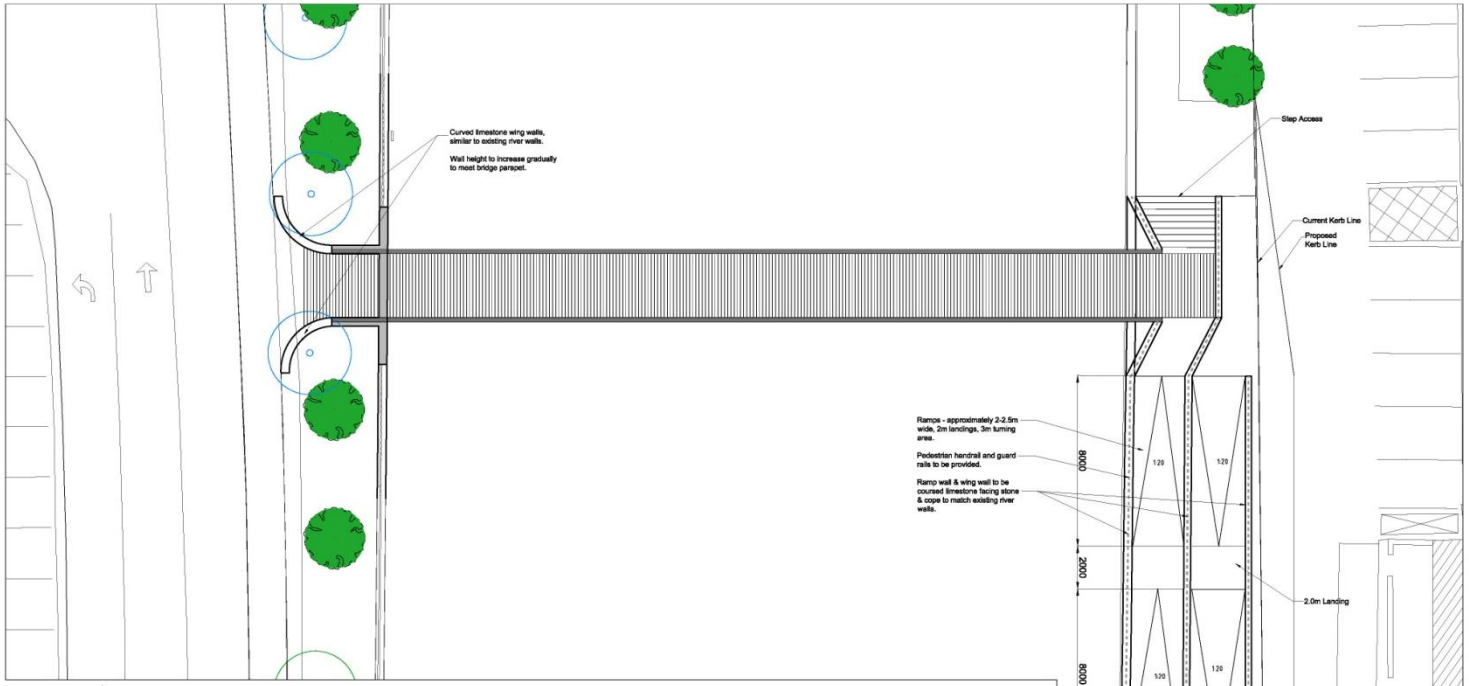
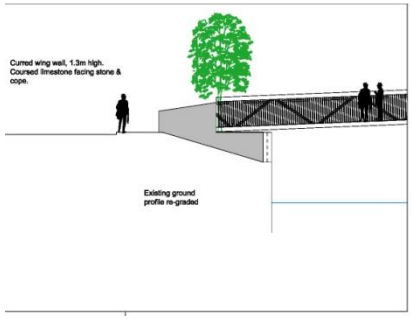
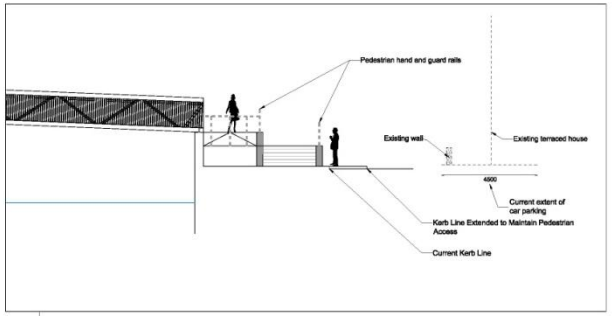


