JBA consulting

Kilkee Flood Relief Scheme

Environmental Impact Assessment Report

Volume 2: Main Report

Final Report

July 2024

Tionscadal Éireann Project Ireland 2040

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Revision History

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Contract

This report relates to the Kilkee FRS commissioned by Clare County Council, on behalf of the Office of Public Works. Conor O'Neill, Christos Papachristou and Bernadette O'Connell of JBA Consulting carried out this work.

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..... Principal Environmental Consultant

Purpose

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Abbreviations

AA	Appropriate Assessment
ACA	Architectural Conservation Area
AEP	Annual Exceedance Probability
BCR	Benefit Cost Ratio
AFA	Area for Further Assessment
CAP23	Climate Action Plan 2023
CCC	Clare County Council
CFRAM	Catchment Flood Risk Assessment and Management
DEHLG	Department of Environment, Heritage and Local Government
EIAR	Environmental Impact Assessment Report
EIS	Environmental Impact Statement

EPA	Environmental Protection Agency
FRS	Flood Relief Scheme
GHG	Greenhouse Gas
GHS	Geological Heritage Site
GIS	Geographic Information System
GSI	Geological Survey Ireland
IAQM	Institute of Air Quality Management
IPP	Individual Property Protection
LHB	Left hand bank
LULUCF	Land Use, Land-use Change and Forestry
MCA	Multi-Criteria Analysis
MWASP	Mid-West Area Strategic Plan
NHA	Natural Heritage Area
NIAH	National Inventory of Architectural Heritage
NPF	National Policy Framework
NPO	National Policy Objective
NPWS	National Parks and Wildlife Service
NSOs	National Strategic Outcomes
NWRM	Natural Water Retention Measures
OPW	Office of Public Works
PCD	Public Consultation Day
PE	Population Equivalent
pNHA	proposed Natural Heritage Area
PSDS	Project Supervisor for the Design Process
QI	Qualifying Interest
RBMP	River Basin Management Plan
RC	Reinforced Concrete
RHB	Right hand bank
RPO	Regional Policy Objective
RPS	Record of Protected Structures
RSES	Regional Spatial and Economic Strategy
SAC	Special Areas of Conservation
SFRA	Strategic Flood Risk Assessment
SPA	Special Protection Areas
tCO2e	tonnes of Carbon Dioxide equivalent
TII	Transport Infrastructure Ireland
UWWTP	Urban Wastewater Treatment Plant
WFD	Water Framework Directive
WWTP	Wastewater Treatment Plant
ZoI	Zone of Influence
ZTV	Zone of Theoretical Visibility

1 Introduction

1.1 Context and Project Background

This Environmental Impact Assessment Report (EIAR) has been prepared on behalf of Clare County Council (CCC) and the Office of Public Works (OPW) in relation to a proposed Flood Relief Scheme (FRS, referred to as *the proposed development*) in Kilkee, Co. Clare.

CCC intends to apply for planning permission for a FRS along the Atlantic and Victoria Streams in Kilkee. The proposed development comprises measures to minimise the flood risks currently posed to people, property, the community, social amenity, environment, and landscape. The proposed planning permission relates only to the construction of fluvial flood defence assets. A separate coastal scheme is being considered for Kilkee. Any future coastal scheme proposals will form part of a separate planning application and EIAR and are therefore not included or being considered in this project, nor EIAR.

Kilkee is located adjacent to Moore Bay along the west coast of County Clare. The Area for Further Assessment (AFA) boundary for the scheme is defined by the Catchment Flood Risk Assessment and Management (CFRAM). Based on the AFA, the study area of the scheme encloses an approximate area of 3.6km² and is shown in Figure 1-1 overleaf. It comprises the town centre with rural lands stretching outwards to the east. The Victoria Stream and the Atlantic Stream are the two main watercourses that flow through the town of Kilkee. They are the two main watercourses considered in the FRS. Both streams flow from southeast to northwest, with the Victoria Stream located to the south of the town and the Atlantic Stream located to the north of the town. The two streams have a number of tributaries and drainage channels which contribute to the flow through the area. Both watercourses are tidal. Kilkee is susceptible to both coastal and fluvial flood risk.

Historically, the town has been subject to fluvial flooding and as such, Kilkee was part of the OPW CFRAM study programme. This study's Preliminary Options Report[1] concluded that a flood relief program for the local community would be feasible and effective. According to the CFRAM Options Report, the viable scheme option for Kilkee consisted of a series of flood embankments and flood walls.

There have been several recent instances of flooding in Kilkee. The Victoria Stream is noted to overflow its banks over a length of 200-300m on an annual basis, causing flooding of Carrigaholt Road and Well Road, and putting a number of residential and commercial properties at risk.

The village of Kilkee and the contiguous areas were severely flooded during April of 2015 due to heavy rain, when a nearby stream burst its banks. Previously, flooding events took place in the surrounding areas in 2014, 2019 and most recently in 2024.

1.2 Purpose of this Report

The Environmental Impact Assessment Directive[2] (Directive 2011/92/EU, amended by Directive 2014/52/EU, hereafter the 'EIA Directive') requires that, before development consent is given, projects likely to have effects on the environment by virtue of their nature, size or location are made subject to a requirement for development consent and an assessment of their effects on the environment. This is referred to as an 'Environmental Impact Assessment' (EIA). Where an EIA is required, the developer must prepare an EIAR, and the EIA Directive sets out minimum information which the EIAR must include.

Schedule 5 of the Planning and Development Regulations 2001 (as amended, hereafter the 2001 Regulations') set out a wide range of development categories with associated thresholds for which an EIA is required.

[1] JACOBS (July 2016) *Shannon Catchment-based Flood Risk Assessment and Management (CFRAM) Study, Preliminary Options Report Unit of Management 27, Option Appraisal*. Office of Public Works.

[2] European Commission (April 2014) *EC Directive 2014/52/EU of 6 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment,* Official Journal of the European Union No. L 124/1, 25/04/2014.

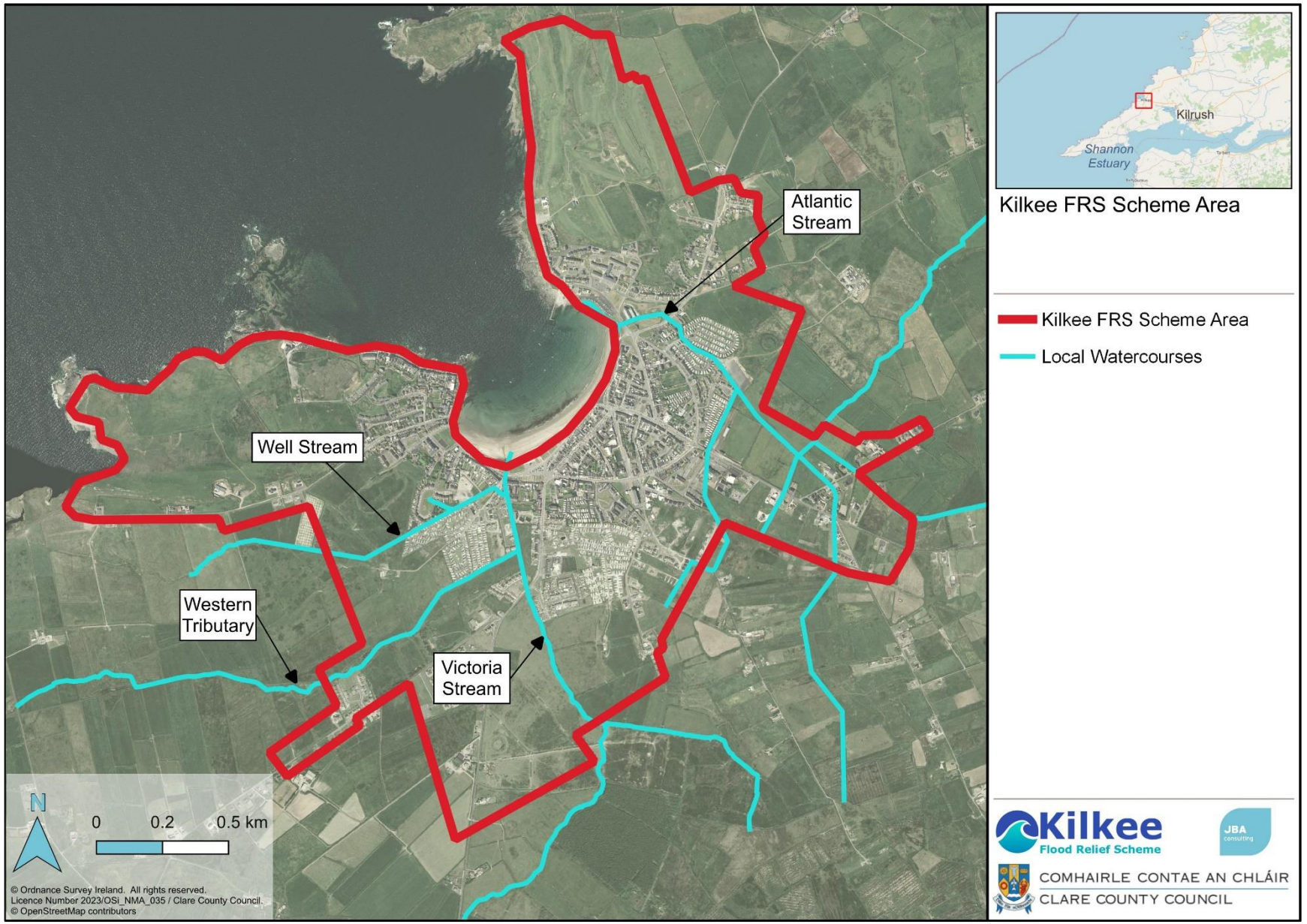

Figure 1-1: Kilkee FRS Scheme Area

Part 2 of Schedule 5 of the Planning and Development Regulations 2001, as amended, includes:

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(f) (ii) Canalisation and flood relief works, where the immediate contributing sub-catchment of the proposed works (i.e. the difference between the contributing catchments at the upper and lower extent of the works) would exceed 100 hectares or where more than 2 hectares of wetland would be affected or where the length of river channel on which works are proposed would be greater than 2 kilometres.

This category contains three thresholds; if any of these thresholds are exceeded, the proposed development must undergo a mandatory EIAR. As such, they will be addressed in turn.

"where the immediate contributing sub-catchment of the proposed works (i.e. the difference between the contributing catchments at the upper and lower extent of the works) would exceed 100 hectares".

Works are proposed on parts of the Atlantic Stream and Victoria Stream in Kilkee, Co. Clare. The contributing sub-catchment of these stretches of river is approximately 188 hectares. The scheme therefore exceeds the 100-hectare threshold.

"where more than 2 hectares of wetland would be affected"

JBA ecologists have undertaken a Fossitt habitat survey of the scheme area and defined the habitats in the areas to be affected. The survey results (detailed further in Section 4.2.2) note that approximately 0.94 hectares of wetland are within the scheme area, but are unlikely to be impacted by the FRS. The scheme is therefore under the 2-hectare wetland threshold.

"where the length of river channel on which works are proposed would be greater than 2 kilometres"

Works are proposed on a stretch of the Victoria Stream, Well Stream, and Atlantic Stream; all in the proximity of Kilkee. The Victoria Stream works would be 1472 meters, and the Atlantic stream works would be 1130 meters. The total length of river channel affected is 2.602 kilometres, which is above the two kilometres threshold.

The proposed FRS is above two parts of the threshold; the immediate contributing sub-catchment of the works is over 100 hectares, and the length of river channel on which works are proposed is greater than two kilometres. Therefore, the requirement for an EIAR has been automatically triggered for this proposed development.

The legislation and planning policies surrounding the proposed development and this EIAR are covered extensively in this report in chapter 2 - Legislation and Planning Policy.

1.3 EIAR Scoping

The purpose of scoping is to identify what information should be contained in an EIAR and what methods should be used to gather and assess that information. It should provide focus for the EIAR and ensure that all relevant issues are identified and addressed in the EIAR.

The document 'Environmental Impact Assessment of Projects Guidance on Scoping'[3] (European Commission, 2017) outlines that although scoping can be considered as a discrete stage in the EIA process, one which ends with the issuing of the terms of reference for the EIA Report, the activity of scoping should continue throughout, so that the scope of work can be amended in light of new issues and new information. The scope of an EIA Report must be flexible enough to allow new issues, which may emerge either during the process or as a result of design changes or through consultations, to be incorporated.

A Scoping Report was prepared for the proposed scheme and was shared with a list of statutory and non-statutory consultees for comment. Responses received are described in chapter 5 - Consultation. The

[3] European Commission, Directorate-General for Environment, McGuinn, J., Lukacova, Z., McNeill, A. et al., (2017) *Environmental impact assessment of projects – Guidance on the preparation of the environmental impact assessment report (Directive 2011/92/EU as amended by 2014/52/EU)*, Publications Office.

Scoping Report[4] outlined the proposed methodology of each chapter of the EIAR, provided a preliminary description of the baseline environment, and the potential impacts for each chapter.

1.4 Format and Methodology of the EIAR

This EIAR comprises three volumes as follows:

- Volume 1, Non-Technical Summary;
- Volume 2, Environmental Impact Assessment Report; and
- Volume 3, Environmental Impact Assessment Report Appendices.

This EIAR comprises the presentation of an extensive range of information and analysis from the EIAR Team. The EIAR is split into the following Chapters:

- Chapter 1 – Introduction;
- Chapter 2 – Legislation and Planning Policy;
- Chapter 3 – Examination of Alternatives;
- Chapter 4 – Description of Proposed Development;
- Chapter 5 – Consultation;
- Chapter 6 – Construction Impacts; including sub-chapters:
    - Air Quality and Dust;
    - Climate;
    - Noise and Vibration; and
    - Population and Human Health
- Chapter 7 – Biodiversity;
- Chapter 8 - Land and Soil;
- Chapter 9 – Water – Surface and Groundwater;
- Chapter 10 - Material Assets;
- Chapter 11 - Cultural Heritage;
- Chapter 12 - Landscape and Visual Impact Assessment;
- Chapter 13 – Interactions; and
- Chapter 14 – Cumulative Impacts

Each competent expert has prepared their relevant chapters which are primarily set out in the following format:

- Introduction (where required to provide information relating to the specialist area);
- Methodology;
- Receiving Environment
- Predicted Impact of the Proposed Development;
- Mitigation Measures;
- Residual Impacts;
- Interactions and Potential Cumulative Impacts.

1.5 EIAR Team

The EIAR has been compiled by JBA Consulting with input from a range of competent experts, the details of which are outlined in Table 1-1.

[4] JBA Consulting (August 2023) *Kilkee Flood Relief Scheme - EIA Screening and Scoping for Fluvial Works* - Clare County Council and Office of Public Works

Table 1-1: EIAR team

Chapter	Consultant	Author
Introduction	JBA Consulting	Michael O'Donoghue BEng (Hons) CEng (MIEI) PGDip *Michael has over 15 years of industry experience in consultancy and contracting has been working on large scale flood relief projects including Miltown Malbay, Kilkee and Bantry as designer and project manager overarching a number of environmental disciplines*. Conor O'Neill BA (Mod) MSc Adv Dip *Conor graduated from Trinity College and has 4 years of consultancy experience. He has been involved in all aspects of the EIAR, from Screening and Scoping to EIAR co-ordination and chapter authoring for Screening and Scoping for numerous projects including the Mountmellick, Castleconnell, Carrickmines/ Shanganagh and Bantry Flood Relief Schemes* Paul Browne BE(Hons) MIEI *Paul has 4 years of experience and has SuDS/ Green Infrastructure experience, has completed numerous surface water audits and flood risk assessments and has contributed to the development of surface water management plans and strategic flood risk assessment policies.* Christos Papachristou MSc MA CMLI MILI *Christos has 12 years of landscape architectural experience undertaking LVIAs for large infrastructure projects and private developments including the Castleconnell FRS and Mountmellick FRS and has lectured on LVIA at UCD. He is a chartered landscape architect in the UK and a corporate member of the Irish Landscape Institute*
Legislation and Planning Policy	Coakley O'Neill Town Planning Ltd *N.S.C. Campus, Loughmahon Technology Park, Mahon, Cork, T12 XY2N*	Aiden O'Neill BSc (Hons) PG Dip MIPI *Aiden is a planning consultant with over twenty-eight years of post qualification experience in the UK (8) and Ireland (20). Aiden set up Coakley O'Neill Town Planning with Dave Coakley in February, 2010, and have since been particularly involved in advising on residential, commercial, retail and industrial developments, airport infrastructure, services infrastructure and waste infrastructure, across the full range of planning services*.
Examination of Alternatives	JBA Consulting	Michael O'Donoghue Paul Browne
Description of Proposed Development	JBA Consulting	Michael O'Donoghue Paul Browne
Consultation	JBA Consulting	Conor O'Neill

		Bernadette O'Connell BA MSc CMLI PgCert *Bernadette has 35 years of engineering and environmental consultancy experience, has project managed EIARs for a range of strategic infrastructure projects including King's Island FRS, Castleconnell FRS and Mountmellick FRS and has acted as an Expert Witness at oral hearings.*
Construction Impacts	JBA Consulting / AONA Environmental Consulting Ltd *Unit 8A Northwest Business Park, Sligo, F91 E285*	Mervyn Keegan BSc Dip Env Sc MSc Env Sc Pg Dip *Mervyn has 25 years of environmental consultancy experience, has appeared as an Expert Witness at oral hearings, public inquiries and legal hearings and prepares in excess of 50 Noise & Vibration and Air Quality & Climate impact assessments annually.*
Population and Human Health	JBA Consulting	Conor O'Neill
Biodiversity	JBA Consulting	Anne Mullen BSc Env (Hons), MSc Ecological Assessment Ecology MCIEEM *Anne has 19 years of experience writing and reviewing Natura Impact Statements, Ecological Impact Statements, Species and Habitat Management Plans, Screenings for Appropriate Assessments. She has also been surveying for rare plants and invertebrates of conservation interest, including marsh fritillary, bat emergence surveying, derogation licences, bird surveying including tape playback for red grouse, hedgerow condition surveys, Q-values and other water quality testing.*
Land and Soil	JBA Consulting	David Casey BSc MSc MCIWEM *David has 13 years of experience preparing and reviewing Flood Risk Assessments and Environmental Impact Statements, notable the Soils & Geology and Hydrology & Hydrogeology chapters, as well as Strategic Flood Risk Assessments (SFRA's) on behalf of county councils and has aided in the development of the OPW Western CFRAM Study*.
Water – Surface & Groundwater	JBA Consulting	David Casey
Material Assets	JBA Consulting	Conor O'Neill
Cultural Heritage	Mizen Archaeology	Julianna O'Donoghue BSc Archaeology *Julianna has 20 years of experience as an underwater archaeologist who is qualified to hold a licence under Section 26 of the National Monuments 1930 Act undertaking specialist underwater archaeological services, intertidal surveys, underwater assessments, archaeological monitoring of dredging works and underwater excavation. She has extensive experience in all aspects of archaeological projects from the initial planning stage, to EIAR, monitoring, testing, excavation and*

		report publication, many of which relate to flood relief schemes.
Landscape and Visual Impact	JBA Consulting	Christos Papachristou MSc MA CMLI MILI
Interactions	JBA Consulting	All of the above
Cumulative Impacts	JBA Consulting	All of the above

1.6 Description of Effects

The EPA Guidelines (2022) outline that the probability of effects can be described as likely or unlikely and the duration of effects can range from momentary, brief, temporary, short-term, medium-term, long-term, permanent, or reversible while the frequency describes how often the effects will occur. The quality of effects can be described as positive, neutral or negative/adverse with varying degrees of significance as shown in Figure 1-2.

This EIAR follows the guidance set out in the Environmental Protection Agency's (EPA) *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (2022)[5] in relation to describing accurately the full range of likely significant effects, (see Figure 1-3), taken directly from these Guidelines, provides a classification of significance of effects. The term *impacts* is used interchangeably to refer to effects.