Plan
Scale 1:1000





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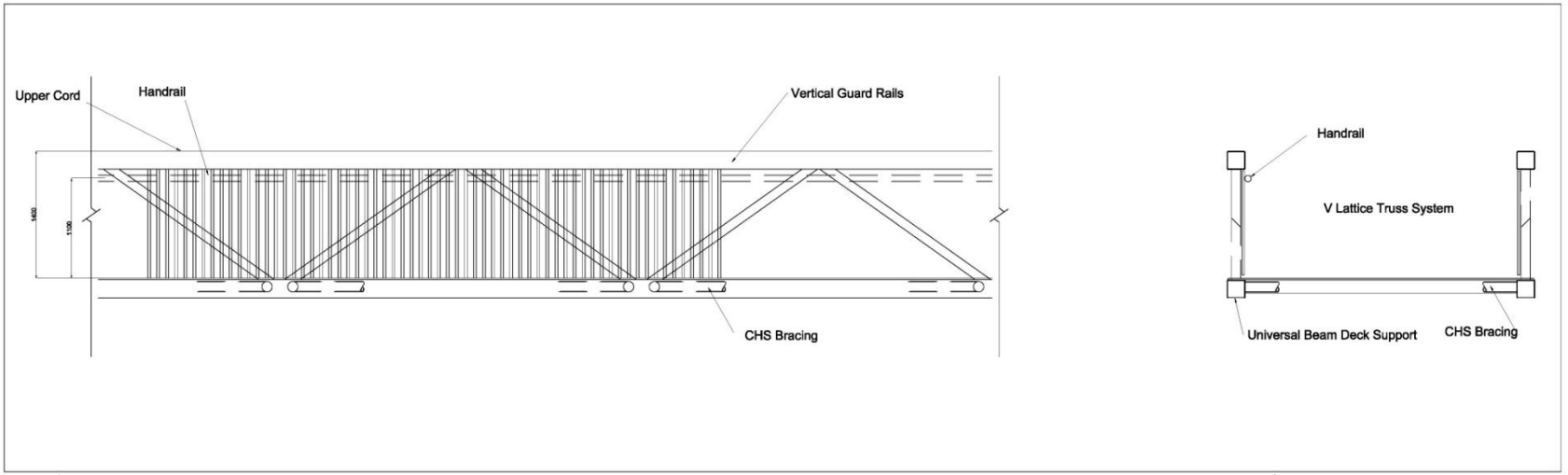
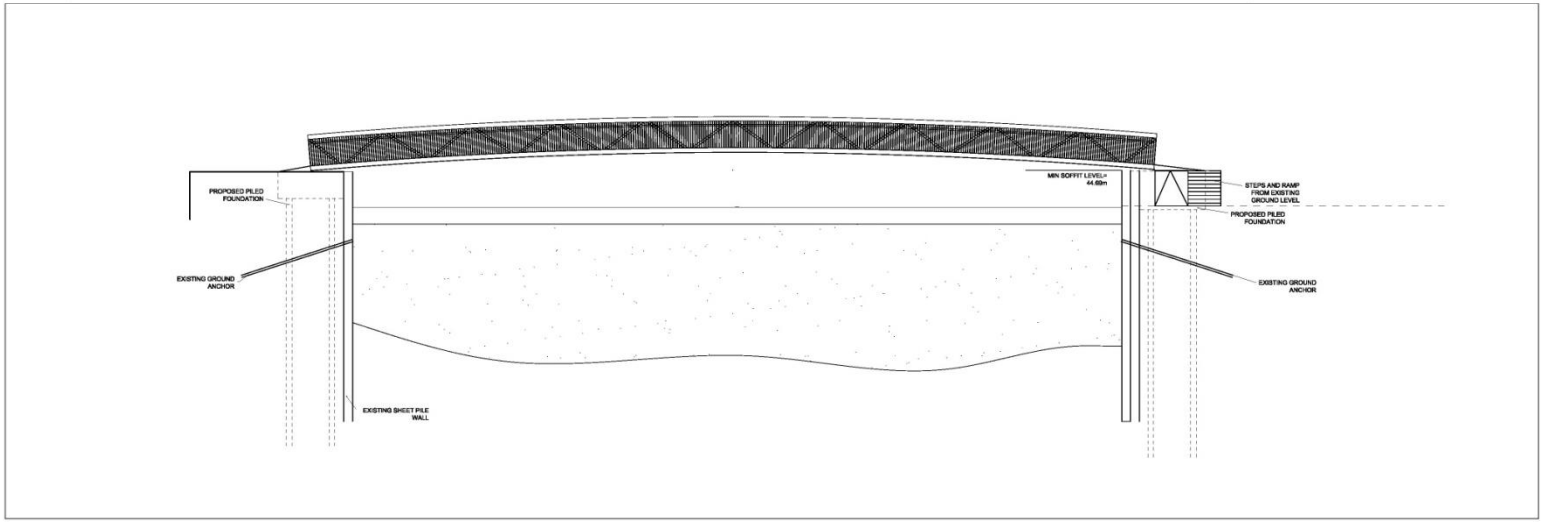
Client	Drawing
Kilkenny Borough Council	Proposed General Layout
Job	
Proposed Pedestrian Bridge	

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
E0877	Figure 2.1	Final	A4	NTS	Oct '12	AW





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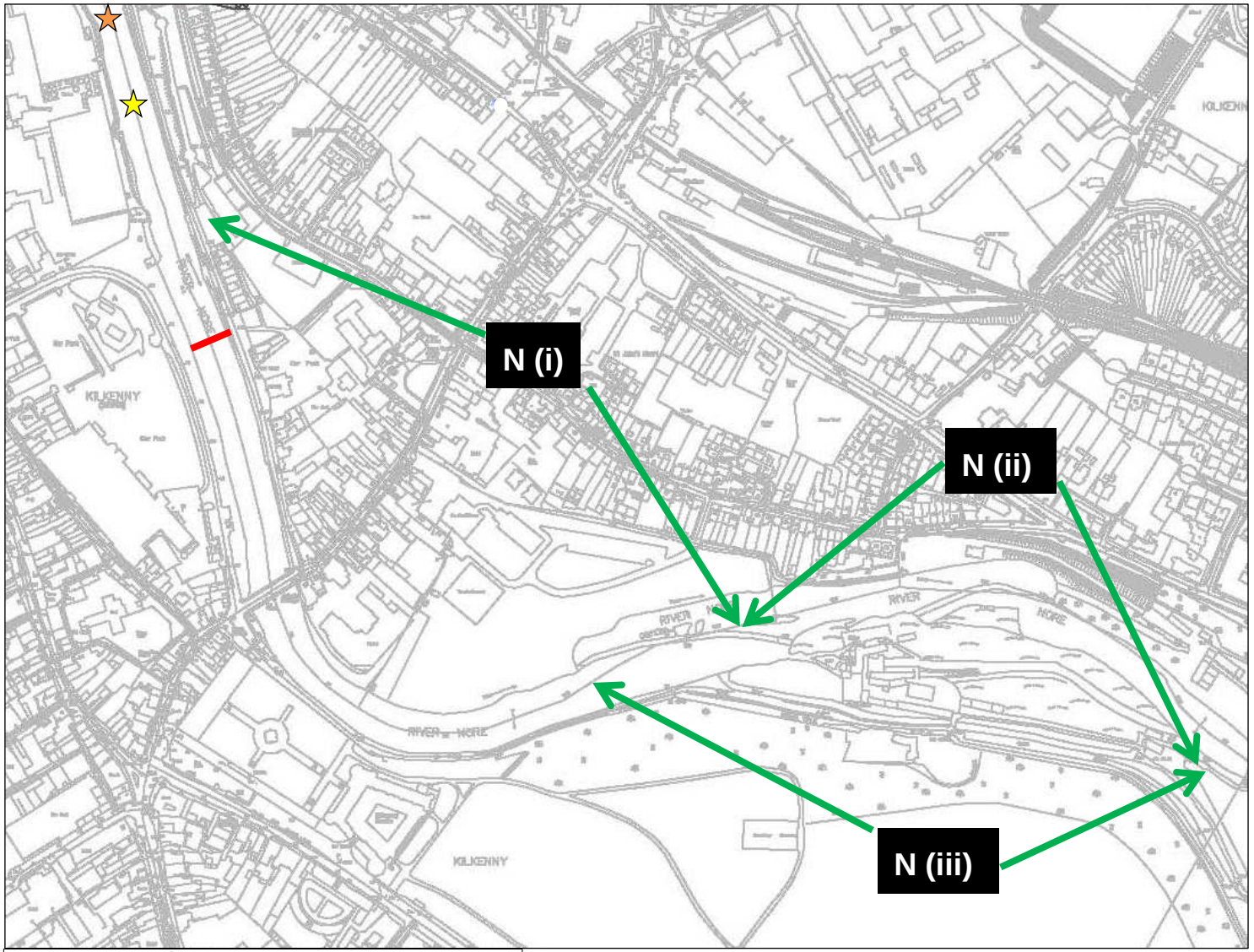
Client: Kilkenny Borough Council						Drawing: Proposed General Layout
Job: Proposed Pedestrian Bridge						
Job Number: E0877	Drawing Number: Figure 2.2	Status: Final	Sht. Size: A4	Scale: NTS	Date: Oct '12	Drawn: AW



N

Legend

- Proposed Bridge Location
- Biological Sampling Point NA
- Biological Sampling Point NB
- N(i) Section N(i) – Nore Main Channel
- N(ii) Section N(ii) – Nore Main Channel
- N(iii) Section N(iii) – Mill Race

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Client: Kilkenny Borough Council						Drawing: Habitat Assessment and Biological Sampling Locations
Job: Proposed Pedestrian Bridge						
Job Number: E0877	Drawing Number: Figure 6.1	Status: Final	Sht. Size: A4	Scale: NTS	Date: Oct '12	Drawn: AW

DON'T FORGET SAFETY

PROPOSED FOOTBRIDGE

Legend:

- Special Area of Conservation (SAC)
- Special Protection Area (SPA)

0m 25m 50m

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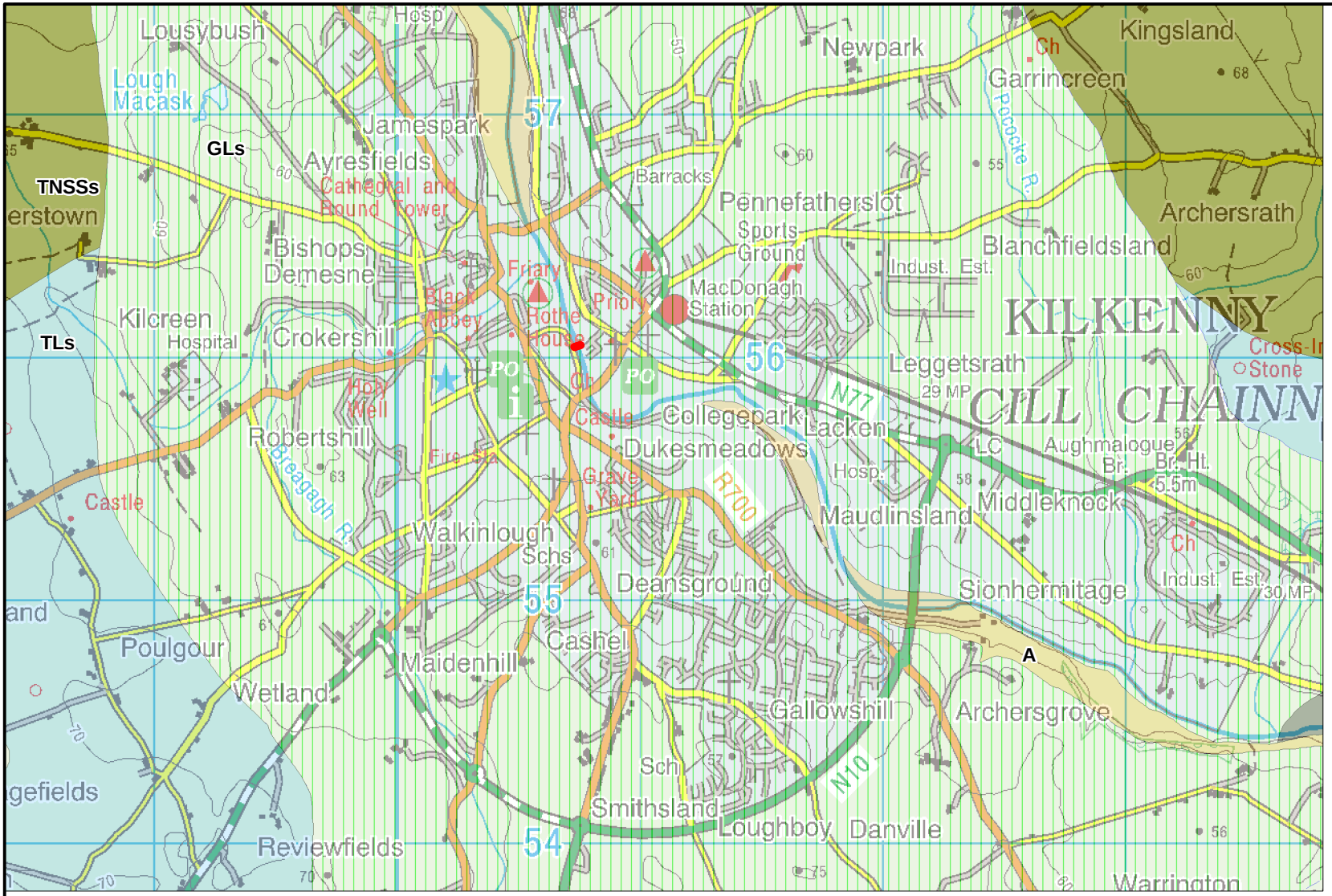
Client: Kilkenny Borough Council	Drawing: Location of Designated Areas at Proposed Bridge Location
Job: Proposed Pedestrian Bridge	