1.7 Limitations and Assumptions

The limitations and assumptions related to the proposed FRS are as follows:

Cultural Heritage- Terrestrial archaeological testing has not been caried out due to poor ground conditions at pre planning stage. A wade survey and metal detection survey were carried out and were included within an Underwater Archaeological Impact Assessment submitted to National Monuments Service. Where terrain proves suitable, a programme of archaeological geophysics shall be undertaken under licence from the National Monuments Service focusing on greenfield areas (Areas 3–7, 9 and 10, shown in Figure 11-16 of Chapter 11) including the possible earthwork site in Area 5. Based on the results of the geophysical survey, a programme of licenced archaeological testing shall be undertaken in advance of the Construction Phase. The results of archaeological testing will inform the requirement for additional archaeological mitigation measures which may include avoidance, archaeological excavation, or archaeological monitoring. The possible earthworks (CHS14) shall be subject to archaeological testing to asses their nature, extent and archaeological potential, and to inform required mitigation during Construction Phase.

[5] Environmental Protection Agency (May 2022) *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.* Environmental Protection Agency, Ireland

Quality of Effects	**Positive Effects** - A change which improves the quality of the environment
	Neutral Effects - No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
	Negative/Adverse Effects - A change which reduces the quality of the environment.
Describing the Significance of Effects	**Imperceptible** - An effect capable of measurement but without significant consequences.
	Not Significant - An effect which causes noticeable changes in the character of the environment but without significant consequences.
	Slight Effects - An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
	Moderate Effects - An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
	Significant Effects - An effect which, by its character, magnitude, duration or intensity, alters a sensitive aspect of the environment.
	Very Significant - An effect which, by its character, magnitude, duration or intensity, significantly alters most of a sensitive aspect of the environment.
	Profound Effects - An effect which obliterates sensitive characteristics.
Describing the Extent and Context of Effects	**Extent** - Describe the size of the area, the number of sites and the proportion of a population affected by an effect.
	Context - Describe whether the extent, duration or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)
Describing the Probability of Effects	**Likely Effects** - The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.
	Unlikely Effects - The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.
Describing the Duration and Frequency of Effects	**Momentary Effects** - Effects lasting from seconds to minutes.
	Brief Effects - Effects lasting less than a day.
	Temporary Effects - Effects lasting less than a year.
	Short-term Effects - Effects lasting one to seven years.
	Medium-term Effects - Effects lasting seven to fifteen years.
	Long-term Effects - Effects lasting fifteen to sixty years.
	Permanent Effects - Effects lasting over sixty years.
	Reversible Effects - Effects that can be undone, for example through remediation or restoration.
	Frequency of Effects - Describe how often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually).
Describing the Types of Effects	**Indirect Effects** - Effects on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative Effects - The addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects.
	'Do-nothing Effects' - The environment as it would be in the future should the subject project not be carried out.
	'Worst-case' Effects - The effects arising from a project in the case where mitigation measures substantially fail.
	Indeterminable Effects - When the full consequences of a change in the environment cannot be described.
	Irreversible Effects - When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
	Residual Effects - The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic Effects - Where the resultant effect is of greater significance than the sum of its constituents (e.g. combination of SOx and NOx to produce smog).

Figure 1-2: Description of Effects (EPA 2022)[6]

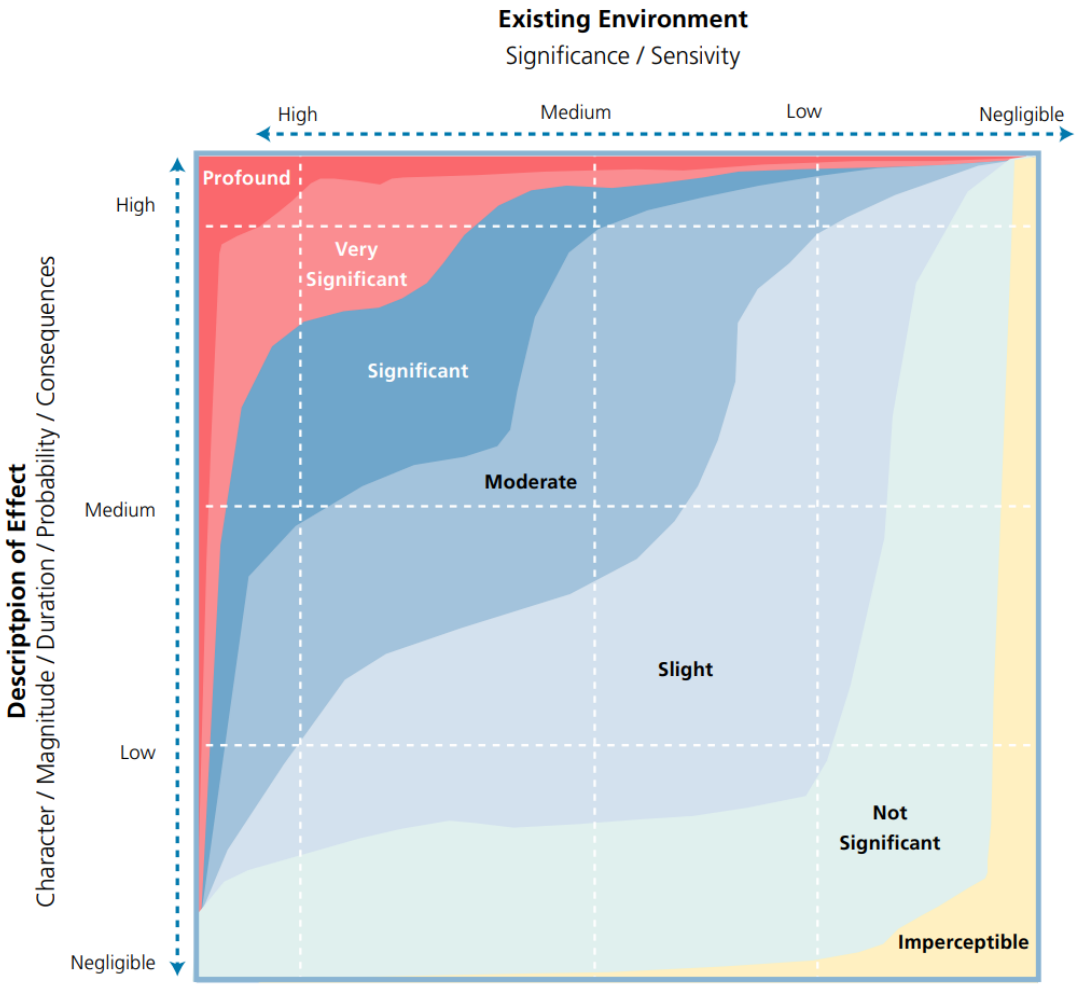

Figure 1-3: Determining the significance of effects (EPA, 2022) [5]

[6] Environmental Protection Agency (May 2022) *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.* Environmental Protection Agency, Ireland

2 Legislation and Planning Policy

2.1 Introduction

This section of the Environmental Impact Assessment Report considers the proposed development in the context of national, regional, and local planning policy, and the legislation governing the proposed works.

2.2 European Union (EU) Law and Policy

EU 'Floods' Directive 2007

The EU Directive[7] on the assessment and management of flood risk, often referred to as the 'Floods Directive', came into force in 2007 and works in tandem with the Water Framework Directive for the protection of water quality.

The requirements of the EU 'Floods' Directive, have been implemented in Ireland as the assessment and management of floods through the Catchment Flood Risk Assessment and Management (CFRAM) Programme. Under CFRAM the Office of Public Works has published a series of documents and policies and plans that set out flood risk measures and the most at-risk communities. CFRAM recommends a proactive approach to flood risk and protection.

In terms of major Flood Relief Schemes, works are typically designed and built to a standard that protects against the 1 in 100-year flood event, and for coastal areas the 1 in 200 year flood event. As the areas subject of this EIAR are highly susceptible to fluvial flooding the 1 in 100-year standard is considered appropriate for these works. Consistent with the Directive, the proposed development is defined to provide protection to properties in the study area from the 1 in 100 year fluvial flood event.

Kilkee is detailed within the Flood Risk Management Plan for the Shannon Estuary North & Mal Bay, this is set out in detail in section 2.5. The plan sets out specific details in relation to flood risk management for the southwest region to meet Ireland's obligations under the 2007 EU 'Floods' Directive.

2.3 Planning Legislation and Policy Provisions

This section sets out the relevant guidance and policy objectives that have been considered in relation to the proposed flood defence works at Kilkee. Firstly, this section considers the legislation governing the Irish planning system, specifically as it relates to flood management works, then moving on to discuss the broad level national strategic objectives, guidelines and policies adopted by the Irish Government in relation to spatial development, physical infrastructure and climate change agreements. Secondly, this section provides an overview of the regional context of the proposed works, and lastly will consider local objectives and development standards as indicated within the city development plan.

The Planning and Development Act 2000 (as amended), and the Planning and Development Regulations 2001, as amended

The Planning and Development Act 2000[8] (as amended) forms the basis of the Irish planning system, setting out the detail for planning guidelines, obtaining planning permission and the process for Environmental Impact Assessment.

CCC wishes to prepare a Planning Application to An Bord Pleanála, under Section 175, of the Planning and Development Act, 2000 (as amended), for the construction of a Flood Relief Scheme for Kilkee, County Clare.

The prescribed classes of development and thresholds that trigger a mandatory Environmental Impact Assessment (EIA) are set out in Schedule 5 of the Planning and Development Regulations, 2001[9], as amended. The most relevant criterion is Class 10 of Part 2 of Schedule 5 which states:

[7] The European Union (October 2007), *European Union Floods Directive 2007/60/EC*

[8] Planning and Development Act 2000, S.I. No. 30/2000

[9] Planning and Development Regulations 2001, *S.I. No.600/2001*

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> *(f) (ii) Canalisation and flood relief works, where the immediate contributing sub-catchment of the proposed works (i.e. the difference between the contributing catchments at the upper and lower extent of the works) would exceed 100 hectares or where more than 2 hectares of wetland would be affected or where the length of river channel on which works are proposed would be greater than 2 kilometres.*

The requirements in respect of Environmental Impact Assessment are contained within the Planning Act and these are described in detail in Chapter 1 Introduction.

National Policy

National Planning Framework (NPF)

The NPF[10] sets out a framework of policy objectives to help Ireland achieve its long-term sustainable goals. The strategic plan focuses on integrating Ireland's economic development, spatial planning, infrastructure planning and social considerations. It promotes environmentally focused planning at local level to tackle climate change.

The plan aims to align itself with the UN Sustainable Development Goals, by ensuring that the decision process will safeguard the needs of future generations. These objectives are integrated as part of the National Strategic Outcomes (NSOs) in areas such as climate action, sustainable cities and innovation and infrastructure.

National Strategic Outcome 9 outlines the urgency of upgrading and investing in water management and environmental resources. In which it states;

Coordinate EU Flood Directive and Water Framework Directive implementation and statutory plans across the planning hierarchy, including national guidance on the relationship between the planning system and river basin management. Local authorities, DHPLG, OPW and other relevant Departments and agencies working together to implement the recommendations of the CFRAM programme will ensure that flood risk management policies and infrastructure are progressively implemented.

Flood relief measures are further highlighted under Section 9 of the NPF, titled Realising our Sustainable Future. It is envisioned that planning will play a vital role in mitigating development in inappropriate or vulnerable areas and will aid the delivery and design of necessary infrastructure in our towns and cities.

National Policy Objective 57 emphasises the importance of flood relief works as part of the national agenda for climate adaption.

National Policy Objective (NPO) 57:

> *Enhance water quality and resource management by:*

- Ensuring flood risk management informs place-making by avoiding inappropriate development in areas at risk of flooding in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities.
- Ensuring that River Basin Management Plan objectives are fully considered throughout the physical planning process.
- Integrating sustainable water management solutions, such as Sustainable Urban Drainage (SUDS), non-porous surfacing and green roofs, to create safe places.

The proposed development will deliver flood relief works to protect Kilkee from flood events, the proposed works have been developed in a manner which is consistent with objective 57 of the NPF.

The Planning System and Flood Risk Management 2009

The Office of Public Works in conjunction with the Department of Environment, Heritage and Local Government (DEHLG) published a set of guidelines[11] in relation to flood risk management. Subject to which, the plan advocates a proactive approach to prevent flooding from occurring. This includes, for

[10] The Government of Ireland (December 2020), *The National Planning Framework – Project Ireland 2040.*

[11] Department of Housing, Local Government and Heritage (November 2009), *The Planning System and Flood Risk Management - Guidelines for Planning Authorities*

example, adopting general policies for protection, improve or restore floodplains and the upgrading of flood barriers. Under these guidelines Planning Authorities have a key role in the delivery of effective measures, policies and infrastructure to minimise the risk of flooding.

In this regard, the proposed development by CCC acknowledges the key role of the Council in minimising flood risk.

Climate Change Sectoral Adaptation Plan for Flood Risk Management, 2015

The Climate Change Sectoral Adaptation Plan for Flood Risk Management, 2015[12], sets out the policy on climate change adaptation of the OPW, the lead agency for flood risk management in Ireland, based on a current understanding of the potential consequences of climate change for flooding and flood risk in Ireland, and the adaptation actions to be implemented by the OPW and other responsible Departments and agencies in the flood risk management sector.

Our Sustainable Future: Framework for Sustainable Development

The Our Sustainable Future: Framework for Sustainable Development[13] paper sets out the national vision to enhance Ireland's sustainable future and sets out the challenges and targets to be adhered to. In terms of flood management and flood risk assessment, the framework acknowledges this as one of the largest challenges to be addressed in the coming years. As most cities and towns on the island have developed along rivers and coastal areas, the majority of urban centres are exposed to flood risk. As national economic prosperity is heavily reliant on the success of cities, and towns, the adoption of flood relief and protection is vital for future growth and will require the integration of comprehensive infrastructure as part of the built environment.

The proposed development, which will provide flood relief in Kilkee, County Clare, is aligned with this policy.

Climate Action Plan 2023

Annually, the Climate Action Plan[14] is published by the Government of Ireland which sets out carbon budgets and sectoral emissions ceilings and sets a roadmap for taking decisive action to halve our emissions by 2030. The Climate Action Plan 2023 identifies the role flood risk mitigation can play in how Ireland adapts as a result of climate change and in mitigating the implications of such. The Plan sets out the Office of Public works will seek to support the development of appropriate flood mitigation and adaption schemes.

Regional Policy

Mid-West Area Strategic Plan (MWASP) 2012-2030

The aim of the Mid-West Area Strategic Plan (MWASP) 2012-2030[15] is to facilitate and inform the implementation of the statutory processes, the constituent Planning Authorities of the Mid-West Region (CCC, Limerick City and County Council and Tipperary County Council) and the Mid-West Regional Authority have developed a non-statutory, 20-year, integrated land-use and transport strategy for the region. This will provide evidence base which can inform transport and planning policy and infrastructure investment decisions in the Region to 2030. The MWASP was prepared to secure the following overall objective:

- Prioritisation of investment in the region;
- Strengthening the Limerick/Shannon Gateway;
- Create and support a well-defined hierarchy of settlement;
- Deliver the required transport infrastructure to meet the Plan objective; and
- Provide economic review and direction of the region.

[12] The Office of Public Works (January 2017), *Climate Change Sectoral Adaptation Plan*

[13] Department of Environment, Community and Local Government (2012), *Our Sustainable Future: A Framework for Sustainable Development in Ireland*

[14] Department of the Environment, Climate and Communications (December 2022), *Climate Action Plan 2023.*

[15] Mid-West Regional Authority (2012), *The Mid West Area Strategic Plan (MWASP) 2012-2030*

The plan recognises the role rural development will play in the overall development of the region, noting that there is a requirement to invest in key infrastructural projects which will meet the needs of the region. Additionally, the plan acknowledges the role the tourism industry places in the economic profile of the region and seeks to ensure that the tourism sector continues to be a key area of growth in the economy of the Mid-West.

In terms of delivering and implementation, the plan acknowledges that appropriate flood risk and mitigation measures and objectives must be delivered, in this respect the works proposed in Kilkee are consistent with the objectives of the plan.

Regional Spatial & Economic Strategy, Southern Region

The Regional Spatial and Economic Strategy (RSES)[16] for the Southern Region was adopted in 2020. The plan provides a long-term regional level strategic plan for physical growth, economic investment and social development for the Southern Region and seeks to align national goals set out in the NPF with local considerations, subject to which flooding is identified as a key challenge facing cities and towns in the region.

The RSES supports measures that address climate action, as outlined in the NPF, these will include Renewable Energy, Sustainable Transport and Climate Resilience through Flood Defence. The latter to also provide for Flood Risk Management and to help reduce vulnerability in known flood zones.

The following objectives contained within the RSES are of note:

Regional Policy Objective (RPO) 4 Infrastructure Investment:

> *Infrastructure investment shall be aligned with the spatial planning strategy of the RSES.*

RPO 5 Population Growth and Environmental Criteria:

> *Increased population growth should be planned with regard to environmental criteria, including:*

Assimilative capacity of the receiving environment;

- *Proximity of Natura 2000 sites and potential for adverse effects on these sites, and their conservation objectives;*
- *Areas with flood potential.*

RPO 9 Holistic Approach to Delivering Infrastructure:

> *It is an objective to ensure investment and delivery of comprehensive infrastructure packages to meet growth targets that prioritise the delivery of compact growth and sustainable mobility as per the NPF objectives including: Water services, digital, green infrastructure, transport and sustainable travel, community and social, renewable energy, recreation, open space amenity, climate change adaptation and future proofing infrastructure including flood risk management measures, environmental improvement, arts, culture and public realm.*

RPO 54 Tourism and the Environment:

> *Development of new or enhanced tourism infrastructure and facilities should include an assessment of the environmental sensitivities of the area including an Environmental Impact Assessment (EIA); Appropriate Assessment (AA) and Strategic Flood Risk Assessment (SFRA) if required in order to avoid adverse impacts on the receiving environment. Where such tourism infrastructure or facilities are developed, the managing authority/agency should ensure that effective monitoring protocols are put in place to monitor and assess the ongoing effect of tourism on sensitive features with particular focus on natural, archaeological and built heritage assets.*

RPO 89 Building Resilience to Climate Change:

> *It is an objective to support measures to build resilience to climate change throughout the Region to address impact reduction, adaptive capacity, awareness raising, providing for nature-based solutions and emergency planning.*

[16] Southern Regional Assembly (January 2020), *Regional Spatial & Economic Strategy for the Southern Region.*

Local Authorities and other public agencies shall continue to work with the Office of Public Works to implement the Flood Risk Management Plans and address existing and potential future flood risks arising from coastal, fluvial, pluvial, groundwater and potential sources of flood risk.

RPO 113 Floods Directive:

It is an objective to support, at a regional level, the implementation of the Floods Directive to manage flood risks. It is an objective to encourage collaboration between local authorities, the OPW and other relevant Departments and agencies to implement the recommendations of the Catchment Flood Risk Assessment and Management (CFRAM) programme to ensure that flood risk management policies and infrastructure are progressively implemented.

RPO 114 Flood Risk Management Objectives:

It is an objective to:

- *Ensure that the flood risk management objectives of the Flood Risk Management Plans are fully considered in the development of planning policy and decision-making by local authorities so that flood risk is a key driver in the identification of suitable locations for new development, considering the CFRAM flood maps and other flood maps as available.*
- *Ensure that developments in upland areas, such as wind farm developments, roadway construction, peatland drainage and forestry proposals, provide sufficient storm water attenuation to avoid the occurrence of river erosion or flooding downstream subject to hydrological and ground/peat stability assessments.*

RPO 115 Flood Risk Management Plans:

Development and Local Area Plans in the Region should take account of and incorporate the recommendations of the Flood Risk Management Plans, including planned investment measures for managing and reducing flood risk. Natural Water Retention Measures should be incorporated where appropriate in consultation with the OPW and other relevant stakeholders.

RPO 115 Planning System and Flood Risk Management:

Consideration must be given to future appropriate land-use policies in accordance with the requirements of the Guidelines, "The Planning System and Flood Risk Management 2009". Strategic and local flood risk assessments and plans should be prepared where appropriate, which should include consideration of potential impacts of flood risk arising from climate change. It is an objective to avoid inappropriate development in areas at risk of flooding and integrate sustainable water management solutions (such as SUDS, non-porous surfacing and green roofs) to create safe places in accordance with the Guidelines.