Job Number	Drawing Number	Status	Sht. Size	Scale	Date	Drawn
E0877	Figure 6.2	Final	A3	as shown	Oct' 12	JA

DON'T SCALE DIMENSIONS



N

Quaternary Geology

- Approximate Site Location
- A - Alluvium
- GLs - Glaciofluvial sands and gravels
- Rck - Rock (unsorted deposits)
- TLs - Limestone till (Carboniferous)
- TNSSs - Shales and sandstones till (Namurian

0m 500 1000m

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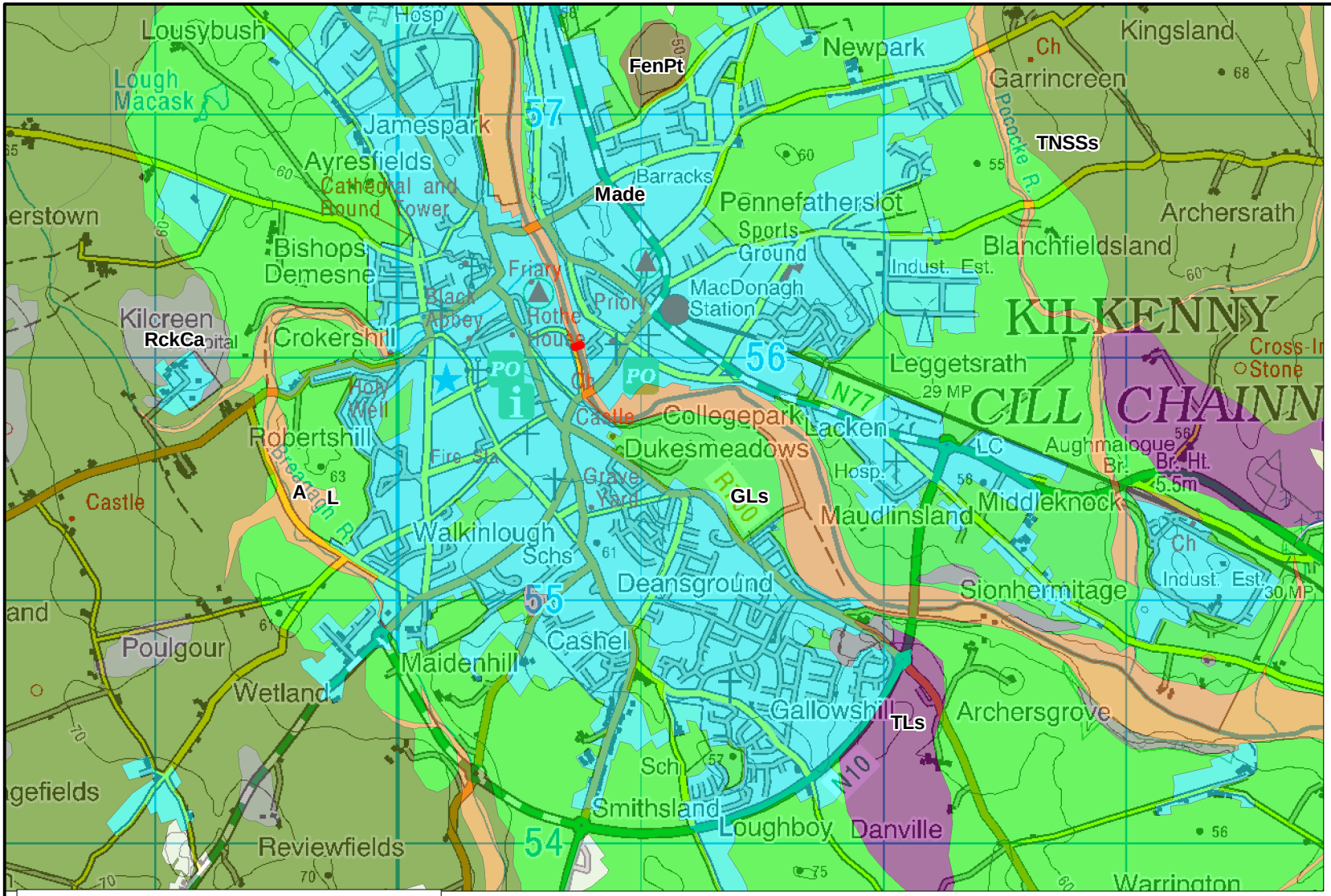
Client: Kilkenny Borough Council			Drawing: Quaternary Geology				
Job: Proposed Pedestrian Bridge							
Job Number: E0877	Drawing Number: Figure 7.1a	Status: Final	Sheet Size: A4	Scale: as shown	Date: Oct '12	Drawn: AW	



N

Teagasc Sub-Soils

- Approximate Site Location
- A - Alluvium
- FenPt - Peat
- GLs - Glaciofluvial Sands and Gravels
- L - Lake Sediments
- Made - Made Ground
- RckCa - Bedrock Outcrop and Subcrop
- TLs - Till Derived Chiefly from Limestone
- TNSSs - Till Derived Chiefly from Namurian Rocks

0m 500 1000m

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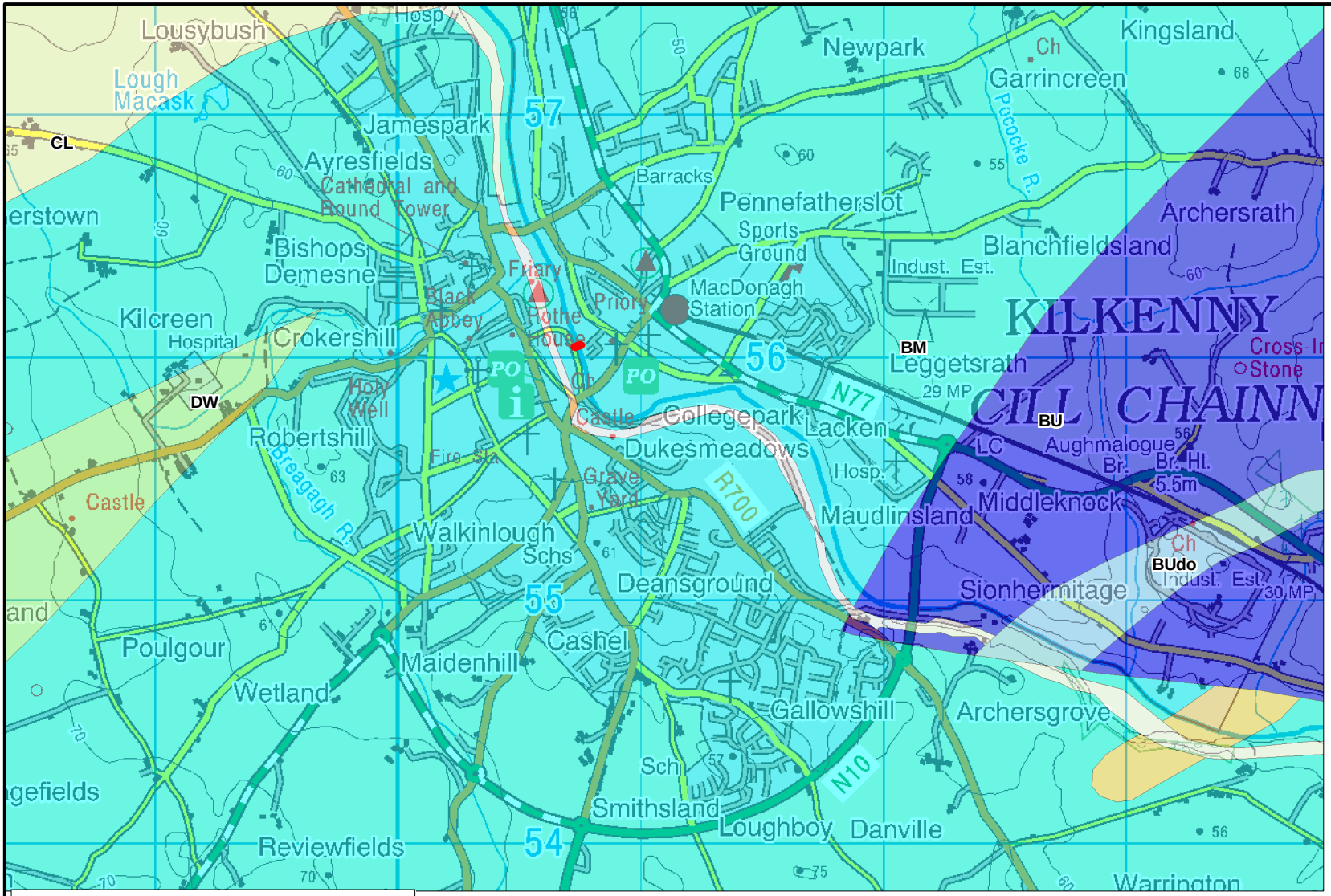
Client: Kilkenny Borough Council			Drawing: Teagasc Sub-soils Data				
Job: Proposed Pedestrian Bridge							
Job Number: E0877	Drawing Number: Figure 7.1b	Status: Final	Sheet Size: A4	Scale: as shown	Date: Oct '12	Drawn: AW	



N

Bedrock Geology

- Approximate Site Location
- BM - Ballyadams Formation
- BU - Butlersgrove Formation
- CL - Clogrenan Formation
- DW - Durrow Formation
- BMdo - in Ballyadams Formation
- BUdo - in Butlersgrove Formation
- KM - Killeshin Siltstone Formation
- LS - Luggacurren Shale Formation