RPO 116 Flood Risk Management and Biodiversity:

It is an objective to avail of opportunities to enhance biodiversity and amenity and to ensure the protection of environmentally sensitive sites and habitats, including where flood risk management measures are planned. Plans and projects that have the potential to negatively impact on Natura 2000 sites are subject to the requirements of the Habitats Directive.

RPO 117 Flood Risk Management and Capital Works:

It is an objective to support investment in the sustainable development of capital works under the flood capital investment programme and Flood Risk Management Plans developed under the CFRAM process.

RPO 118 Flood Relief Schemes:

It is an objective to:

- *Support investment in the sustainable development of Strategic Investment Priorities under the National Development Plan 2018-27 and to ensure that flood risk assessment for all strategic infrastructure developments is future-proofed to consider potential impacts of climate change;*
- *Support investment in subsequent projects by capital spending agencies to deliver flood relief schemes under the National Strategic Outcome, Transition to a Low Carbon and Climate Resilient Society. Such projects should be future proofed for adaptation to consider potential impacts of climate change.*

- *Ensure that all infrastructure and energy providers/operators provide for adaptation measures to protect strategic infrastructure (including roads, railways, ports and energy infrastructure) from increased flood risk associated with climate change.*

Flooding is a risk to infrastructure, homes, businesses and the economic health of Kilkee. The RSES sets out two principal approaches for mitigation and adaption works, as set out in the policies above, the works subject of this EIAR will reduce the existing vulnerabilities and deliver upgrades to the flood defences, consistent with the RSES.

Shannon Estuary North & Mal Bay Flood Risk Management Plan (CFRAM)

The CFRAM Programme, prepared by the OPW, has examined the flood risk, and possible measures to address the risk, in 300 communities throughout the country at potentially significant flood risk. The Flood Risk Management Plan (the 'Plan') for the Shannon Estuary North & Mal Bay River Basin[17] sets out the feasible flood risk mitigation measures for the river basin network which includes Kilkee.

The study outlines that community level mitigation measures are required in Kilkee, noting the construction of new flood defence walls, development and extension of embankments and the addition of culverts may be required.

In this respect, the proposed development is consistent with the findings of the study, to provide flood relief measures at critical locations in Kilkee.

Local Policy

Clare County Development Plan 2023-2029

The Clare County Development Plan 2023-2029[18] was adopted in March 2023, with a variation in April 2023. The Clare County Development Plan sets out the policies and objectives, with regard to both National and Regional planning policies, the policies and objectives which will guide the development of the Clare environs to 2029.

The Plan identifies the role CCC has in the mitigation and adaptation to Climate Change with a goal to *developing 'a county that is resilient to climate change, plans for and adapts to climate change and flood risk, is the national leader in renewable energy generation, facilitates a low carbon future, supports energy efficiency and conservation and enables the decarbonisation of our lifestyles and economy'.*

With regard to this, chapter two of the Plan sets out the policies and objectives which relate to Climate Action, this includes:

CDP 2.1 Climate Action:

It is an objective of Clare County Council:

- *To support the implementation of the National Climate Action Plan 2023 and the National Climate Change Adaptation Framework (and any subsequent versions thereof), and to work with the Regional Climate Action Offices to enable County Clare to transition to a low carbon and climate resilient county;*
- *To adopt sustainable planning strategies through integrating land use and transportation and by facilitating mixed use developments as a means of supporting national targets of climate policy mitigation and adaptation objectives, and reducing our carbon footprint and greenhouse gas emissions; and*
- *To raise awareness and understanding of the impacts of climate change on both the local economy and communities in the county, and the ways communities can increase their response and grow their resilience to these impacts.*

CDP 2.2 Climate Change Mitigation, Adaptation and Resilience:

It is an objective of Clare County Council:

- *To support the implementation of the Clare Climate Change Adaptation Strategy 2019-2024 (and any subsequent versions);*

[17] The Office of Public Works (2012), *Shannon Estuary North & Mal Bay Flood Risk Management Plan*

[18] Clare County Council (August 2023), *The Clare County Development Plan 2023-2029.*

- *To promote measures that build resilience to climate change to address impact reduction, adaptive capacity, awareness raising, providing for nature-based solutions and emergency planning;*
- *To raise awareness of issues relating to climate change and climate change adaptation during the lifetime of this plan;*
- *To liaise, collaborate and work in partnership with the relevant government approved sectors in relation to initiatives and activities across the county; e) To support the Ennis 2040 Spatial and Economic Strategy and its aspiration for Ennis to become Irelands first climate adaptive town; and*
- *To facilitate and support the relevant stakeholders and enterprises in the progression of advancements in climate adaptation solutions and renewable energy generation and technologies.*

CPD 2.3: Severe Weather Emergency Response Plans:

It is an objective of Clare County Council:

- *To support the implementation of the Flood Emergency Plan for the county with specific flood response plans for identified areas and of a Business Continuity Plan which identifies, and addresses impacts associated with extreme weather events on all functions/services of the Local Authority.*

CPD 2.6 Flood Risk Assessment and Management:

It is an objective of Clare County Council to:

- *To ensure development proposals have regard to the requirements of the SFRA and Flood Risk Management Guidelines; and where required are supported by an appropriately detailed hydrological assessment / flood risk assessment.*
- *To ensure that flood risk assessments include consideration of potential impacts of flooding arising from climate change including sea level rise and coastal erosion;*
- *To integrate sustainable water management solutions, prioritising nature-based solutions (such as SuDS, non-porous surfacing and green roofs) into development proposals;*
- *To include Natural Water Retention Measures (NWRMS) where appropriate in consultation with the Office of Public Works (OPW) and other relevant stakeholders:*
- *To support investment in the sustainable development of capital works under the Flood Capital Investment Programme and Flood Risk Management Plans developed under the Catchment Flood Risk Assessment and Management (CFRAM) process; and*
- *To ensure that potential future flood information obtained/generated through the Development Management process is used to inform suitable adaptation requirements in line with the Guidelines for Planning Authorities on Flood Risk Management (DoECLG & OPW, 2009).*

CPD 2.8 Floods Directive and CFRAMS:

It is an objective of Clare County Council:

- *To support the implementation of the EU Floods Directive 2007/60/EC to manage flood risks; and*
- *To implement the recommendations of the Catchment Flood Risk Assessment and Management Study (CFRAMS) programme as it relates to County Clare and to ensure that flood risk management policies and infrastructure are progressively implemented.*

CPD 2.10 Flood Relief Schemes:

It is an objective of Clare County Council:

- *To support investment in subsequent projects by capital spending agencies to deliver flood relief schemes under the National Strategic Outcome, Transition to a Low Carbon and Climate Resilient Society. Such projects should be future proofed for adaptation to consider potential impacts of climate change; and*
- *To require that all infrastructure and energy providers/operators provide for adaptation measures to protect strategic infrastructure (including roads, railways, ports and energy infrastructure) from increased flood risk associated with climate change.*

CPD 2.13 Maintenance of Rivers:

It is an objective of Clare County Council:

- *To encourage and facilitate the maintenance of rivers and waterways by statutory authorities and the cleaning of drains in urban areas where appropriate, subject to the requirements of Objective CDP3.1, the OPW Best Practice Guidelines and the Wildlife Act.*

The proposed works and subject of this EIAR, seeks to deliver works which would be entirely consistent with the climate change adaptation and flood risk management objectives outlined in the County Development Plan.

Within the settlement hierarchy of the Plan, Kilkee is identified as a small town. The Plan outlines that small towns are fundamental to the overall development and success of the Clare region, playing an essential role in providing employment, essential services to a wider rural hinterland population and providing for an expansive tourism industry within the region.

The overall objective for the development of small towns is set out in objective CPD 4.6 below.

CPD 4.6 Small Towns:

It is an objective of Clare County Council:

- *To ensure that the small towns throughout the county continue to act as important local service centres that maintain sustainable communities, help to ensure a good quality environment, provide public transport to the main centres, and provide a high quality of life for those who live in the vicinity;*
- *To work with the relevant bodies and to seek investment for the timely and sustainable delivery of holistic infrastructure, to enhance the levels of amenity and design quality and to regenerate and rejuvenate the Small Towns throughout the county;*
- *To ensure that future growth is incremental and balanced in nature, and is relative and appropriate to the scale, size and character of the small towns and to seek to achieve centre out compact growth;*
- *To seek investment in the sustainable development of a "New Homes in Small Towns and Villages" initiative in the County and the provision of services and serviced sites to create "build your own home" opportunities within the existing footprint of small towns; and*
- *To monitor the cumulative effect of grants of planning permission on available wastewater capacity, where connection to a public wastewater treatment plant is included as part of a development proposal.*

Volume three of the County Development Plan outlines the plans and policies which relates to the settlements of West Clare, including Kilkee. The settlement plan outlines that there are areas of the town which are at flood risk, with past flooding events experienced, the plan notes that the development of a flood relief scheme within the town is underway.

It is an objective of the Plan to support the development of a flood relief scheme in the town.

The flood extents of the town are illustrated in the Strategic Flood Risk Assessment which accompanies the Clare County Development Plan. The extent of the areas impacted by flood zones A and B are displayed in Appendix A.

The proposed works are to be developed along two streams, the Victoria Stream to the southwest of the town and the Atlantic Stream to the southeast of the town. The land use objectives of the lands contained within the areas of these works are outlined below.

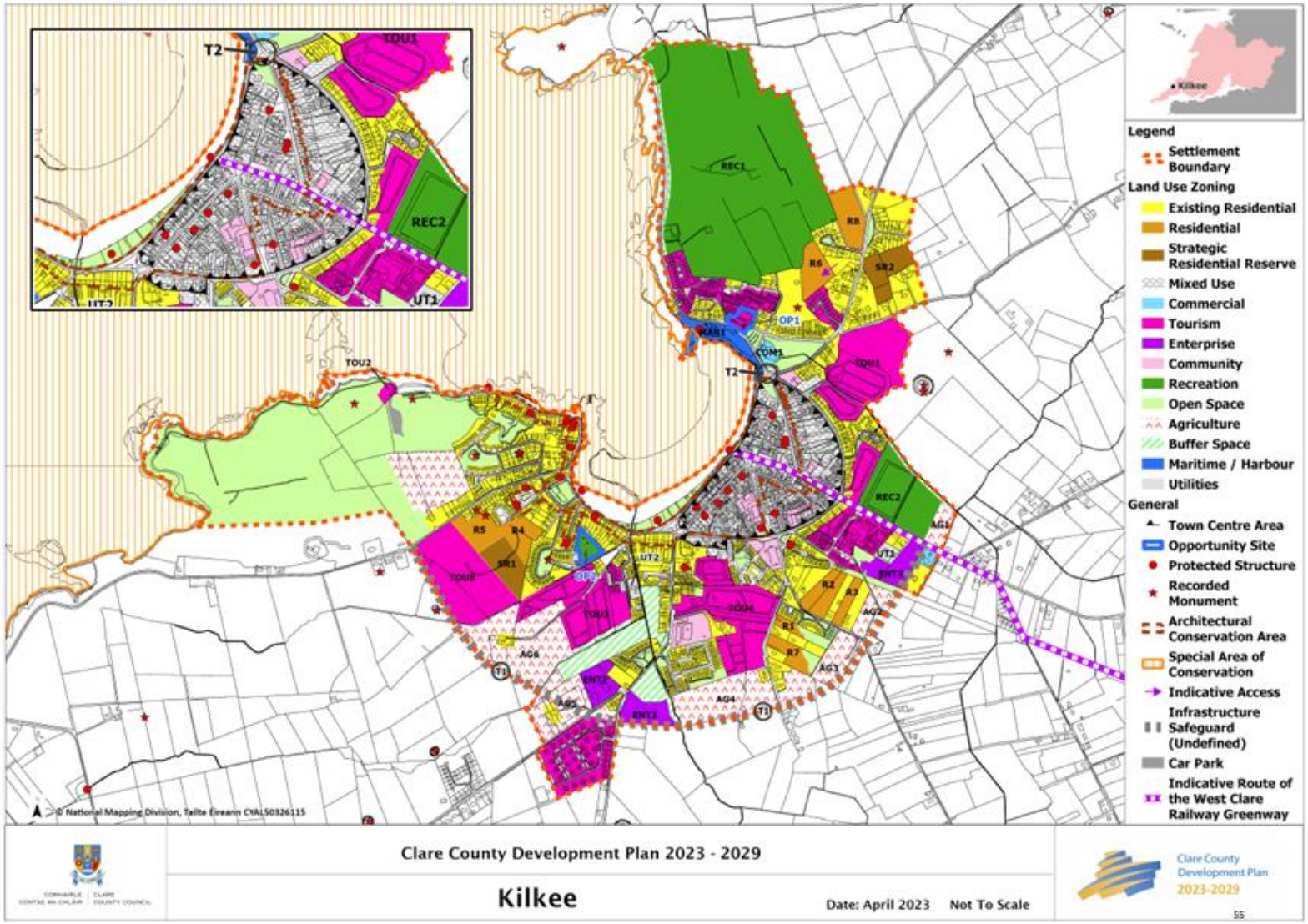


Figure 2-1: Land Use Zoning Objectives of Kilkee[19]

[19] Clare County Council (August 2023), The Clare County Development Plan 2023-2029.

Table 2-1: Land Use Zoning Objectives for Lands Adjoining the Atlantic Stream and Atlantic Stream Outfall Works

Area:	Land Use Zoning Objective(s):
Lands to the rear of the Kilkee Bay Hotel	Open Space
Sandpark Caravan Park	Tourism
Lands adjacent to Sandpark Caravan Park and the N67	Existing Residential
Kilkee Park	Open Space
WaterWorld	Commercial
Waterfront/Beach Steps	Marine/Harbour

Table 2-2: Land Use Zoning Objectives for lands adjoining the Victoria Stream works

Area:	Land Use Zoning Objective(s):
Lands adjacent to Carrigaholt Road	Buffer Space
Lands to the rear of Cunninghams Caravan Park	Agriculture
Lands abutting Well Road and Marine Parade	Existing Residential Tourism

As outlined in Table 2-1 and Table 2-2 above, there are a number of land use zoning objectives on the lands of the proposed schemes as well as the lands adjacent. The objective of these land use zonings is as follows:

Agriculture:

This zone is for the use of land for agricultural purposes and farming-related activities and to preserve the amenity of the town or village setting.

Buffer Space:

Buffer spaces are intended to provide a buffer of undeveloped land for the conservation of biodiversity, visual amenity or green space.

Commercial:

The use of land zoned for 'commercial' purposes shall be taken to include the use of the lands for commercial and business uses including offices, service industry, warehousing and the facilitation of enterprise/retail/office type uses as appropriate.

Existing Residential:

The objective for land zoned 'existing residential' is to conserve and enhance the quality and character of the areas, to protect residential amenities and to allow for small scale infill development which is appropriate to the character and pattern of development in the immediate area and for uses that enhance existing residential communities.

Maritime/Harbour:

The use of land for maritime/harbour related activity shall be taken to include the use of land, including harbours and piers, that will facilitate small-scale, water-based commercial or tourism activity and associated facilities including carparking facilities.

Open Space:

It is intended that lands zoned 'open space' will be retained as undeveloped open space, mainly for passive open space related activities.

Tourism:

Land zoned for tourism development shall be used for a range of structures and activities which are primarily designed to facilitate tourism development and where uses are mainly directed at servicing

A manner of different development types are permitted under these land use zonings. The proposed works, which are the subject of this EIAR will allow CCC to meet the objectives of these land use zonings in accordance with the objectives set out in the Clare County Development Plan 2023-2029.

The town Centre of Kilkee has been designated as an Architectural Conservation Area (ACA) within the County development Plan. The proposed works will not negatively impact on this designation.

Volume 4 of the County Development sets out the structures which have been designated as protected structures under the Record of Protected Structures (RPS) within the Plan. There is 1no. structure listed on the RPS which is adjacent to the proposed works on the Victoria Stream. The Bandstand, RPS No: 572, is located adjacent to the Victoria Stream outlet at Kilkee Beach. The proposed works will not have any negative impact on this structure.

In addition to this, there is 1no. of site which is designated as a National Monument, a Holy Well, REF: CL056-042. This is located along the Well Stream tributary. The proposed works will not have a negative impact on the integrity or value of the site.

The area of sea directly off the Kilkee beach is designated as the Kilkee Reefs Special Area of Conservation (SAC) and is situated downstream of both the Victoria and Atlantic Streams. The Kilkee Reefs SAC is protected under the EU Habitats Directive and are of international importance for Large Shallow Inlets and Bays, Reefs and Sea Caves which provide habitats to a number of species.

In this respect, a Natura Impact Assessment (NIS) has been prepared and the conclusion thereby is: the proposed development is appropriately balanced and does not impact the sensitive nature of the SAC.

2.4 Planning History

There are a number of historical planning applications in the vicinity of works. Table 2-3 and Table 2-4 overpage set out the recent planning history associated with the locations of works in Kilkee.

Table 2-3: Planning History for Lands Adjacent to Victoria Stream[20]

REF	Location	Development	Decision
21355	Well Road, Kilkee	Permission to extend the existing holiday park by way of the provision of an additional twenty no. serviced mobile home sites along with associated roads and services	Refused
17754	Victoria Park, Kilkee	Permission to carry out the following works within the existing Kilkee Pumping Station site at Victoria Park, Kilkee: a) construct an electrical substation building with client switch room/metering room (33sq.m) and associated site works with an entrance off Victoria park, (b) construct a standby generator building (39sq.m) and associated site works and (c) construct a welfare building with toilet and office (20 sq.m) and associated site works	Grant
14167	Well Road, Kilkee	Permission to construct first floor Manager's accommodation to roof of existing Caravan Park Utility Building with change of use of existing ground floor office to accommodation stairwell	Grant
18141	5 Wellfield, Kilkee	Permission for the removal of existing single storey wc and lobby to side of house; Construction of Single storey extension to rear and side of existing house; associated site works	Grant
14779	8 Victoria Court, Kilkee	Permission to replace attic Velux windows with balcony to rear elevation	Grant
14780	9 Victoria Court, Kilkee	Permission to replace attic Velux windows with balcony to rear elevation	Grant
Kilkee Sewerage Scheme	Victoria Park, Kilkee, Co. Clare	U**E** is progressing the design stage of a project to install a new wastewater treatment plant in Kilkee and end the discharge of raw sewage to the marine environment. This project is currently at design stage and, following completion of site selection and land acquisition as well as a successful planning stage, Uisce Éireann expects to commence works in 2024 on this project.	Construction expected to commence in 2024

[20] Clare County Council (December 2023), *Online Planning Register.*

Table 2-4: Planning History for Lands Adjacent to Atlantic Stream Works.[20]

REF	Location	Development	Decision
18812	Kilrush Road, Kilkee	Permission to construct an extension to the existing clubhouse building to consist of a new main entrance, referees room, gym and storage facilities, along with all associated site works	Grant
16981	Kilrush Road, Kilkee	Permission to construct a new stone faced low boundary wall to the front of the GAA Grounds and to construct a new block boundary wall and "Welcome" sign to the Eastern boundary of the front car park along with all associated site works	Grant
16488	Dough, Kilkee	Permission to develop the following: 67 serviced camping pitches, 17 serviced motorhome (RV) pitches, 12 serviced Pod pitches, 0.8ha of sports facilities including two all-weather playing pitches and a children's playground, a site management office, 6 No. parking spaces for members of the public to visit the historic earthen fort, ancillary roads and ground works including connection to public services, landscaping and to relocate boundary wall, install public lighting and foot-path at this location	Refused
211280	Milltown Road, Kilkee	Permission to retain constructed dwelling house, shed, entrance, boundaries and connection to existing services plus all ancillary site works	Grant
21884	Kilkee Sub Aqua Club, Pound Street, Kilkee	Permission to 1 to demolish existing Dive Centre Building and close up existing entrance; 2 PERMISION to construct new Dive Centre Building consisting of 2 No. Rib Storage areas, changing area, toilets office and briefing room; 3. PERMISSION for new vehicular entrance, internal road, footpaths and parking spaces and ancillary site works, including connection to public sewer / services	Grant
148004	The Strandline, Kilkee	Permission for development which shall entail the following construction works: 1. Careful removal and reconstruction of a forty five metre long portion of existing damaged stone seawall, which is a Protected Structure, as per the RPS contained in the Clare County Development Plan 2011 - 2017 (as varied), on new foundations at the northern end of the Strand Line, 2. Construction of stabilisation works consisting of a new forty five metre long beachside terrace with stone facing in front of the section of existing stone seawall to be re-constructed, 3. Construction of stabilisation works consisting of a new eighty metre long beachside terrace with stone facing, in front of a damaged section of stone seawall between two existing beachside terraces, which will be retained, 4. New pedestrian access points from footpath at the Strand Line and from beach onto new beachside terraces, 5. Provision of new steel railing and paving to new terraces and 6. Reconstruction of damaged roadway, L-2021 at the Strand Line, including new surfacing, lining, kerbing, footpath, lighting, and all other associated works. The development has been the subject of an Appropriate Assessment Screening in accordance with Article 6(3) of the EU Habitats Directive (Directives 92/43/EEC) and the Planning and Development Acts 2000 as amended.	Grant

2.5 Environmental Legislation and Policy

This assessment has regard to the following policy documents and guidelines.