0m 500 1000m

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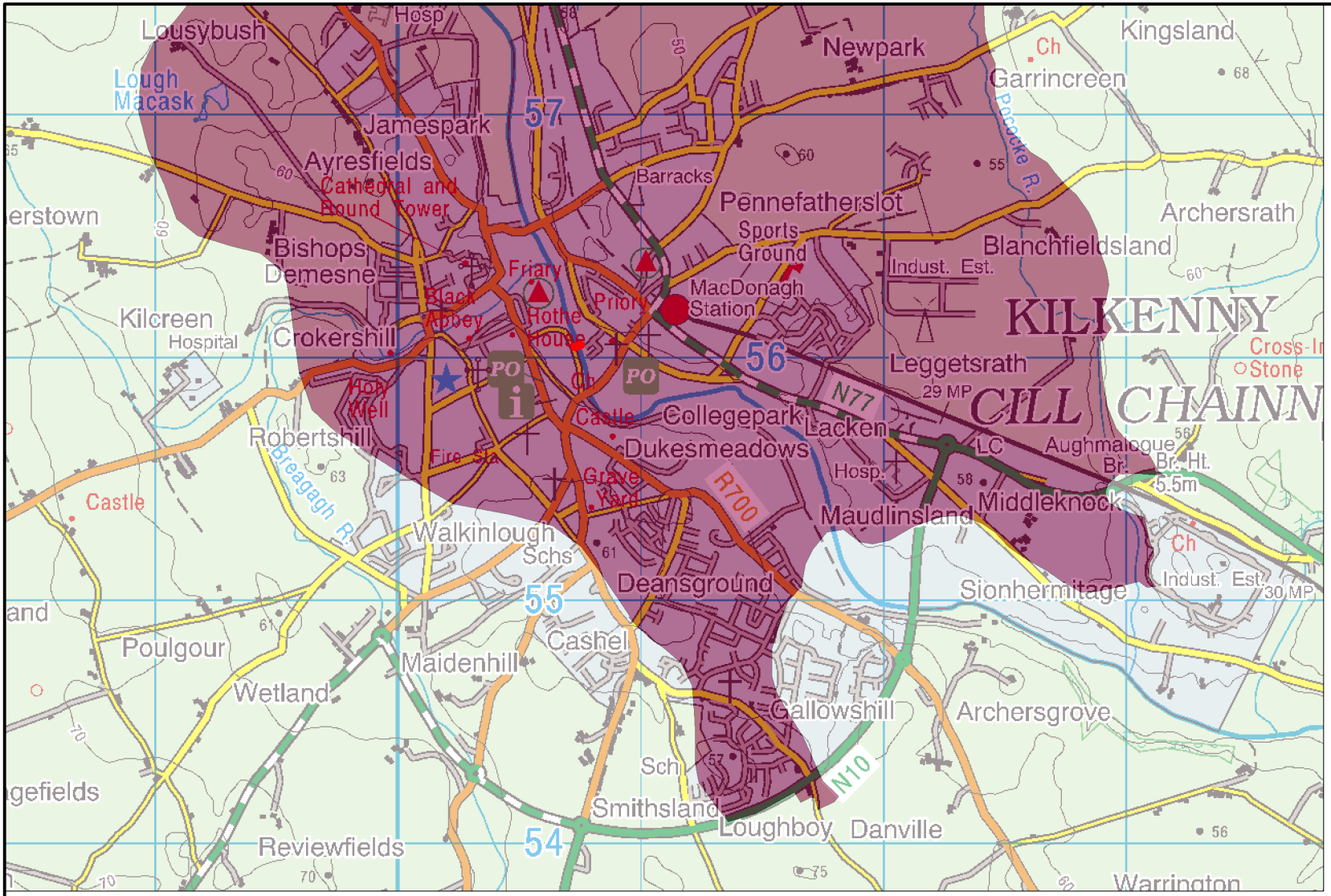
Client: Kilkenny Borough Council			Drawing: Bedrock Geology				
Job: Proposed Pedestrian Bridge							
Job Number: E0877	Drawing Number: Figure 7.2	Status: Final	Sheet Size: A4	Scale: as shown	Date: Oct '12	Drawn: AW	