- Wildlife Acts 1976-2021, and Wildlife (Amendment) Act 2023;
- European Communities (EC) (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011 (as amended) hereafter the ‘Birds and Habitats Regulations’;
- EU Birds Directive 2009/147/EEC;
- EU Habitats Directive 92/43/EEC (as amended);
- EU EIA Directive (2014/52/EU);
- Flora (Protection) Order, 2022;

- Inland Fisheries Act 2010 encompassing Fisheries Consolidation Act, 1959-2021 (as amended)
- EC Environmental Objectives (Surface Water) Regulations 2009 (S.I. No. 272 of 2009)
- National Biodiversity Action Plan 2023 – 2030
- Shannon River Basin District, Shannon Estuary North Catchment Summary WFD Cycle 3 actions
- Towards A Better Kilkee A Town Improvement & Economic Development Strategy 2014-2024
- Clare County Council's Biodiversity Action Plan 2017-2023
- Policies relating to Invasive Species, including species listed under S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011.
- EU Biodiversity Strategy, 2030.

2.6 Conclusion

Having regard to the provisions of:

- EU 'Floods' Directive 2007
- The National Planning Framework
- The Regional Spatial and Economic Strategy for the Southern Region
- The Planning System and Flood Risk Management 2009
- Climate Change Sectoral Adaptation Plan for Flood Risk Management, 2015
- Our Sustainable Future: Framework for Sustainable Development
- National Climate Action Plan
- Mid-West Area Strategic Plan (MWASP) 2012-2030
- Shannon Estuary North & Mal Bay Flood Risk Management Plan
- Clare County Council Development Plan 2023-2029

It is concluded that the proposed development would be in compliance with national, regional and local planning policy provisions and would not seriously injure the amenities of the area or significantly impact the current land use objectives in Kilkee and would, therefore, be in accordance with the proper planning and sustainable development of the area.

3 Examination of Alternatives

This chapter of the EIAR provides an overview of the alternative approaches, locations, designs, and concepts that have been considered in the Options Report[21] for the FRS. It describes the process of selecting the Preferred Option based on the engineering, design, and environmental criteria. The goal of this FRS is to protect properties and infrastructure in Kilkee considering fluvial flooding only. Alternatives are selected to comply with the aim, providing feasible engineering and design with the lowest impact in the environment.

3.1 Alternatives Considered

Alternative options were considered in the early phases of the development. The consideration of alternatives followed a two-stage approach. The initial phase included screening of potential measures based on hydraulic feasibility to determine whether they provide the required level of flood protection. The feasible options were then further developed into full options. These options were then assessed for environmental impacts. A multi-criteria analysis was carried out to help in the selection of the Preferred Option.

Table 3-1 overpage summarises the first and second stage option assessment process. This process is described in detail in the following sections. The third stage of the options assessment process relates to the multi-criteria analysis (MCA) and is looked into more detail in Section 3.2.

Directive 2014/52/EU

The EIA Directive 2014/52/EU[22] requires that the main alternatives of a proposed FRS be considered and presented in the EIAR, and the reasons for selecting the emerging Preferred Option to be justified accordingly. This requirement is outlined in the following statement:

"A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen Option, including a comparison of the environmental effects".

Alternatives were considered for this development early in the Options Development phase, and their viability was assessed with regard to applicability to the areas, economic impacts / benefits, environmental impacts / benefits, social impacts and acceptability, and cultural benefits / impacts. The process followed at the early phase is described further below.

First Stage: Initial Screening

A review of alternative Flood Risk Management (FRM) approaches was undertaken to consider the different FRM methods that could potentially be viable and related to the study area. Options were screened based on the following criteria.

- Applicability to the area;
- Economic (potential benefits, impacts, likely costs etc.);
- Environmental (predicted impacts and benefits);
- Social (impacts on people, society and the likely acceptability of the measure); and
- Cultural (potential benefits and impacts upon heritage sites and resources).

During the screening process, eight FRM approaches were screened. Nature-based solutions were also considered. These approaches are described in the Options Report[23].

[21] JBA Consulting (July 2024) *Kilkee Flood Relief Scheme - Options Report.* Clare County Council and Office of Public Works

[22] European Commission, (April 2014) *EC Directive 2014/52/EU of 6 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment,* Official Journal of the European Union No. L 124/1, 25/04/2014.

[23] JBA Consulting (July 2024) *Kilkee Flood Relief Scheme - Options Report.* Clare County Council and Office of Public Works

Table 3-1: Summary of First and Second stage Options development and assessment process

First stage: *Initial screening*		**Second stage:** *Development of Flood Risk Management (FRM) Approaches and Technical Assessment of Options in Study area*	
FRM Approaches	**Screening of FRM Approaches**	**Development of FRM**	**Environmental Assessment of Options**
FRM Approach 1: Repurposing of existing non-flood management infrastructure	Highly complex, associated with uncertainty, third party asset and would have little benefit to flood risk reduction. Can be considered for future flood risk management. **Not taken forward**	Not taken forward	Not taken forward
FRM Approach 2: Catchment scale and disperse actions to reduce flow downstream	Implementation will be complex and costs significant. Not viable but considered for future catchment scale restoration. **Not taken forward**	Not taken forward	Not taken forward
FRM Approach 3: Inline storage on main watercourses or tributaries to reduce flow downstream	Provides multi benefit to environment and tourism, important for Kilkee as a touristic destination. **Taken forward**	-Embankment in southern part of Kilkee. Taken forward for Option Assessment -Culvert on Well Road -Construction of walls along the Well Stream. **Taken forward**	The three Options for Atlantic Stream include embankment and walls. ***Option 1 is the preferred*** Option as it does not include culvert as does Option 3 and has lower environmental impacts. Inclusion of a long Culvert from the Western Tributary north to Well Road makes ***Option 1B less preferable than Option 1A and 2 of Victoria Stream area*** due to higher negative impacts on waterbodies. In difference to Option 1A, Option 2 includes additional embankment construction upstream Carrigaholt Road.
FRM Approach 4: Diversion of flow around and away from risk areas	Creates a controlled link between Victoria Stream Western Tributary and Wells Stream. Beneficial in combination with other measures. **Taken forward**	-Chanel diversion of Well Stream, Western Tributary and Victoria. Stream. -Flow diversion at the back of Kilkee Bay Hotel would reduce the amount of water affecting southwestern Kilkee Bay Hotel with other storage and conveyance measures -Installation of precast concrete channel in Well Stream. **Taken forward** -Removal of pipe crossing Victoria Stream would provide no benefit to key impacted areas. **Not taken forward**	All four Options in Victoria Stream area include channel realignment of Well Stream, Victoria Stream and Western Tributary. Option 2 has an additional channel realignment upstream in the Victoria Stream.
FRM Approach 5: Improved conveyance of flow	Improving conveyance is a potentially viable approach in combination with other measures. Key limitations of this approach are the potential environmental and visual impacts associated with such works. **Taken forward**	-Channel widening of Atlantic Stream at Dún an Óir estate and Sandpark -Increase capacity of Atlantic Outfall -Precast U-channel of Well Stream -New debris screen in Atlantic Stream, at the entrance of Atlantic stream culvert, at Waterworld. **Taken forward**	***Option 2 for Atlantic Stream Outfall is the preferred Option*** because it includes upgrade of the existing outfall and sealing of the manhole therefore it has fewer environmental impacts as it doesn't include construction of a new outfall. Option 2 for Atlantic Stream is similar to Option 1. The difference is at the Sandpark Mobile Park where channel widening is included. This would have higher impacts, ***making Option 1 the Preferred Option for Atlantic Stream.***
FRM Approach 6: Refurbish or enhance defences to achieve standard of protection	There are no existing formal flood defences in Kilkee. There are informal defences including boundary walls and embankment. Considering turning them into formal. **Taken forward**	-Increase boundary wall height at Dún an Óir estate -Reconstruction of Victoria Crescent and Victoria Court boundary -Replacement of flood walls **Taken forward**	These measures are included in all Options of Victoria Stream area having similar impacts in environment.
FRM Approach 7: Containment of flood level	Very high flood walls with adverse effects on environmental criteria. **Not Taken forward**	Not taken forward	Not taken forward
FRM Approach 8: Containment of flood level in combination with other Options	Feasible in combination with other measures. **Taken Forward**	-Flood wall along Victoria a and Victoria Stream. -Regrading of the Western Tributary field. -embankment at Kilkee Bay Hotel and Sandpark Caravan Park. **Taken forward**	These measures are included in all the Options of Victoria Stream Area, having similar impacts in environment.
FRM Approach 9: Flood resilience, preparedness, and emergency response	Associated risks with timely erection of the barriers. Non technically feasible. **Not taken forward**	Not taken forward	Not taken forward
Nature Based Solutions (NbS)	Would contribute to flood retention in combination with other measures. **Taken forward**	-Creation of wetland along channel realignment of both Atlantic Stream and Vicotria Stream -Leaky barriers across channel upstream **Taken forward** -Woodland creation would be complex in term of land acquisition, and soils in the area are unsuited to it **Not taken forward**	These measures are included in the Victoria Stream area; Option 1A, 1B, 2 and 3. Option 2 has the highest positive impacts as the extension of the area of wetlands is higher, meaning long term permanent benefits for biodiversity. Because of biodiversity improvement Option 1 is slightly preferred from Option 1A.

Directive 2014/52/EU

The EIA Directive 2014/52/EU[24] requires that the main alternatives of a proposed FRS be considered and presented in the EIAR, and the reasons for selecting the emerging Preferred Option to be justified accordingly. This requirement is outlined in the following statement:

"A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen Option, including a comparison of the environmental effects".

Alternatives were considered for this development early in the Options Development phase, and their viability was assessed with regard to applicability to the areas, economic impacts / benefits, environmental impacts / benefits, social impacts and acceptability, and cultural benefits / impacts. The process followed at the early phase is described further below.

First Stage: Initial Screening

A review of alternative Flood Risk Management (FRM) approaches was undertaken to consider the different FRM methods that could potentially be viable and related to the study area. Options were screened based on the following criteria.

- Applicability to the area;
- Economic (potential benefits, impacts, likely costs etc.);
- Environmental (predicted impacts and benefits);
- Social (impacts on people, society and the likely acceptability of the measure); and
- Cultural (potential benefits and impacts upon heritage sites and resources).

During the screening process, eight FRM approaches were screened. Nature-based solutions were also considered. These approaches are described in the Options Report[25].

FRM Approach 1: Repurposing of existing non-flood management infrastructure

This approach considered the re-purpose of the pumping station, a third-party asset of Uisce Éireann, as a flood relief measure. It would require significant upgrades to the pumping station for little benefit in flood risk reduction. This approach would have an additional level of uncertainty during a flood event as the storage would also be used for Uisce Éireann operations and could impact the system's storage capacity.

FRM Approach 2: Catchment scale and disperse actions to reduce flow downstream

This approach considered the storage within the catchment area. At the upper part of the catchment area the potential of sufficient storage would be limited due to the steep topography. Storage and flow reduction in the form of leaky barriers or buffer zones would have potential for benefits in combination with other measures. Catchment floodplain riparian woodland creation was also considered for Kilkee because much of the upstream catchments are greenfields. However, the soil type in the upstream catchments is not favourable to woodland creation, so this would have been a complex option due to the unsustainable and increased requirements for management of the woodlands in the future. Provision of storage in the lower reaches closer to the town would be more beneficial and is discussed under the FRM approach 3.

Measures associated with FRM Approaches 1 and 2 were not progressed further as standalone solutions, but may form part of a wider catchment scale restoration project or be considered for future flood risk management.

FRM Approach 3: Inline storage on main watercourses or tributaries to reduce flow downstream

This approach considered provision of storage along the main Victoria Stream channel and its tributaries as beneficial to the town of Kilkee by reducing the peak of the hydrograph and slowing the water release. Storage would be in the form of natural water retention measures (NWRM), an appropriate example of

[24] European Commission, (April 2014) *EC Directive 2014/52/EU of 6 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment,* Official Journal of the European Union No. L 124/1, 25/04/2014.

[25] JBA Consulting (July 2024) *Kilkee Flood Relief Scheme - Options Report.* Clare County Council and Office of Public Works

NWRM would be constructed wetlands. This approach would benefit the local environment and tourism given the importance of Kilkee as a touristic destination.

FRM Approach 4: Diversion of flow around and away from risk areas

This approach considered the Option of a full diversion, which would not be possible due to the topography of the area, complexity, and costs which would outweigh the flood risk benefits. It was identified the route for a potential diversion channel was to create a controlled link between the Victoria Stream, Western Tributary and the Well Stream.

FRM Approach 5: Improved conveyance of flow

Increasing the flow conveyance of the stream was considered, this would be achieved through; dredging and continued maintenance of pipes plus the removal of structures in Victoria and Atlantic Streams, in addition to widening of Atlantic Stream channel. These measures would result in minor reductions of flood risk and would not achieve the sufficient level of protection. Therefore, it was only considered in combination with other measures. Significant environmental impacts related to removals and enhanced maintenance were considered during this FRM approach.

FRM Approach 6: Refurbish or enhance defences to achieve standard protection

There are no current formal fluvial flood defences in Kilkee. However, as there are several informal defences such as boundary walls - the flood defence potential for these existing structures was considered as well as their upgrade to formal ones.

FRM Approach 7: Containment of flood level

The containment of flood levels through erection of flood walls and embankments along the streams was a potentially feasible standalone measure. This would have resulted in very high walls with potentially significantly adverse effects on environmental criteria. Therefore, it was excluded as a standalone approach. The containment of flood levels has been considered in combination with other Options and is discussed further below under paragraph ***Error! Reference source not found. Error! Reference source not found.***.

FRM Approach 8: Containment of flood level with other Options

This approach is feasible when considered in combination with other measures and would result in less of an environmental and social impact. However, it could not be considered as a standalone approach due to the higher anticipated flooding events. This approach alone is not sufficient.

FRM Approach 9: Flood resilience, preparedness, and emergency response

This approach considered measures related to preparedness and resilience to address the vulnerability and exposure to flood hazard. Individual Property Protection (IPP) considered consist of demountable barriers, effective to approximately 0.6m flood depth, which would protect properties on an individual basis. IPP also include measures to seal or secure windows and vents and tanking buildings above and below ground to resist water ingress. Because of the risks associated with the timely erection of the barrier, any measure involving IPP which places a high number of people or properties behind demountable defences was screened out as being non-technically feasible. In localised situations, and where alternatives are either non-feasible or non-cost beneficial, the use of IPP would have been considered. Relocation of a property / infrastructure at-risk although always technically feasible is related to social negative impacts.

Measures associated with this approach would only have been considered should no other method be found suitable.

Nature Based Solutions (NbS)

NWRM were considered and potential areas for their implementation were identified. NWRM included measures such as woodland creation, constructed wetland and buffer zones which were model tested. For this scheme a flood storage area was considered as appropriate due to multiple benefits such as water quality improvement. It is particularly important for Kilkee's Blue Flag status to be maintained. Thus, careful consideration was given to this measure. In terms of flood risk reduction, it would be beneficial in combination with other measures.

Measures associated with FRM Approaches 3, 4, 5, 6 and 8 and nature base solutions were progressed further for technical analysis as combined measures.

Second Stage: Technical Assessment of Feasible Options

Further to the initial screening of the FRM approaches, the following flood risk management measures were identified as potentially feasible for Kilkee and were taken forward for further technical assessment. The potentially feasible measures were then considered on an area-by-area basis in the Options Assessment, considering the constraints faced in different parts Kilkee. The potentially feasible measures consisted of:

- Do nothing;
- Do minimum;
- Structural Measures:
- Flood storage/ Direct flood defences
- Flood flow bypass channel
- Increase channel conveyance/ Channel widening and pipe removal
- Walls and/or embankments
- Natural water retention measures

Do Nothing

The 'Do Nothing' scenario is defined as the Option involving no future expenditure on flood defences or maintenance of existing defences/channels. The implication is that the existing risk of flooding persists in the study area and possibly worsens over time, due to the condition of the existing walls and embankments and climate change impacts.

This is not sustainable; therefore, it was not considered further.

Do Minimum

The do minimum measure would involve ongoing maintenance works to maintain the existing standard of protection and would generally involve repairing and reinforcing existing walls now and as repairs are needed in the future.

The existing location and height of walls/embankments are not sufficient to reduce the risk of flooding, therefore this alternative was not considered further.

Structural measures

Flood storage/ Direct flood defences

The construction of flood defences, including embankments, flood wall, culverts and flow controls, along the banks of the streams would contain volumes and flows within the stream's channels. The final choice of method would be determined following further review of the detailed site investigation and subsequent detailed design. In general, embankments would be more suited to the southern part of Kilkee, where there would be sufficient space to accommodate them in the adjoining fields. Therefore, this measure was further considered in the Options assessment.

Flood flow bypass channel

This measure would involve channel diversions from Well Stream and Western Tributary floodplains to the Victoria Stream. It would provide benefits in flood reduction in combination with other measures. This measure would result in greater flood depths in the areas adjacent to the Haugh and Cunninghams caravan parks and consequently higher embankment levels. As a result, the culverts through the serviced area would need to be extended and the maintenance requirements of the outfall would increase. The hydraulic modelling of the channel diversion to the west of Kilkee Bay Hotel, at the outflow of the Atlantic Stream and of the Victoria Stream to Moore Bay, indicated that the reduction of flood levels for the southern and western part of Kilkee would be negligible. A flow diversion at the back of Kilkee Bay Hotel would reduce the amount of water affecting southwestern Kilkee when considered in combination with storage and conveyance measures. This measure was considered further.

Increase channel conveyance/ Channel widening and pipe removal

Channel widening was considered at Dún an Óir estate and Sandpark locations along Atlantic Stream, to increase its conveyance. The hydraulic modelling showed that this measure would contribute to the

reduction of flooding upstream when considered with other measures. Land acquisition from the adjoining caravan parks would be required to implement this measure. This would potentially result in the loss of some caravan spaces. Along the Victoria Stream, the increased conveyance through removal of pipe crossings would provide no benefit to key impacted areas, therefore it was scoped out of the Optioneering process. However, it would potentially be considered to reduce residual risk of blockage after deciding on a Preferred Option.

Walls and embankments

This measure would comprise construction of embankments at Kilkee Bay Hotel and Sandpark Caravan Park and building walls along the streams. An embankment at Kilkee Bay Hotel will provide protection to the building and increase flood extents in the agricultural land upstream on the tributary. Embankments at Sandpark Caravan Park will contribute towards storage as well as reduction of flood risk to the caravan park. To prevent flooding overtop, construction of walls was considered and will be implemented at Atlantic Stream through raising of a boundary wall at Dún an Óir estate and Victoria stream through demolition, upgrades and new wall sections to be constructed on the left bank, from Victoria Park to Crescent place and on the right bank at Victoria Crescent and Victoria Court.

Natural Water Retention Measures (NWRM)

A range of NWRM were considered to reduce the risk of flooding as well as enhance local habitats. Creation of wetlands along the channel realignment of both Atlantic Stream and Victoria Stream was considered. Leaky barriers across the channel, upstream would result in a delay in peak flow. Although woodland creation would reduce the runoff from the upstream Victoria Stream catchment area, it is not considered at this stage due to complexities regarding land acquisition, and the unsuitability of soils in the area. However, woodland creation may be more preferred when looking at climate adaption and implementation at larger scales upstream.

3.2 Options Assessment

The Options Assessment Report presents the various structural and non-structural defences in the wider context through the screening of all available alternatives considered (as described above in Section 3.1). From the technical assessment of the feasible measures, different Options were developed for three areas: Atlantic Stream (Option 1, 2 and 3), Atlantic Stream Outfall (Option 1 and 2) and Victoria Stream (Option 1A, 1B, 2 and 3). Each of the options considered how the scheme may need to be altered in the future to allow for adaptation in terms of alignment and height of defences from the impact of climate change on flows. The assessment of the options is discussed for each area.

Atlantic Stream area

Table 3-2 below summarises the measures involved in each Option per location of the Atlantic Stream.

Table 3-2: Summary of the measures for the three Options of Atlantic Stream

Measures location	Option 1	Option 2	Option 3
Kilkee Bay Hotel	Construction of c. 200m long embankment c. 1.3-1.6m high. Diversion of c. 110m of open channel into centre of floodplain. Installation of new headwall and 600mmØ inlet culvert under embankment to link with existing culvert.	Similar to Option 1	Similar to Option 1 and Construction of RC box culvert c. 1.8m wide by 0.9m high, c. 270m long under N67 road
Dún an Óir estate	Boundary wall height increased by c.300mm over c.103m length	No intervention	Similar to Option 1
Sandpark Mobile Park	Construction of c.110m long embankment c.700mm high.	c.200m of channel widening upstream of Sandpark culvert and c.85m channel widening downstream	Similar to Option 1.
Waterworld	New debris screen at upstream culvert headwall.		

Meadow View Court	Construction of 2no. 2100mmØ inlet manholes with grated covers on existing 1200mmØ culvert.

Options 1 and 2 consist of the same measures, except for the measures at Sandpark Mobile Park and Dún an Óir estate (no intervention here for Option 2). Measures at Waterworld and Meadow View Court are common to all three Options. At Kilkee Bay Hotel, Option 3 includes an additional culvert diversion along with the measures that are similar to Option 1 in the other locations.

Detailed descriptions and figures illustrating each of the Options can be found in the Kilkee Flood Relief Scheme Options Report[25].

Atlantic Stream Outfall area

The Flood Relief Scheme for the Atlantic Stream outfall considered two Options for intervention on the outfall culvert which is undersized from a hydraulic review. Options 1 and 2 are summarized in Table 3-3 below.

Table 3-3: Summary of the measures for Option 1 and 2 of the Atlantic Stream outfall

Measures location	Option 1	Option 2
Atlantic Stream Outfall	Upgrade main outfall culvert to 1500mmØ and associated manholes. Decommission existing 750mmØ main outfall and overflow outfall culverts. Install non-return valve to upgraded 1500mmØ outfall culvert.	Upgrade existing overflow chamber with raised cover (c. 2.7m long x 2m wide x 400mm high) with flap valves. Reconstruction of outfall manhole and installation of non-return valve on upstream 750mmØ culvert. Install non-return valve to existing 750mmØ overflow outfall culvert. Seal existing cover of manhole downstream of overflow chamber on main outfall culvert at existing ground level. (c. 2m long x 0.8m wide x 400mm high RC slab and new sealed lid).

Measures in this area relate to the outfall culvert capacity. There are only two Options as shown above, Option 1 considers the construction of a new culvert and Option 2 the upgrade of the existing culvert system.

For the Victoria Stream, four options were developed: 1A, 1B, 2 and 3 by combining various measures. A summary of the Options is provided in Table 3-4.

Table 3-4: Summary of the measures for Option 1A, 1B, 2 and 3 of Victoria Stream area

Measures location	Option 1A	Option 1B	Option 2	Option 3
Well stream	Construction of c. 146m long embankment c. 1.1m high upstream of Cunningham's Holiday Park with inclusion of new headwall and 1050mmØ inlet culvert to existing culvert downstream. Installation of overflow on the Well Stream Tributary and non-return valve on the Well Stream u-channel left bank wall to maintain connectivity during normal flows and enable overflow to the carrier drain system during flood events. Decommissioning of existing Well Stream box culvert and circular overflow culverts at Crescent Place. Installation of new RC box culvert (c. 1.6m wide x 900mm high) c. 55m long under Crescent Place. Resurfacing and regrading of Well Road (c. 300m long x 5.5m wide x 300mm high).			
	Installation of precast reinforced concrete u-channel along the existing Well Stream alignment c. 240m long and c. 1.6m above the adjacent road level.	Replacement of Well Stream with RC box culvert (c. 2m wide x 900mm high) c.240m long from Well Field to Crescent Place.	Similar to Option 1A	Similar to Option 1A
Victoria court	Reconstruction of Victoria Court boundary wall.			
Victoria Stream	Local repointing and thickening of existing left bank wall behind Crescent Place properties. Replacement of c. 3m section of wall to facilitate Well Stream RC box culvert installation at Crescent Place. Construction of c. 280m long embankment behind Carrigaholt Road c. 1.2-1.4m high above ground level. Construction of new flood defence wall c. 230m long along filled-in left hand bank from Victoria Park to Crescent Place c. 1.2-1.8m high above ground level. Diversion of c. 170m of open channel to centre of floodplain. Existing open channel to be filled in. Reconstruction of Victoria Crescent boundary wall c. 130m long. Construction of c. 37m long embankment c. 800mm high north of Victoria Crescent.			
		Construction of embankment upstream of R487 bridge c. 430m long and c. 1.5-2.0m high above ground level. Regrading of lands upstream of R487 bridge for floodplain storage c. 400mm max. Diversion of c. 140m of open channel to centre of floodplain upstream of R487 bridge. Existing open channel to be filled in. Installation of 900mmØ inlet and outlet culverts from floodplain storage upstream of R487 bridge.		
Western Tributary	Construction of embankment c. 980m long and c. 1.3-1.8m high around Western Tributary floodplain. Diversion of c.400m of open channel to centre of floodplain and backfill of existing channel. Regrading of floodplain in field north of Cluain na Mara estate by c. 700mm max. Installation of 900mmØ culvert under Western Tributary embankment to link to diverted Victoria Stream alignment. Inclusion of headwalls on inlet and outlet of culvert.			
	Regrading of floodplain in field west of Cunningham's Holiday Park (north of existing alignment of backfilled Western Tributary) by raising to 6.70mOD for the northern two-thirds section and lowering to 6.40mOD for the southern third section.			Construction of RC box culvert (c. 2.1m wide x 800mm high) under Caravan Park Road c. 360m long to discharge to Well Stream RC box culvert at Crescent Place. Inclusion of headwall and local deepening of lands around the culvert inlet.

Victoria Stream area represents the highest level of interventions of the flood relief scheme, within this area measures are localized in 4 main locations: Well Stream, Victoria Court, Victoria Stream and Western Tributary. A detailed location is given for each measure as shown in the table above, most measures are common to all options for Victoria Court, Victoria Stream and Western Tributary area. Option 2 and 3 consist of the same measures apart from two locations for Victoria Stream area, and two locations in Western Tributary area.

Detailed descriptions of each measures are provided in Kilkee Flood Relief Scheme Options Report.

Environmental impact assessment of Options

The potential environmental impacts associated with all Options is summarised below for each area, Atlantic Stream, Atlantic Stream Outfall and Victoria Stream. The discussion focusses on the comparison of impacts of the measures among Options, particularly for measures that differ.

Atlantic Stream area

As measures including Option 1, 2 and 3 are the same for Waterworld and Meadow View Court, effects will be the same for the three Options in these locations. Measures in Kilkee Bay Hotel differ only for Option 3. Options 1 and 2 would have the same impacts. In Sandpark Mobile Park impacts would be different for Option 2 as it involves different measures while 1 and 3 have the same measures.

Option 1

Waterbodies

No significant effects would be expected on the waterbodies for Option 1. During construction, temporary slight negative effects would be possible on the water quality and hydromorphology of the Atlantic Stream, with affects downstream as it discharges to Moore Bay. Existing boundary wall height increase at Dún an Óir estate, construction of embankments along Kilkee Bay Hotel, and Sandpark Mobile Park, and the new pipe under the embankment at Kilkee Bay Hotel would have the potential to increase sedimentation and runoff entering the nearby waterways, resulting in temporary slight negative effects. The works at Meadow View Court have the potential to increase sedimentation to the Atlantic Stream, resulting in temporary slight negative effects.

Soils, Geology and Hydrogeology

No significant effects would be expected on soil geology and hydrogeology from measures related to Option 1. During construction the impacts in the groundwater would be temporary slight negative effects as a result of works during construction of embankments along Kilkee Bay Hotel, Dún an Óir estate and Sandpark Mobile Park, and the new pipe under the embankment at Kilkee Bay Hotel and works at Meadow View Court.

Landscape and Visual Amenity

No significant effects would be expected to landscape and Visual Amenity. Permanent imperceptible to slight negative effects on visual amenity would be expected due to increase in the height of the wall at Dún an Óir and construction of embankment south of the Kilkee Bay Hotel. During construction, machinery and excavation would be visible having potential effects which will be temporary slight.

Biodiversity

No significant effects would be expected to biodiversity as a result of construction and operation of measures for Option 1. Construction has the potential to cause slight negative effects due to disturbance, loss of habitat, temporary changes to habitat connectivity, and pollution or increased sedimentation in Kilkee Bay Hotel, Dún an Óir estate, Sandpark Mobile Park and Meadow View Court. Once operational, an imperceptible to slight negative impact on the ecology could result from the upgrade of the debris screen upstream of Waterworld.

Construction

Across the scheme there is the potential for temporary slight negative effects for residents, pedestrians and road users through disturbance associated with construction works at the Dún an Óir estate and Sandpark Mobile Park. These would not be significant and would be typical for construction projects.

Option 2

Waterbodies

The greatest impact of Option 2 is expected to be on the Sandpark Mobile Park due to channel widening. Widening the channel poses greater risk to water quality and aquatic species and results in greater extent of habitat loss. At Kilkee Bay Hotel, Waterworld and Meadow View Court impacts would be the same as Option 1 as they consist of the same measures.

Overall the impact on water bodies for Option 2 would be moderate negative.

Soils, Geology and Hydrogeology

The impacts expected at the Sandpark Mobile Park as a result of channel widening would result in greater amount of earth removal. The increase of the width would impact the flow by lowering the water levels.

Impacts at Kilkee Bay Hotel, Waterworld and Meadow View Court would be the same as Option 1.

Landscape and visual amenity

The impact expected at the Sandpark Mobile Park would be permanent slight negative because of removal of vegetation as a result of increasing the channel width. However, they are not expected to be significant. The other impacts which are temporary slight negative would be the same as Option 1 during construction due to the works and machinery.

Biodiversity

The greatest impact on biodiversity for Option 2 would be expected at Sandpark Mobile Park due to the channel widening. As a result of the channe widening and the embankment construction, the loss of habitat would negatively impact the biodiversity and species who rely on that habitat. Furthermore, the risk of accidental release of pollutants would have the potential to negatively impact fish and aquatic species. Impacts at Kilkee Bay Hotel, Waterworld and Meadow View Court would be the same as Option 1.

Overall, the impacts of Option 2 in biodiversity would be moderate negative.

Construction and access impacts

The greatest impact on construction and access would be expected at the Sandpark Mobile Park, which would result in moderate negative impacts.

At Kilkee Bay Hotel, Waterworld and Meadow View Court, impacts would be the same as Option 1.

Option 3

Waterbodies

Compared to Option 1, measures in Option 3 differ slightly because of the additional 270m long culvert diversion at the Kilkee Bay Hotel. However, the impact would be slight negative.

At the Dún an Óir estate, Sandpark Mobile Park, Waterworld and Meadow View Court, the impacts would be the same as Option 1.

Soils, Geology and Hydrogeology

Impacts on soil geology and hydrogeology would be the same as Option 1.

Landscape and Visual Amenity

Permanent imperceptible to slight negative effects on visual amenity are expected in this area due to increase in the height of the wall at Dún an Óir and the construction of the embankment south of the Kilkee Bay Hotel.

Impacts in the other locations; Dún an Óir estate, Sandpark Mobile Park, Waterworld and Meadow View Court would be the same as Option 1.

Biodiversity

Impacts on biodiversity would be the same as Option 1.

Construction

The difference between Option 1 in the impacts on construction and access would be at the Kilkee Bay Hotel, where the measures include the additional 270m long culvert diversion. During the construction works, the impact would be temporary moderate negative.

Atlantic Stream Outfall area

Option 1

Waterbodies

As this Option consists of construction of a new culvert, excavation along the seafront would have the potential to increase sedimentation and potential pollutants entering the stream and Moore Bay, adjacent. Impacts would be temporary moderate negative.

Soils, Geology and Hydrogeology

The northern corner of Kilkee lies on a high sensitivity aquifer. However, the excavations for the proposed culvert will not be deep and will be on ground elevated above the shoreline. Therefore, no significant impacts would be expected. During construction there would be expected temporary slight negative effects on hydrogeology.

Landscape and Visual Amenity

No significant effects would be expected in this area. Temporary slight impacts on visual amenity would be expected during construction, affecting the mid- and long-range views over Kilkee town.

Biodiversity

Part of beach, the water, the reefs and the cliffs in Kilkee are within an SAC designated area, and excavation works adjacent to Moore Bay could lead to accidental release of pollutants and sedimentation increase. Therefore, potential moderate negative impacts would be expected on fish, aquatic species, and overwintering birds.

Construction and access impacts

During construction, extent of safe work zone on and near the promenade would require partial or full closure of road, car parking and sections of the seafront. There is the potential for temporary moderate negative effects for residents, pedestrians and road users through disturbance associated with construction and access.

Option 2

Waterbodies

In comparison with Option 1, in Option 2 the level of work would be lower as it includes the upgrade of the existing culvert. Therefore, no significant impacts would be expected. During construction works impacts would be temporary slight negative.

Soils, Geology and Hydrogeology

During the upgrade of the culvert there would be predicted impacts on hydrogeology, but they are not expected to be significant. Compared to Option 1 these impacts will be lower as this option does not include the construction of a new culvert.

Landscape and Visual Amenity

Impacts on landscape and visual amenity in Option 2 would be the same as Option 1.

Biodiversity

Compared to Option 1, impacts on the biodiversity would be lower as the measures include only the upgrade of the existing culvert and not the construction of a new one. Therefore, impacts during construction would be temporary slight negative on fish, aquatic species, and overwintering birds in Moore Bay due to potential accidental pollutant release during works.

Construction and access impacts

Compared to Option 1 during construction, the extent of safe work zone would require only partial closure of road, parking, and sections of the seafront as the area altered is smaller. Therefore, no significant impacts are expected. There is the potential for temporary slight negative effects for residents, pedestrians, and road users through disturbance associated with construction and access.

Victoria Stream area

Option 1A

Waterbodies

Due to different type of intervention across the Victoria Stream area, there would be different levels of impacts in different locations. During construction the regrading of the field that Western Tributary flows through and the construction of the U-shaped precast channel at the Well stream would increase the risk of sediments, pollutants and runoff entering the waterways. The highest impacts would be north of Cunningham's Holiday Park due to the installation of the U-channel along the Well Stream and embankment construction along Carrigaholt Road, Victoria Court, upstream of Cunningham's Holiday

Park on the Well Stream and in the Western Tributary field. During operations, there would be a slight negative due to changes to the stream hydromorphology.

Realignment of Victoria Stream in the Southeast of the scheme and the realignment of Western tributary and the increased storage of their flood plain would have positive impacts to the water bodies by improving connectivity of the streams with their floodplain, increase habitat diversity and improving water quality.

Overall, the impact of the works would be temporary moderate negative on the streams and downstream at Moore Bay.

Soils, Geology and Hydrogeology

This option involves measures that would require extensive earthworks and disruption of the courses of the three Streams: Well Stream, Victoria Stream and Western Tributary. Most of the measures included are also in the other options, i.e. flood walls and embankment construction. Therefore, impacts related to these works during construction for all options would be expected to be temporary moderate negative.

Different to the other Options, Option 1 includes a concrete U- channell at the Well Stream north of Cunningham Holiday Park. The impermeable character of the proposed rechannelling would cause permanent moderate negative impacts.

Overall impacts on soil geology and hydrogeology for Option 1A would be moderate negative.

Landscape and Visual Amenity

During construction, temporary slight negative effects will occur due to the extents of the proposed works and the proximity to residential receptors. Heavy plant movement and construction operations are expected to reduce the amenity received by the local landscape. Permanent slight negative effects on visual amenity and landscape elements are expected in this area due to the replacement of the Well Stream with a precast concrete channel.

Biodiversity

Impacts on biodiversity are likely to occur because of excavations and construction works, which would disturb the habitat and cause loss of riparian and grass land, foraging grounds, and pollution. Particularly, at Carrigaholt Road location, which has the potential to be nesting grounds for wading birds, would have negative impacts on these birds' activities. This would be expected in all options, as the diversion of the channel in this location and filling the existing channel is common to all Options. Also, works instream and adjacent to the riverbank have the potential to have negative impacts due to the risk of accidental release of pollutants, increased sedimentation, and changes to habitat connectivity on fish and aquatic species. Positive effect on biodiversity is expected due to the creation of habitat around realigned channel in Victoria Stream and Western Tributary.

Overall, the impact on biodiversity in this area will be moderate negative.

Construction and access impacts

The works during construction would require the partial or fully closures of roads. The highest impacts would be in the Vicotria Court and Well Road that involve more construction works.

Overall predicted impacts would be moderate negative for residents pedestrians and road users.

Option 1B

Waterbodies

As displayed in the Table 3-5 most measures included in Option 1B are the same as Option 1A and so the impact would be similar. The location where measures are different, is the Well Stream where a 240m long box culvert will be constructed along the Well Stream. Therefore, the impacts would be higher compared to Option 1A, 2 and 3 in this area. During construction temporary high negative effects are likely on hydrology and hydromorphology in the streams and downstream in Moore Bay. The positive effects in the Western Tributary and Victoria Stream due to the channel realignment, which are common to all options, would not fully offset the high negative impacts of the Well Stream culvert.

Overall, the impacts on waterbodies would be high negative.

Soils, Geology and Hydrogeology

Compared to Option 1, the level of works for Option 2 are more significant. The improvement of flood walls, construction of embankments, and new piping under the proposed embankments have the potential to alter the flow regimes and groundwater flows and therefore impact the geology and hydrogeology of the site. These effects would be slight negative. During operation, due to the impermeable character of the rechannelling of the Well Stream, and changes in flood zones the impacts would be moderate.

Overall impacts on soils geology and hydrogeology would be moderate negative, the same as Option 1A.

Landscape and Visual Amenity

Impacts on landscape and visual amenity will be the same as Option 1A as the extent of the proposed works and proximity to residential receptor is the same. Expected impacts would be temporary slight negative. Permanent impacts would be expected due to the unvegetated boundary along Well Stream that will not allow for revegetation.

Biodiversity

The highest adverse effects on biodiversity for this Option would be at the Well Road because of the Well Stream culverting, causing loss of habitat. Along with the other impacts which are the same as Option 1A and 3, particularly at the Carrigaholt Road as nesting grounds for birds, the overall impacts on biodiversity for Option 1B would be high negative, the highest among all the Options.

Construction and access impacts

During construction a high level of works would be required across the Victoria Stream area. Even though measures differ slightly from Option 1A, the works required have the potential to cause temporary moderate effects, particularly at the Well Stream, requiring partial or full closure or roads. Therefore, the impacts would be the same as Option 1A, 2 and 3.

Option 2

Waterbodies

The highest impact for Option 2 would be as a result of regrading the Western Tributary field and the U-shaped precast channel which would cause increase of sediment, runoffs and risk of pollutants entering the waterways. As this is common to Option 1A, the impacts would be the same in these locations. Positive impacts would be expected because of channel realignment, which would improve hydrology, Hydromorphology and water quality, which is common to all Options. Compared to the other Options, Option 2 includes an additional flood storage area upstream at the Victoria Stream, which will increase the extension of area with positive impacts.

Overall impacts on waterbodies would be moderate negative.