N

0m 500 1000m

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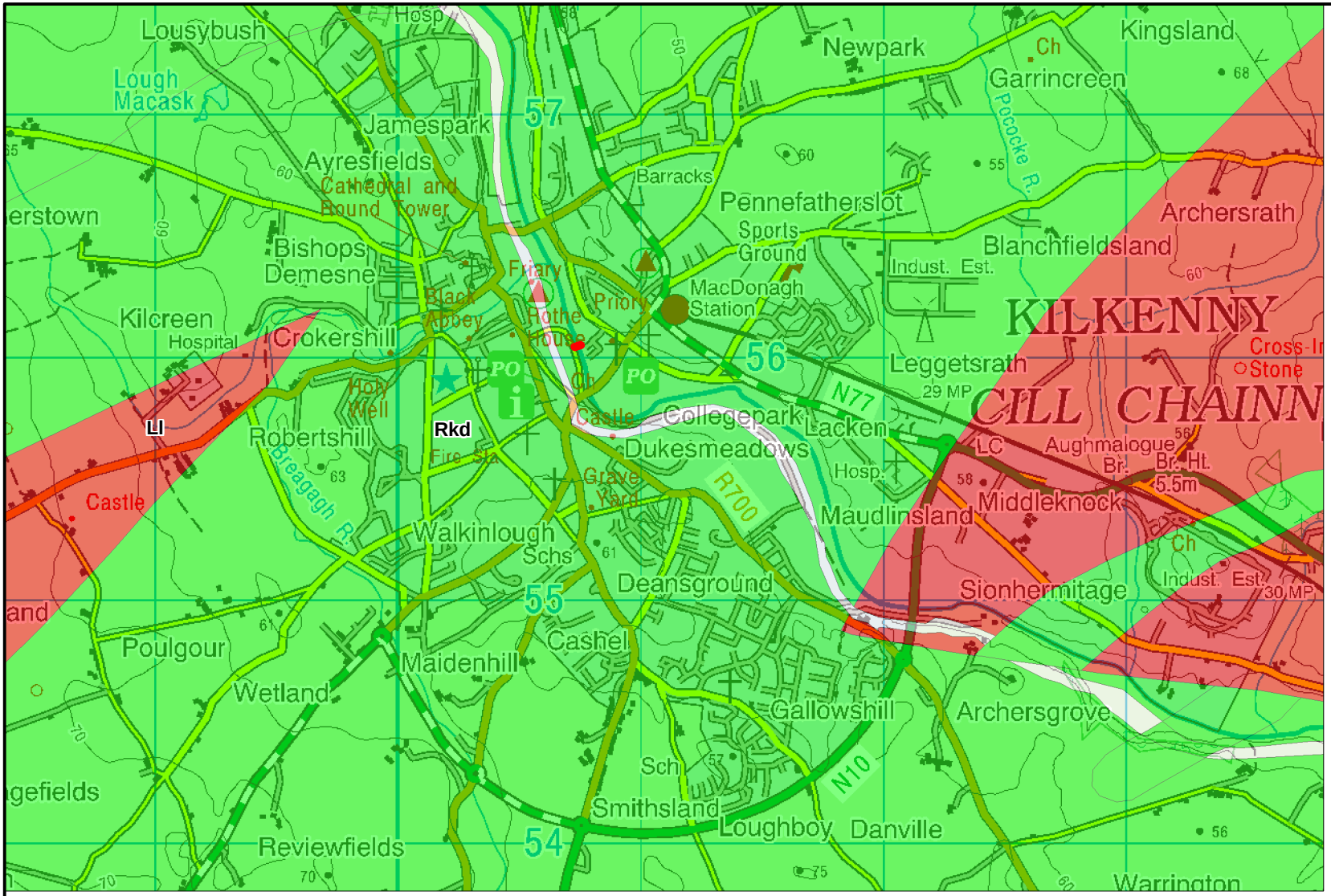
Gravel Aquifer Classification

- Approximate Site Location
- Rg - Regionally important gravel aquifer

Client: Kilkenny Borough Council			Drawing: Gravel Aquifer Classification				
Job: Proposed Pedestrian Bridge							
Job Number: E0877	Drawing Number: Figure 7.3a	Status: Final	Sheet Size: A4	Scale: as shown	Date: Oct '12	Drawn: AW	



N

0 500 1000 m

Bedrock Aquifer Classification

Approximate Site Location

LI - Locally Important Aquifer - Moderately Productive only in local zones

Rkd - Regionally Important Aquifer - Karsifed (diffuse)

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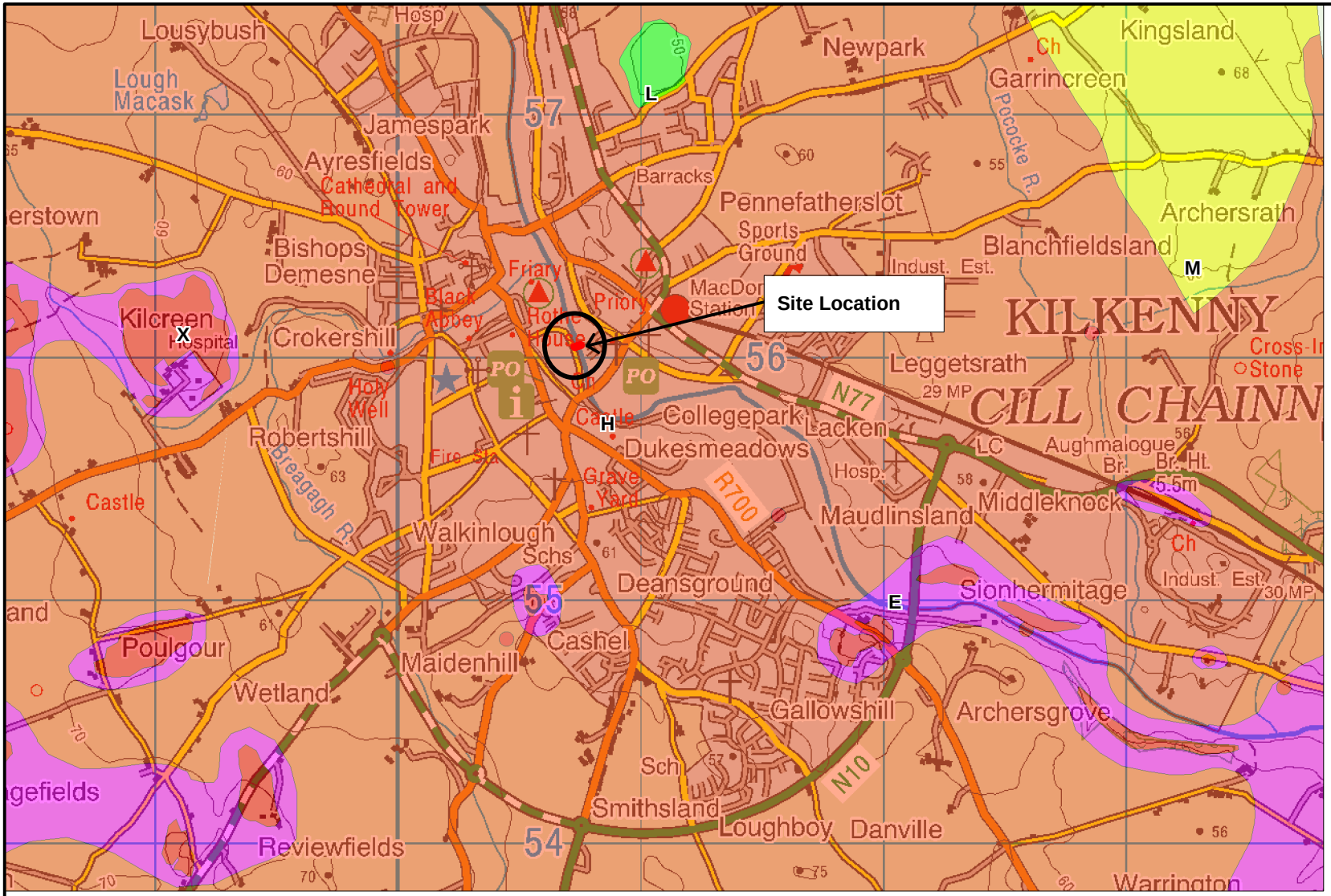
Job: Proposed Pedestrian Bridge							
Job Number: E0877	Drawing Number: Figure 7.3b	Status: Final	Sheet Size: A4	Scale: as shown	Date: Oct '12	Drawn: AW	