Soils, Geology and Hydrogeology

Construction works required in the area would require disturbance of the courses and earthworks, in the same areas as Option 1A, 1 B and Option 3. Even though they differ in some of the options, the temporary impacts on soils geology and hydrogeology would be of the same magnitude, moderate negative for all Options.

Landscape and Visual Amenity

During construction, temporary slight negative effects are expected due to the extents of the proposed works and the proximity to residential receptors along Well Road and Marion Estate. Heavy plant movement and construction operations would be expected to reduce the amenity received by the local landscape. Most of these effects would potentially be temporary moderate negative. Permanent slight negative effects on visual amenity and landscape would be expected in this area due to the introduction of the embankments south of Carrigaholt Road and the u0channel along the Well Stream. These measures would have the potential to allow for revegetation that is expected to reduce the visual impacts. Therefore, the overall impacts on landscape and visual amenity would be slight negative, which is the same for all Options.

Biodiversity

Temporary negative impacts on biodiversity for Option 2 would be the same as Option 1A and 1 B for the Carrigaholt Road location, as they all include interventions in that location. Different to the other options, in Option 2 the extent of flood storage area creation is higher. This includes the channel realignment and

habitat creation in Victoria Stream and Western Tributary which is common to all Options, and additional flood storage upstream of the R487 bridge on the Victoria Stream. The increase of the floodplain connectivity with the streams, and creation of new habitats, would support biodiversity. This has the highest potential for positive impacts on biodiversity meaning the negative impacts on this area would be slight negative. Therefore Option 2 is the Option with the lowest impacts on biodiversity among all Options for the Victoria Stream area.

Construction and access impacts

As stated in the above options, due to the high level of works required across the Victoria Stream area for all Options, impacts of construction and access would be the same, temporary moderate negative.

Option 3

Waterbodies

Measures in Option 3 in most locations are common to Option 1A, therefore impacts in those locations would be the same as Option 1A. Impacts would be higher compared to Option 1A on the Western Tributary due to the construction of a 360 m culvert form the Western Tributary to Well Road. It would have the potential to cause high negative impacts during operation. Positive impacts to hydrology and hydromorphology due to channel realignment and floodplain connectivity to on the Western Tributary and the Victoria Stream would compensate the high negative impacts of culverting.

Therefore, overall impacts expected in waterbodies for this option would be moderate negative.

Soils, Geology and Hydrogeology

As with the other Options, the level of interventions proposed for the Victoria Stream area are high, and would require earthworks and disruption of the courses of the three streams. The highest impacts are related to the changes of flood zones, which is common to all Options. Therefore, overall impacts on soil, geology and hydrogeology will be the same as the other Options.

Landscape and Visual Amenity

Similar to other Options during construction, temporary slight negative effects would be expected due to the extents of the proposed works and the proximity to residential receptors, mostly along Well Road. Similar to Option 2, measures in this Option allow for revegetation, which would reduce the visual impacts, along the Well Stream u-channel. Overall, impacts on landscape and visual amenity for Option 3 would be slight negative, which is of the same magnitude of all other Options.

Biodiversity

Impacts on biodiversity for Option 3 would be the same as Option 1A, for most locations, as the interventions are similar. The highest impacts for this option compared to 1A would be expected along the Well Stream, due to the construction of a new culvert. It would cause loss of habitat, meaning lower biodiversity. This would have the potential to cause higher impacts on biodiversity compared to Option 1A and 2. Overall, impacts on biodiversity of this Option in the Victoria Stream area would be moderate negative.

Construction and access impacts

Due to the high level of works required across the Victoria Stream area for all Options, impacts of construction and access would be the same, temporary moderate negative.

Table 3-5 overleaf summarises the environmental impacts discussed above to provide a colour-coded comparison between impacts of the Options for each area.

Table 3-5: Colour coded system representing the predicted level of impacts.

Legend					
High potential effect		Moderate potential effect		Slight/no potential effect	

	Atlantic Stream			Atlantic Stream Outfall		Victoria Stream			
Option	**1**	**2**	**3**	**1**	**2**	**1A**	**1B**	**2**	**3**
Waterbodies									
Biodiversity									
Soils and Geology									
Landscape & Visual									
Construction									
Comments	Use of insitu concrete to increase height of flood walls poses risk to water quality and aquatic species. No channel widening nor extensive culverting therefore less excavation. This would reduce the risk on waterbodies.	Widening of channel with in-situ concrete poses greater risk to water quality and aquatic species. Greater extents of habitat loss. Potential of higher impacts to visual amenity from removal of vegetation. Higher volume of earth removal.	Higher volume of earth removal due to diversion at Kilkee Bay Hotel and extent of excavations than Option 1. Less potential for impacts to waterbodies and biodiversity due to reduced instream and bank-side works.	Due to the extent of excavations along the seafront promenade, higher impacts are expected on adjacent shoreline and aquatic species. This is the least Preferred Option.	Option 2 has reduced risks due to the limited area being altered, that is around the existing chamber. This is the Preferred Option over Option 1.	The replacement of the Well Stream with a precast U-shaped channel will lead to temporary high negative impacts on the waterbody during construction. The reinstatement of the original bed materials in the channel after construction, and the use of an open channel instead of a culvert, means that this is preferable to Option 1B, with a long-term moderate negative impact on the waterbody.	The replacement of the Well Stream with a culvert for much of its length would lead to permanent high negative impacts on the stream's hydromorphology and its ability to function naturally. This would have further high negative effects on its water quality and on biodiversity, with the Well Stream effectively ceasing to act as an ecological corridor once the culvert is operational.	The replacement of the Well Stream with a precast U-shaped channel will lead to temporary high negative impacts on the waterbody during construction. The reinstatement of the original bed materials in the channel after construction, and the use of an open channel instead of a culvert, means that this is preferable to Option 1B, with a long-term moderate negative impact on the waterbody.	The replacement of the Well Stream with a precast U-shaped channel will lead to temporary high negative impacts on the waterbody during construction. The reinstatement of the original bed materials in the channel after construction, and the use of an open channel instead of a culvert, means that this is preferable to Option 1B, with a long-term moderate negative impact on the waterbody.
						Option 1A and 2 are similar and both preferred to Option 1B and 3. Option 1A has less flood storage area than Option 2, meaning it has less potential for habitat creation and long-term permanent biodiversity benefits. Option 2 is therefore slightly preferred over Option 1A.	Due to the significant negative effects on the Well Stream in terms of biodiversity, hydrology, and hydromorphology, Option 1B is least preferred.	The inclusion of a flood storage area on the Victoria Stream, upstream of Cluain Na Mara, will lead to a long-term permanent benefit for biodiversity as it has the greatest potential for habitat creation. This combined with the storage area on the Western Tributary means that Option 2 is slightly preferred over Option 1A.	The inclusion of a long culvert from the Western Tributary north to Well Road will lead to a permanent moderate negative impact on hydromorphology and water quality. This makes Option 3 less preferred than Options 1A or 2.

Adverse Flood Risk due to fluvial measures

When considering fluvial defence measures, it needs to be assessed as to whether they will increase flood risk from other sources. Aside from fluvial risk, there exists both a pluvial and coastal risk. The following sections detail what elements are included in the scheme to ensure that the flood risk from these other sources isn't increased by the fluvial defences.

Pluvial flood risk mitigation

Both the Victoria Stream and Well Stream have pluvial drainage outlets discharging into them. As containment measures are being considered on these watercourses, the water levels will increase from the baseline. This results in the pluvial outfalls becoming more surcharged compared to that of their current downstream condition.

To ensure that the fluvial defences don't result in an increase in pluvial flooding, a number of stormwater drainage elements including pump stations and sub-surface storage are included in the scheme.

The scale of pluvial drainage elements varied per option. All options would require a pump station and sub-surface storage on the Well Road (at CCC compound) and the Carrigaholt Road, in lands north of Victoria Crescent. Option 2 only would require an additional pump station and sub-surface storage at the Marion Estate as described below.

- Installation of pump station, sub-surface storage and rising main at CCC compound at Well Road.
- Installation of pump station, sub-surface storage and rising main in field north of Victoria Crescent to cater for Carrigaholt Road drainage systems.
- Construction of c. 375-450mmØ carrier sewers and associated manholes under Well Road and Victoria Park for interception / overflow of existing surface water network outfalls and direct them to a single outfall at the Well Stream RC u-channel (with non-return valve fitted) / pump station at Clare Co. Co. compound.
- Construction of c. 200m of 225mmØ carrier drain and associated manholes to cater for overflows from Carrigaholt Road drainage systems to link with pump station north of Victoria Crescent.
- Upgrade of Carrigaholt Road surface water drainage network – construction of c. 115m of 300mmØ sewer, new manhole, headwall, gullies and non-return valve fitted to outfall.

Option 2 only includes the following additional measures:

- Carrier drains, associated manholes, non-return valve fitted to existing outfall pipe, pump station, rising main and underground storage to cater for Marion Estate surface water drainage network.

Coastal Flood Risk

Kilkee is at risk of significant flooding due to wave overtopping of the seawall. The means by which this flood volume returns to the sea is via the Victoria and Well Streams. In all proposed options, it is intended to provide hard defences on both the Well Stream and Victoria Stream. Consequencely, this route for the overland volume is restricted. Therefore, it is proposed to introduce the following measures to allow the flood volume to drain via their baseline flow routes:

- 8no. sluice gates (c. 2m wide x 900mm high) to left hand bank of Victoria Stream walls with invert level set at ground level.
- 1no. sluice gate (c. 2m wide x 900mm high) to right hand bank of Victoria Stream with invert level set at ground level.
- 3no. sluice gates (c. 2m wide x 900mm high) to left hand bank of Well Stream u-channel wall with invert level set at ground level.
- 2no. junctions reprofiling by c. +300mm at Well Road (c. 20m long x 10m wide x 300mm high) and Geraldine Place (c. 20m long x 12m wide x 300mm high).

The road raising is proposed to restrict surface flows entering the Well Road and Geraldine Place.

Cost

A full break down of costs for the Options in each area is provided in the Options Report[26].

[26] JBA Consulting (July 2024) *Kilkee Flood Relief Scheme - Options Report.* Clare County Council and Office of Public Works

MCA outcomes

The effectiveness of each feasible Option was measured in terms of how it achieves a set of flood risk management objectives. This section summarises the detailed MCA of the shortlisted Options which was carried out to evaluate the performance of each Option in terms of predefined objectives. It follows the OPW Guidance Note adopted for the Flood Risk Management Plans[27], which was applied to the detailed scheme appraisal. Each MCA objective was weighted both globally and locally to reflect their importance. These weightings were in accordance with the OPW Technical Methodology Note (TMN) – Option Appraisal and the MCA Framework.

Criteria Scores

The MCA produces a weighted score for each objective and the sum of these within each of the criteria classifications is the Criteria Score, as summarised in:

- **MCA Benefit Score**: The sum of the scores for the economic, social and environmental criteria. It excludes the technical criteria score. This score represents the net benefits of the Option.
- **Option Selection MCA Score**: The sum of the scores for all four of the criteria. This score compliments the MCA Benefit Score with the Technical Criteria Score, and hence includes all of the aspects that should be taken into account in considering the Preferred Option for a given location.

MCA was carried out for Atlantic Stream area and Victoria Stream area. For the Atlantic Stream Outfall the difference between impacts between Option 1 and 2 was clear, with Option 2 being the least intrusive and with higher return benefits. For this reason, MCA was not carried out for the Atlantic Stream Outfall.

Table 3-6: Summary of MCA scores for each Option for Atlantic Stream and Victoria Stream area

Criteria	Atlantic Stream area			Victoria Stream area			
	Option 1	Option 2	Option 3	Option 1A	Option 1B	Option 2	Option 3
Technical	500	300	100	700	500	700	500
Economic	201	201	201	714	714	678	714
Social	110	110	110	-8	-8	-8	-8
Environmental	156.5	-51	-42	441	137	530	335
MCA Benefit Score	467	260	269	1147	843	1200	1041
Options Selection Score	**967**	**560**	**369**	**1847**	**1343**	**1900**	**1541**

The MCA score table above shows that Option 1 for the Atlantic Stream and Option 2 for the Victoria Stream have the highest MCA benefit scores. The negative value in the environmental and social criteria show the negative impacts. Positive or no impacts are represented by positive values.

For the Atlantic Stream, all Options score the same for the social and economic criteria. Option 2 scores the lowest for environmental criteria due to its increased construction needs, with associated greater potential for construction phase impacts. Option 1 has the highest environmental score due to reduced potential for disturbance to the existing environment, as it has the lowest construction requirements.

For the Victoria Stream area higher scores correspond to Option 1A and Option 2. While they have similar scores on the social and economic criteria, the key difference is between the economic and environmental scores, which are higher for Option 1A. As shown in the table all the environmental criteria scores are positive, due to the fact that all the Options include channel realignment and creation of habitats, eventually resulting in positive environmental impacts in the operational phase, particularly on biodiversity and waterbodies quality. As Option 1A reduces the impacted area while allowing for habitat reinstatement at a slightly greater degree when compared to the other Options, it scores higher in the Environmental criteria.

[27] Technical Methodology Note - Option Appraisal and the Multi-Criteria Analysis (MCA) Framework, Office of Public Works- Flood and Risk Assessment and Management Section

Preferred Option Selection

Following the Options Assessment outlined in the above sections, preferred Options for each area emerged.

Atlantic Stream

There were common elements to all three Options for the Atlantic Stream. Option 3 requires a long culvert diversion around Kilkee Bay Hotel, which would have resulted in higher negative environmental impacts compared to Option 1. This would also have resulted in higher costs. These reasons made Option 3 the least preferred Option.

Option 1 proposed containment of the watercourse using an embankment at Sandpark Mobile Park, with a minor increase in the existing boundary wall height at the Dún an Óir estate. Option 2 proposed watercourse widening, which would provide some habitat potential and water quality benefits. However, these benefits would not be substantial enough to justify the increased risk of watercourse pollution during construction. These potential impacts make Option 2 the least preferred from the environmental perspective.

Option 1 has the highest environmental MCA Score, the highest MCA benefit score, and the highest Options Selection Score (Table 3-6).

When considering benefit cost ratio (BCR) for all Options, Option 1 is the most favourable (BCR Option 1: 0.4987, versus BCR Option 2: 0.253, and BCR Option 3: 0.138). These scores show that additional cost and additional risk associated with Options 2 and 3 make them less beneficial overall than Option 1. Therefore, Option 1 has been selected as the Preferred Option for the Atlantic Stream area.

Atlantic Stream outfall

For the Atlantic Stream Outfall, the difference in impacts between Option 1 and 2 is clear, with Option 2 being the preferred Option because it includes upgrade of the existing outfall culvert system, therefore it has fewer environmental impacts as it doesn't include construction of a new outfall.

Therefore, Option 2 has been selected as the Preferred Option for the Atlantic Stream Outfall area.

Victoria Stream

For the Victoria Stream there were common elements to all four options in most locations. Decommissioning of the existing Well Stream culvert and overflow pipes and replacement with a box culvert under Crescent Place is common to all Options. Similarly, common measures are the construction of embankments on the Well Stream, Victoria Stream and Western Tributary and the construction of new walls along the Victoria Stream. Environmental impacts related to these common measures would be the same for all of the options. Positive impacts on the four options are associated to the channel realignment and creation of habitat along the realigned channels, of the Western Tributary and Victoria Stream. Of all the options, Option 1A reduces the disturbance to the existing environment and offers the possibility to reinstate habitats.

With regard to MCA scores, there is very little difference in the economic benefits or impacts across all options, and all scored the same with regard to social impacts. Therefore, the environmental criteria become a dominant metric. In this regard, Option 1B and Option3, have the lowest environmental criteria scores due to the extended length of culvert on Well Road, which has the highest environmental impacts.

Option 1A and 2 are similar to each other with slight differences and are the ones with the highest MCA scores. Both options 1A and 2 provide very similar schemes, including in both cases the diversion of open channel to the centre of the floodplain, leading to the creation of wetlands and minimising culverting solutions. The difference between both lies to the south of the Victoria Stream, with the creation of an additional storage along Well Stream in Option 2. Assessed environmentally, Option 1A does become the most favourable solution, for its habitat creation and reduced disturbance to the local receptors.

It was considered if potential biodiversity benefits relating to the additional storage area to the south of Victoria Stream for option 2 would outweigh the financial costs as a result of land acquisition and the benefits provided by option 1A. The difference was coming up to 0.009 between Option 1A (BCR 0.19) and Option 2 (BCR 0.18) which was not deemed substantial to justify the additional cost of Option 2. This would make Option 2 less preferrable over Option 1A.

Therefore, considering all factors, Option 1A is the preferred option for the Victoria Stream area. This is the option that was presented to the public at the Public Consultation Day in April 2023.

Summary of Preferred Option

From the screening of alternative measures and assessment of Options the following were selected as the Preferred Options:

- Atlantic Stream – Option 1
- Atlantic Stream Outfall – Option 2
- Victoria Stream – Option 1A

This selection considered the objective of the project to reduce flood risk to properties in the town, be technically feasible and have the lowest impacts from a technical, economic, social, and environmental perspective.

For the Atlantic Stream the Preferred Option (Option 1) provides flood protection through construction of embankments and increase of boundary walls. What makes it different to the other Options is the fact that it has lower impacts because it does not include culvert extension or channel widening that requires extensive instream works.

For Atlantic Stream Outfall the Preferred Option (Option 2) increases the Outfall capacity by; upgrading the existing overflow chamber with a raised cover, installing non-return valves to the main outfall and overflow /outfall culverts and sealing a manhole at it's existing ground level. These measures, thus avoid major impacts and risks associated with the construction of a new outfall adjacent to the Moore Bay.

For the Victoria Stream area the Preferred Option (Option 1A) provides flood protection through a combination of measures summerised below.

Construction of an embankment will occur at Cunninghams Holiday Park with the inclusion of a new headwall with an inlet culvert to the existing culvert downstream. North of Victoria Crescent there will be an embankment, also behind Carrigaholt Road and at the Western Tributary.

There will be installation of an overflow pipe on the Well Stream Tributary and a non-return valve on the Well Stream u-channel left bank wall, thus maintaining connectivity during normal flows and therefore enabling overflow to the carrier drain during flood events.

Decomissioning of existing overflow culverts at Crescent Place will happen with the installation a new reinforced concrete culvert under Crescent Place. This option includes: the installation of precast reinforced concrete u-channel along the existing Well Stream alignment. There will also be the installation of a culverts under the Western Tributary embankment linking to the diverted Victoria Stream alignment and the inclusion of headwalls on the inlet and outlet of the culvert.

Reconstruction of Victoria Court boundary wall, repointing, thickening and replacing sections of the Crescent Place left bank wall of the Victoria Stream is proposed. Also with the reconstruction of Victoria Crescent boundary wall on the right bank of the Victoria Stream.

Diversions of open channels to the centre of newly created floodplains with existing open channels filled in will occur behind Carrigaholt Road and the Western Tributary. There will be regrading of floodplains in a field north of Cluain na Mara estate and in a field west of Cunningham's Holiday Park.

The measures include nature-based solutions which would provide multiple benefits on biodiversity and water quality, given the importance of Kilkee beach to maintain water quality. Also, the creation of flood storage areas provide benefits on biodiversity and reduces extra costs on added land acquisition which would not have a significant BCR difference and time delay risk on the project.

4 Description of Proposed Development

4.1 Site Location

A description of the study area and site location is given in Chapter 1 and shown in Figure 1-1.

4.2 Proposed Development

To facilitate the reader, the proposed development is split and described in the same sequence and areas as the set in the Options Report. The proposed development is illustrated in the engineering and landscape drawings, refer to Appendix B. These drawings take precedence over information and measured described in other reports :

- 19109-JBAI-XX-XX-DR-C-02102 (Well Stream)
- 19109-JBAI-XX-XX-DR-C-02105 (Atlantic Outfall Culvert)
- 19109-JBAI-XX-XX-DR-C-02106 (Victoria Court)
- 19109-JBAI-XX-XX-DR-C-02107 (Sandpark / Dún an Óir)
- 19109-JBAI-XX-XX-DR-C-02108 (Kilkee Bay Hotel)
- 19109-JBAI-XX-XX-DR-C-02109 (Meadow View Court)
- 19109-JBAI-XX-XX-DR-C-02111 (Victoria Court)
- 19109-JBAI-XX-XX-DR-C-02112 (Well Stream)
- 19109-JBAI-XX-XX-DR-C-02114 (Sandpark / Dún an Óir)
- 19109-JBAI-XX-XX-DR-C-02115 (Kilkee Bay Hotel)
- 19109-JBAI-XX-XX-DR-C-02120 (Atlantic Outfall Culvert Screen)
- 19109-JBAI-XX-XX-DR-C-02124 (Adverse Flood Risk)
- 19109-JBAI-XX-XX-DR-C-02145 (Construction Access)
- 19109-JBAI-XX-XX-DR-C-02167 (Well Road Property Permanent Access)
- 19109-JBAI-XX-XX-DR-L-02121 (Western Tributary / Victoria Stream)
- 19109-JBAI-XX-XX-DR-L-02122 (Western Tributary)
- 19109-JBAI-XX-XX-DR-L-02123 (Victoria Stream)

Atlantic Stream

The Atlantic Stream proposals include the following measures in key locations:

Kilkee Bay Hotel

- Construction of c. 200m long embankment c. 1.3-1.6m high.
- Diversion of c. 110m of open channel into centre of floodplain.
- Installation of new headwall and 600mmØ inlet culvert under embankment to link with existing culvert.

Dún an Óir estate

- Increase the height of the existing boundary wall by c.300mm over c.103m length.

Sandpark mobile park

- Construction of c.110m long embankment c.700mm high.

Waterworld

- Replacement of existing debris screen at upstream culvert headwall with new one.

Meadow View Court

- Construction of 2no. 2100mmØ inlet manholes with grated covers on existing 1200mmØ culvert.

Atlantic Stream Outfall

The Atlantic Stream outfall proposals include:

- An upgrade to the existing overflow chamber with raised cover (c. 2.7m long x 2m wide x 400mm high) with flap valves.
- The reconstruction of outfall manhole and installation of non-return valve on upstream 750mmØ culvert.

- The installation of non-return valve to the existing 750mmØ overflow outfall culvert.
- The sealing of the manhole downstream of the overflow chamber on the main outfall culvert at existing ground level (c. 2m long x 0.8m wide x 400mm high RC slab and new sealed lid).

The proposed works include reconstruction of the overflow manhole with a new pressure-releasing chamber cover to allow surcharged flows to be dissipated in a controlled fashion and allow flood waters to run down the promenade terracing and onto the beach. Non-return valves are proposed to the existing main outfall and overflow outfall culverts. The manhole on the main outfall culvert alignment downstream of the upgraded overflow manhole is to be sealed at its existing ground level.

The proposed measures in these two areas, Atlantic Stream and Atlantic Stream Outfall are show overleaf in Figure 4-1 and Figure 4-2.

Victoria Stream

The Victoria Stream proposals include the following measures in key locations:

Well Stream

- Construction of c. 146m long embankment c. 1.1m high upstream of Cunningham's Holiday Park with inclusion of new headwall and 1050mmØ inlet culvert to existing culvert downstream.
- Installation of precast reinforced concrete u-channel along the existing Well Stream alignment c. 240m long and c. 1.6m above the adjacent road level.
- Installation of overflow on the Well Stream Tributary and non-return valve on the Well Stream u-channel left bank wall to maintain connectivity during normal flows and enable overflow to the carrier drain system during flood events.
- Decommissioning of existing Well Stream box culvert and circular overflow culverts at Crescent Place. Installation of new RC box culvert (c. 1.6m wide x 900mm high) c. 55m long under Crescent Place.
- Resurfacing and regrading of Well Road (c. 300m long x 5.5m wide x 300mm high).

Victoria Court:

- Reconstruction of the boundary wall from 20 Victoria Court to the boundary of 21 Victoria Court, a section approx. 36m long.

Victoria Stream

- Local repointing and thickening of existing left bank wall behind Crescent Place properties. Replacement of c. 3m section of wall to facilitate Well Stream RC box culvert installation at Crescent Place.
- Construction of c. 280m long embankment behind Carrigaholt Road c. 1.2-1.4m high above ground level.
- Construction of new flood defence wall c. 230m long along filled-in left hand bank from Victoria Park to Crescent Place c. 1.2-1.8m high above ground level.
- Diversion of c. 170m of open channel to centre of floodplain. Existing open channel to be filled in.
- Reconstruction of Victoria Crescent boundary wall c. 130m long.
- Construction of c. 37m long embankment c. 800mm high north of Victoria Crescent.

Western Tributary:

- Construction of embankment c. 980m long and c. 1.3-1.8m high around Western Tributary floodplain.
- Diversion of c.400m of open channel to centre of floodplain and filling in of existing channel.
- Regrading of floodplain in field north of Cluain na Mara estate by c. 700mm max.
- Regrading of floodplain in field west of Cunningham's Holiday Park (north of existing alignment of filled-in Western Tributary) by raising to 6.70mOD for the northern two-thirds section and lowering to 6.40mOD for the southern third section.
- Installation of 900mmØ culvert under Western Tributary embankment to link to diverted Victoria Stream alignment. Inclusion of headwalls on inlet and outlet of culvert.

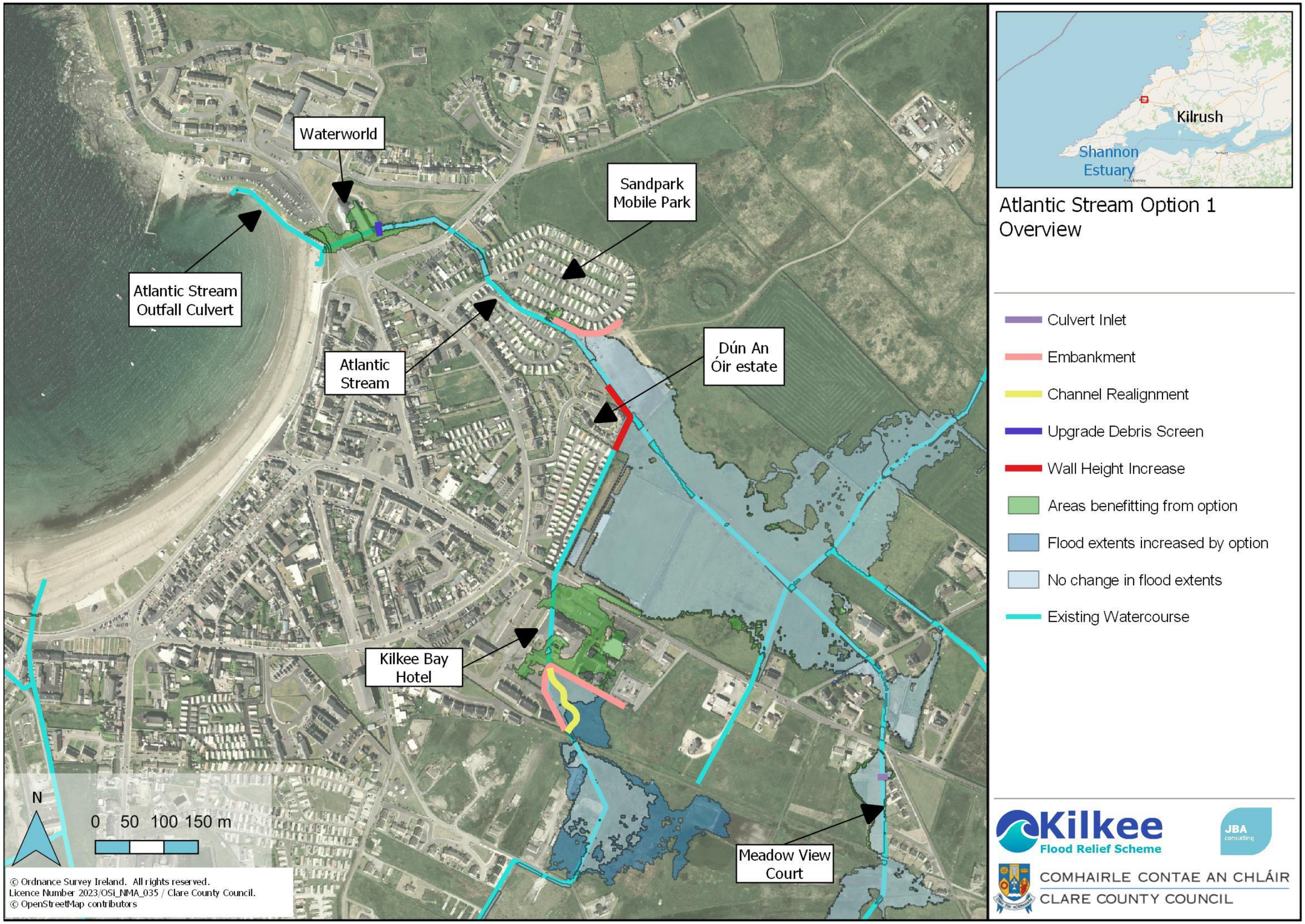


Figure 4-1: Preferred Option overview for the Atlantic Stream area

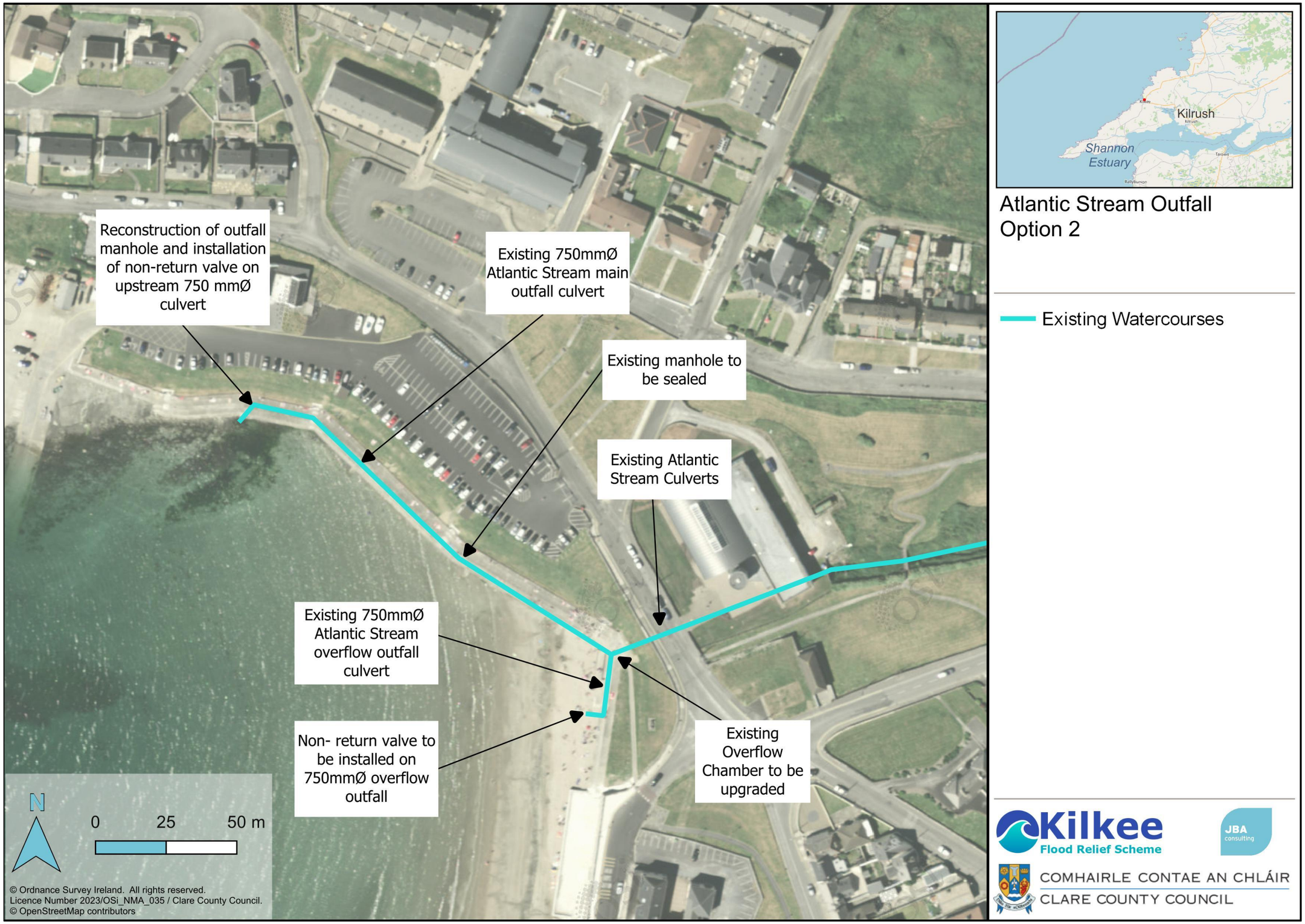


Figure 4-2: Preferred Option overview for the Atlantic Stream outfall

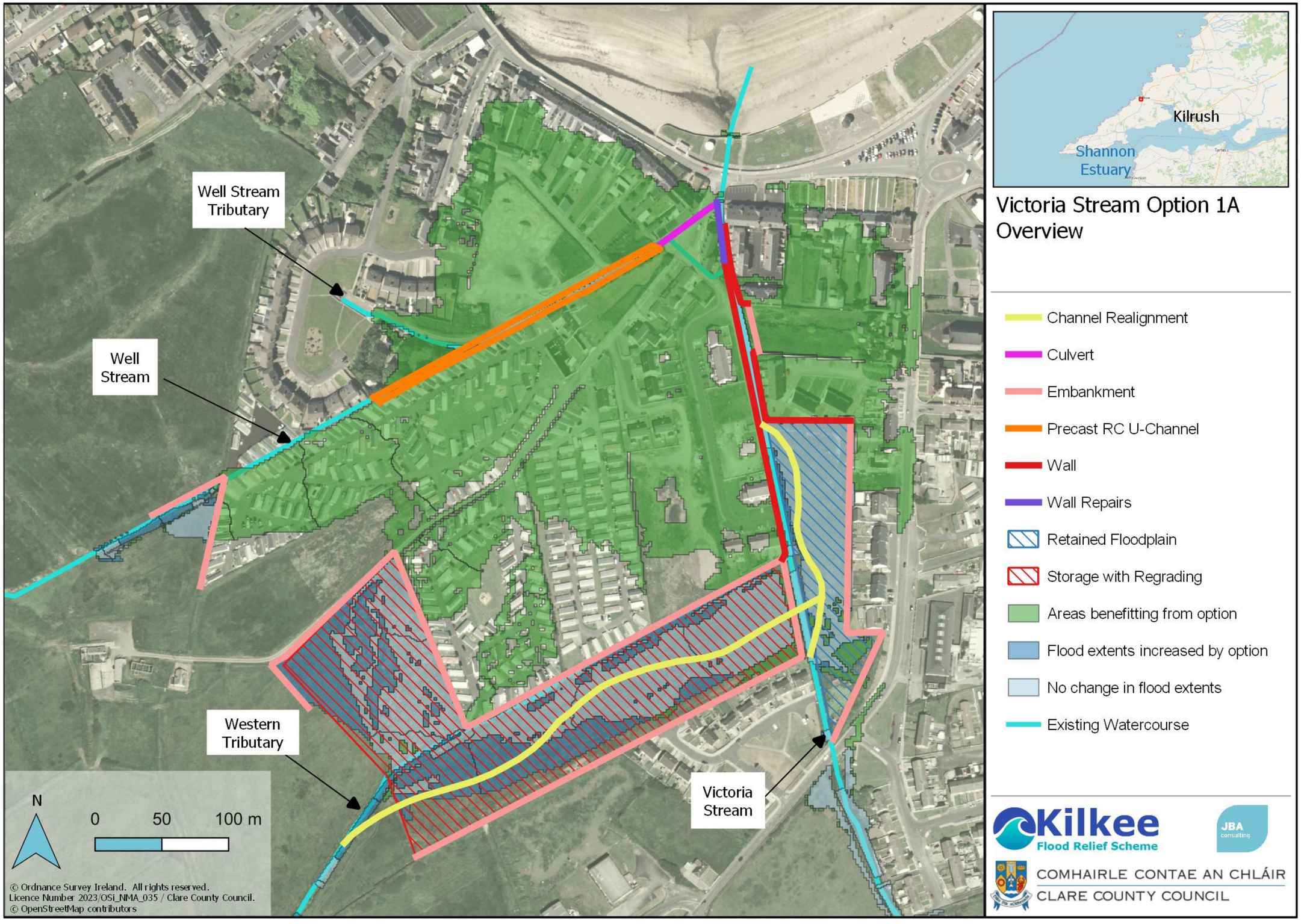


Figure 4-3: Preferred Option overview for the Victoria Stream

Adverse Flood Risk due to fluvial measures

When considering fluvial defence measures, it needs to be assessed as to whether they will increase flood risk from other sources. Aside from fluvial risk, there exists both a pluvial and coastal risk. The following sections detail what elements are included in the scheme to ensure that the flood risk from these other sources isn't made worse by the fluvial defences.

Pluvial Flod Risk

Both the Victoria Stream and Well Stream have pluvial drainage outlets discharging into them. As containment measures are being considered on these watercourses, the water levels will increase from the baseline. This results in the pluvial outfalls becoming more surcharged compared to that of their current downstream condition.

To ensure that the fluvial defences don't result in an increase in pluvial flooding, a number of stormwater drainage elements including a pump station and sub-surface storage on the Well Road (at CCC. compound) and the Carrigaholt Road, in lands north of Victoria Crescent are required as described below.

- Installation of pump station, sub-surface storage and rising main at CCC compound at Well Road.
- Installation of pump station, sub-surface storage and rising main in field north of Victoria Crescent to cater for Carrigaholt Road drainage systems.
- Construction of c. 375-450mmØ carrier sewers and associated manholes under Well Road and Victoria Park for interception / overflow of existing surface water network outfalls and direct them to a single outfall at the Well Stream RC u-channel (with non-return valve fitted) / pump station at CCC compound.
- Construction of c. 200m of 225mmØ carrier drain and associated manholes to cater for overflows from Carrigaholt Road drainage systems to link with pump station north of Victoria Crescent.
- Upgrade of Carrigaholt Road surface water drainage network – construction of c. 115m of 300mmØ sewer, new manhole, headwall, gullies and non-return valve fitted to outfall.

Retention of Baseline: Coastal Flood Risk

To avoid an increase in the extents of coastal flooding of Kilkee as a result of the proposed development, it is proposed to introduce the following measures to allow the coastal flood volume to drain via their baseline flow routes:

- 8no. sluice gates (c. 2m wide x 900mm high) to left hand bank of Victoria Stream walls with invert level set at ground level.
- 1no. sluice gate (c. 2m wide x 900mm high) to right hand bank of Victoria Stream with invert level set at ground level.
- 3no. sluice gates (c. 2m wide x 900mm high) to left hand bank of Well Stream u-channel wall with invert level set at ground level.
- 2no. junctions reprofiling by c. +300mm at Well Road (c. 20m long x 10m wide x 300mm high) and Geraldine Place (c. 20m long x 12m wide x 300mm high).

The road raising is proposed to restrict surface flows entering the Well Road and Geraldine Place.