N

Legend
Aquifer Vulnerability

- X - Rock near Surface or Karst
- E - Extreme
- H - High
- M - Moderate
- L - Low

0 500 1000m

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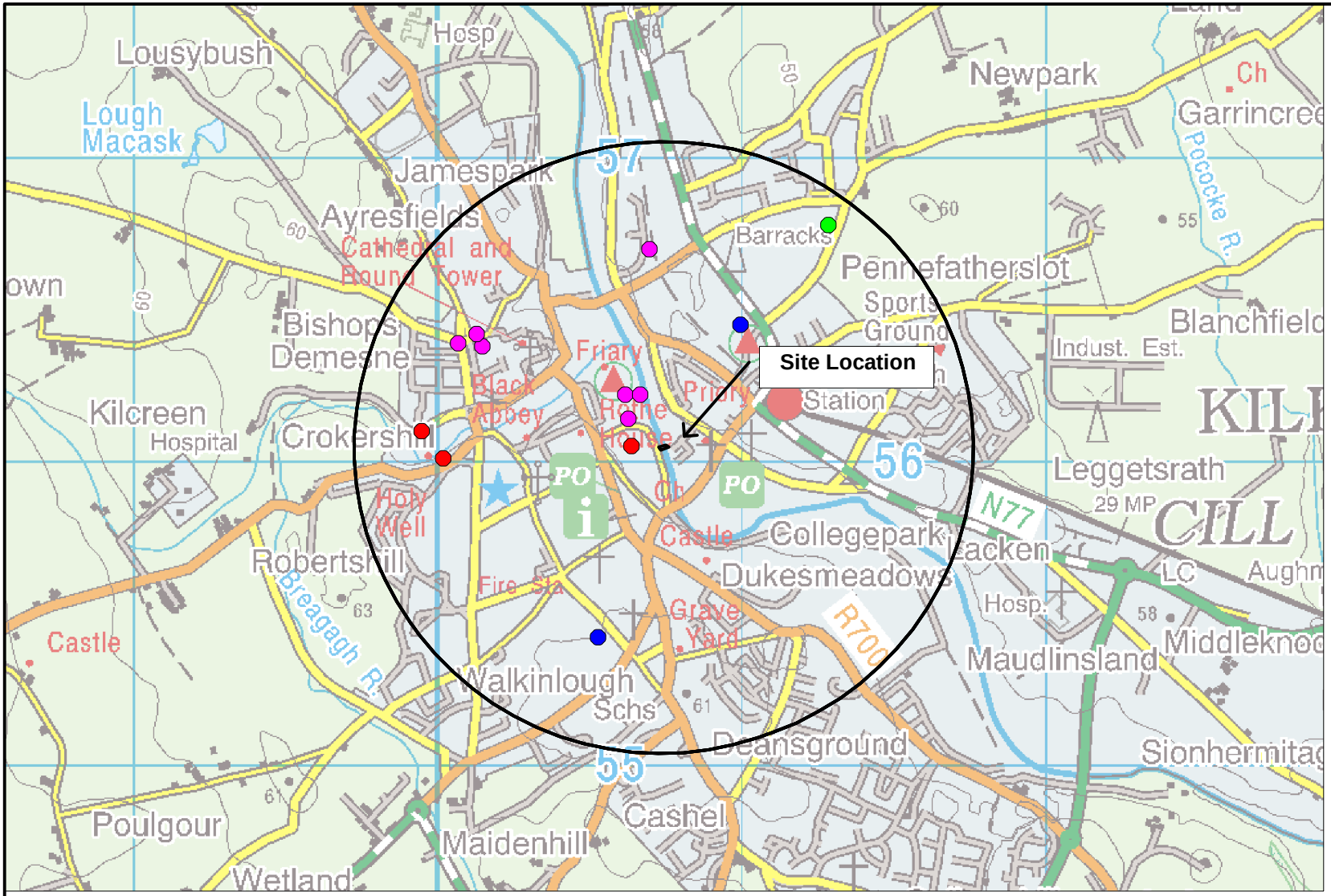
Job	Proposed Pedestrian Bridge							
Job Number	Drawing Number	Status	Sheet Size	Scale	Date	Drawn		
E0877	Figure 7.4	Final	A4	as shown	Oct '12	AW		



1km GSI Well Search

- Industrial use
- Agricultural and domestic use
- Agricultural use only
- Unknown

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Client	Drawing
Kilkenny Borough Council	GSI Well Search - Within 1km of Proposed Site
Job: Proposed Pedestrian Bridge	

Job Number	Drawing Number	Status	Sheet Size	Scale	Date	Drawn
E0877	Figure 7.5	Final	A4	as shown	Oct '12	AW