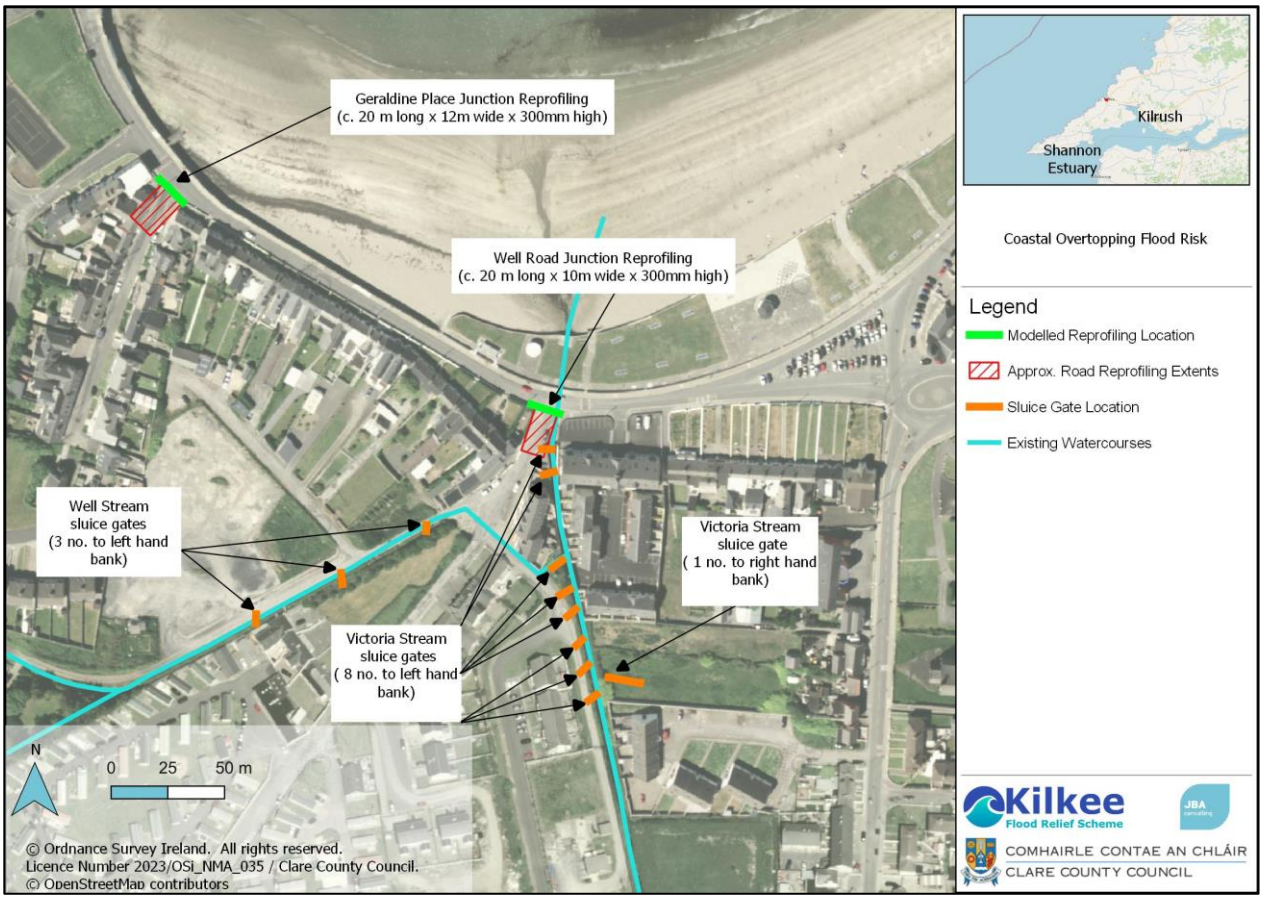


Figure 4-4: Coastal overtopping flood risk measures

4.3 Construction Activities

Details of the construction activities can be found in the buildability report 19109-JBAI-XX-XX-RP-C-00482_Buildability_Report[28]. Figures 4-5 through 4-13 below illustrate the temporary access roads, material storage areas, potential site compound locations, temporary road closures and properties that are expected to be affected during the construction phase.

Atlantic Stream

A summary of the key construction works per area along the Atlantic Stream are as follows:

Kilkee Bay Hotel

- Upgrade ESB substation access road including widening of entrance from the N67. Construct access road from site compound to point downstream of Atlantic Stream diversion point and to headwall construction point.
- Excavate Atlantic Stream two stage diversion channel and construct temporary crossing over excavated diversion channel. Excavate for new headwall and culvert, construct new headwall, culvert and trash screen and connect into existing culvert.
- Divert Atlantic Stream immediately downstream of existing 750 mm culvert under old west Clare railway route.
- Excavate redundant Atlantic Stream open channel to a suitable depth. Excavate ground beneath proposed embankments to a suitable depth. Export excavated material to a licensed facility. Replace excavated material with imported impermeable engineered material. Fill in Atlantic Stream open channel with imported impermeable engineered material.

[28] JBA Consulting (July 2024) *Kilkee Flood Relief Scheme - Buildability Report.* Clare County Council and Office of Public Works

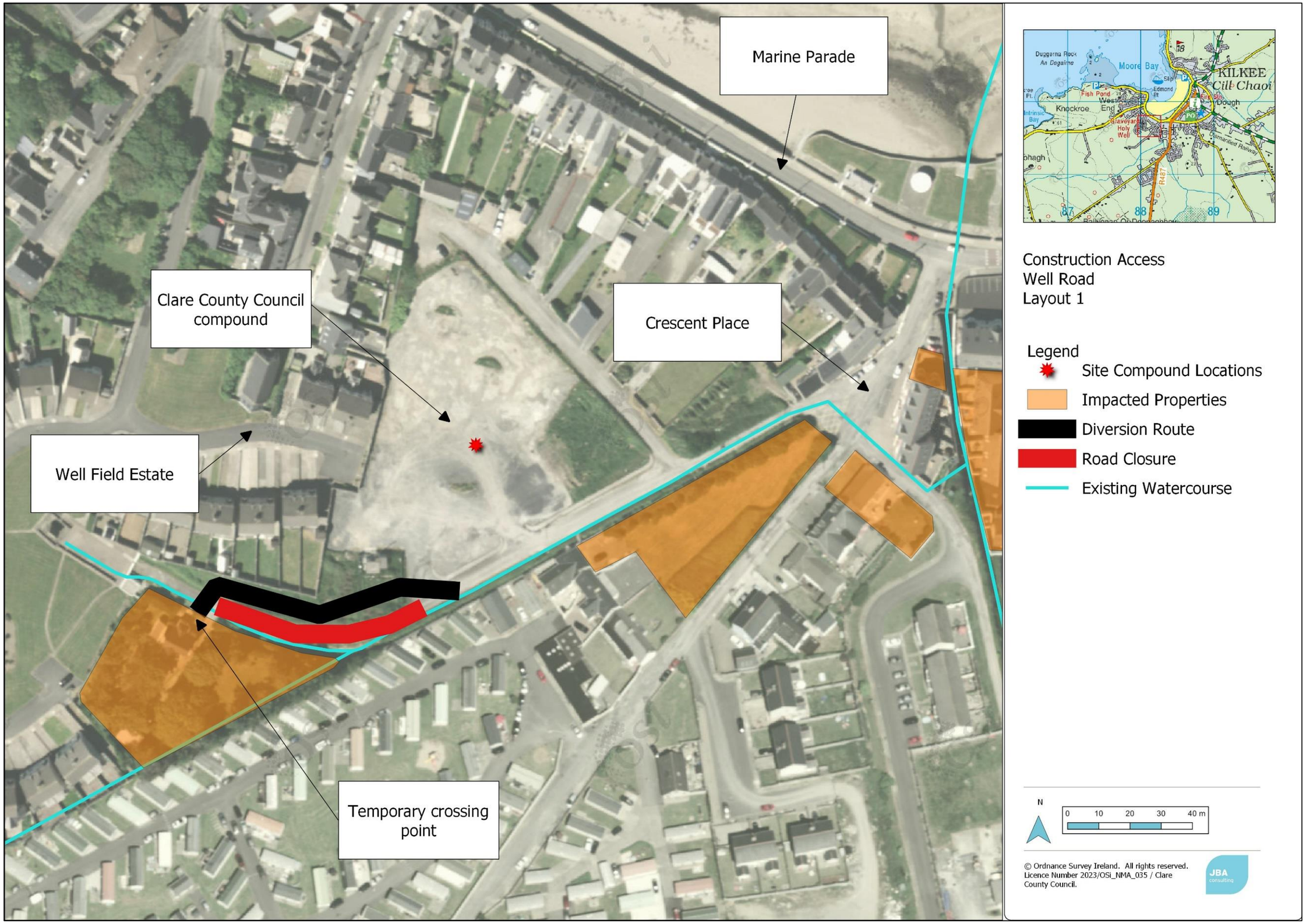
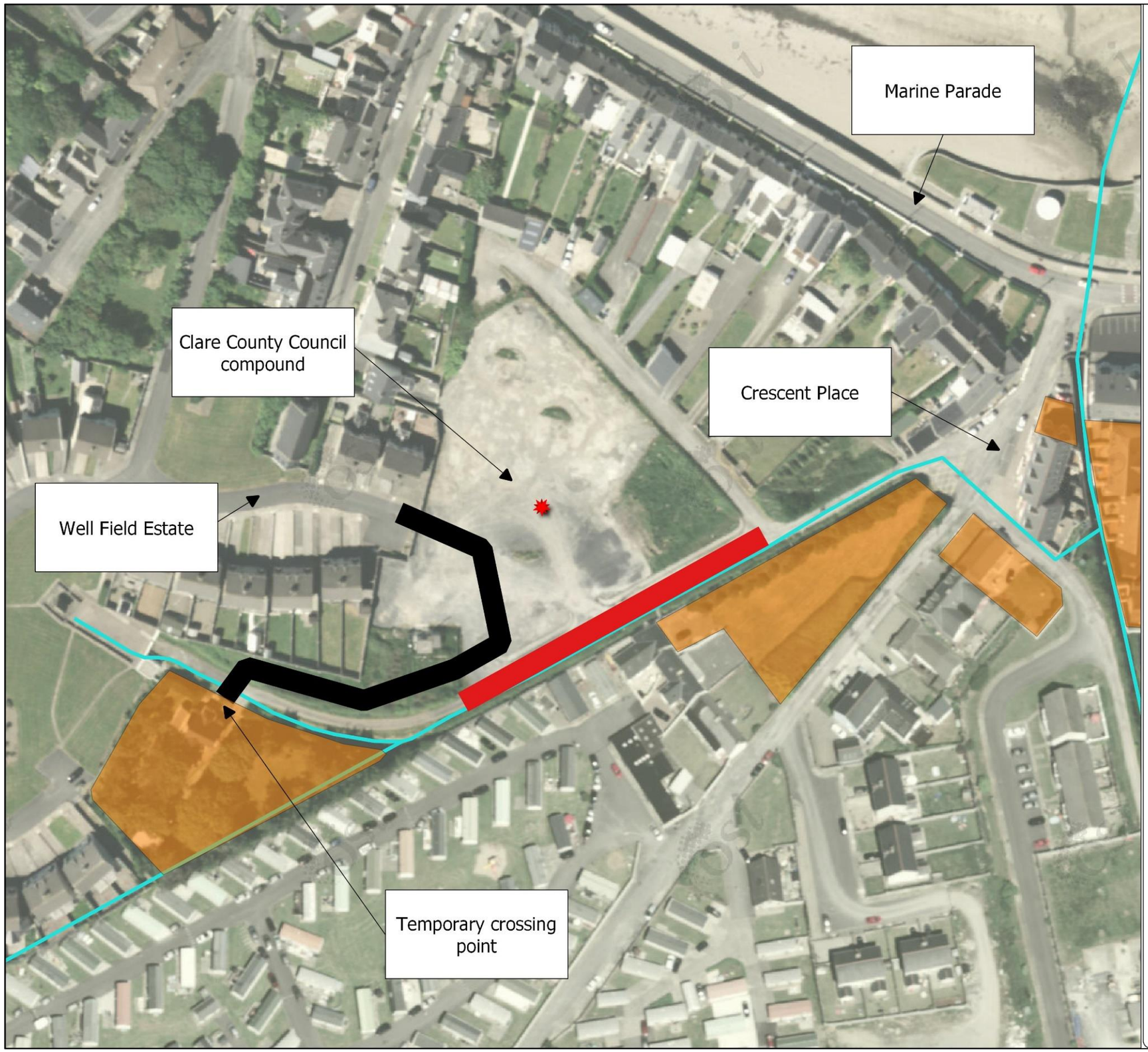
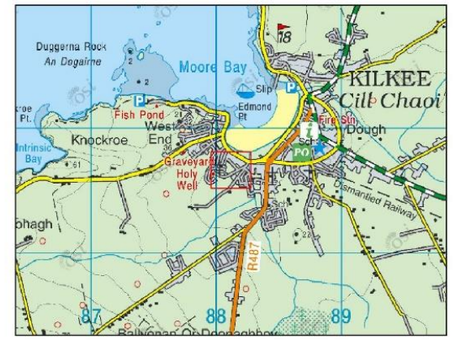


Figure 4-5: Temporary access road at the Well Stream, main access 1.





Construction Access
Well Road
Layout 2

Legend
- Site Compound Locations
- Impacted Properties
- Diversion Route
- Road Closure
- Existing Watercourse

N
0 10 20 30 40 m

JBA consulting

Figure 4-6: Temporary access road at the Well Stream, northern access 2.

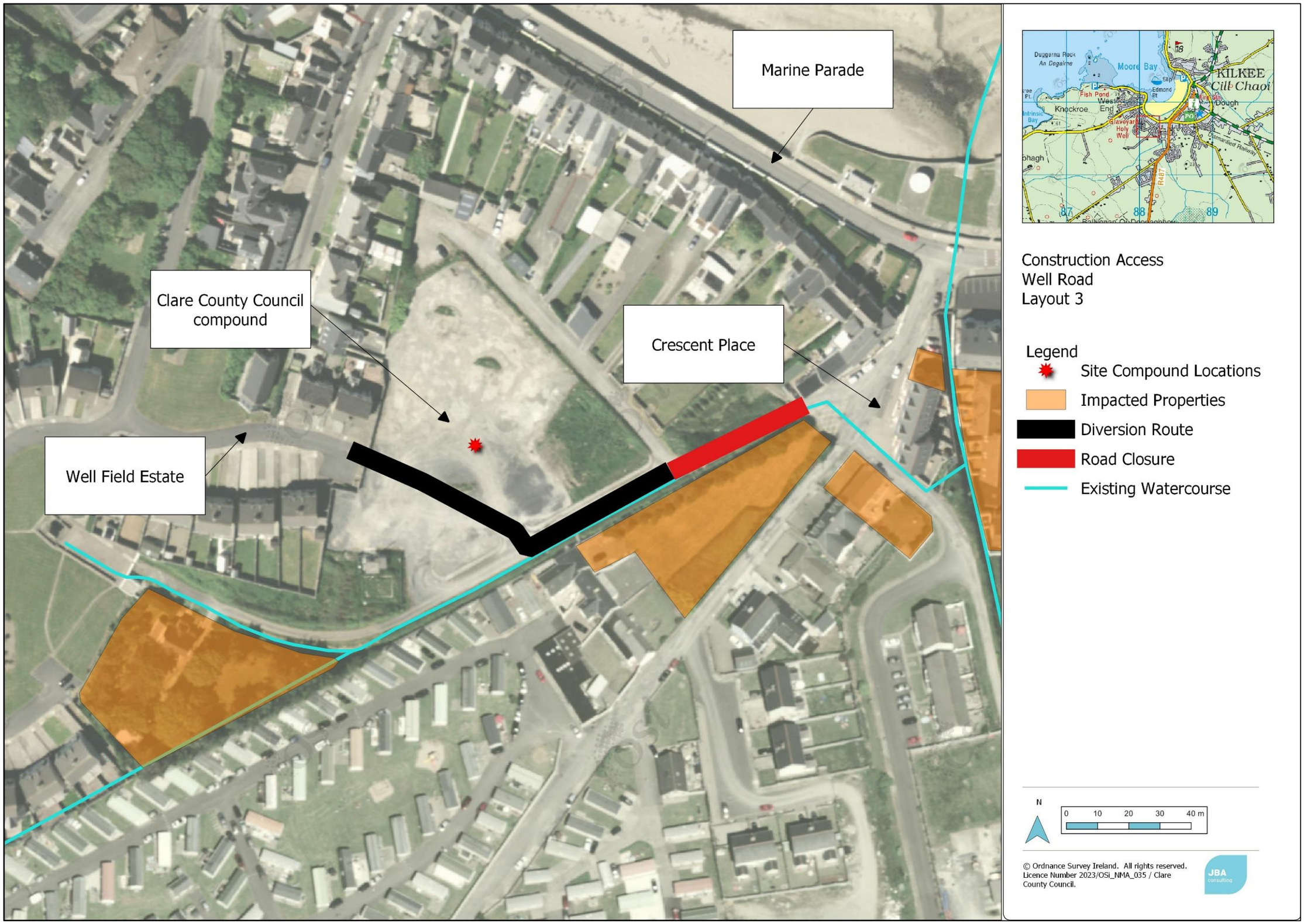


Figure 4-7: Temporary access roads at the Well Stream, northern access 3.

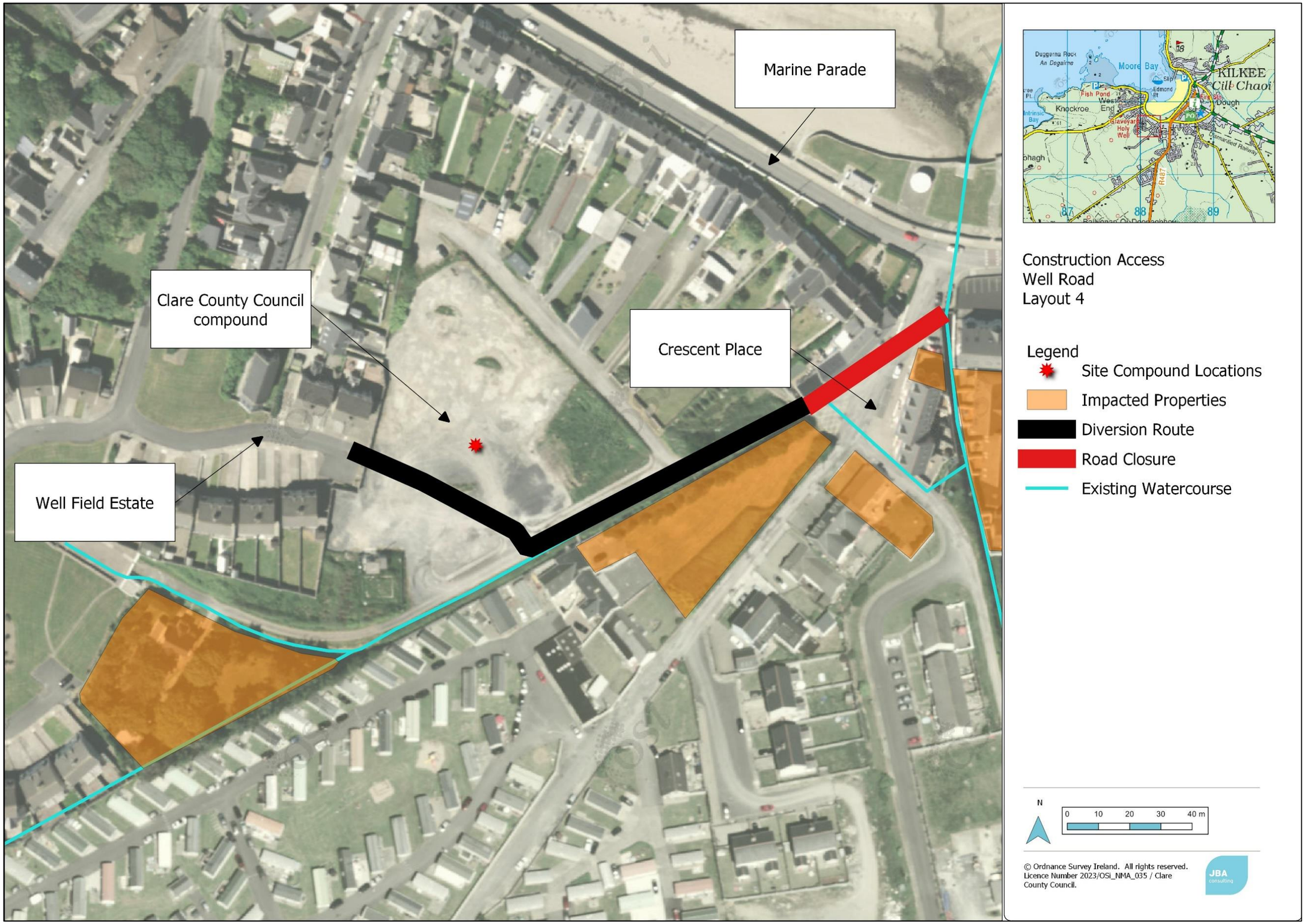


Figure 4-8: Temporary access roads at the Well Stream, northern access 4.

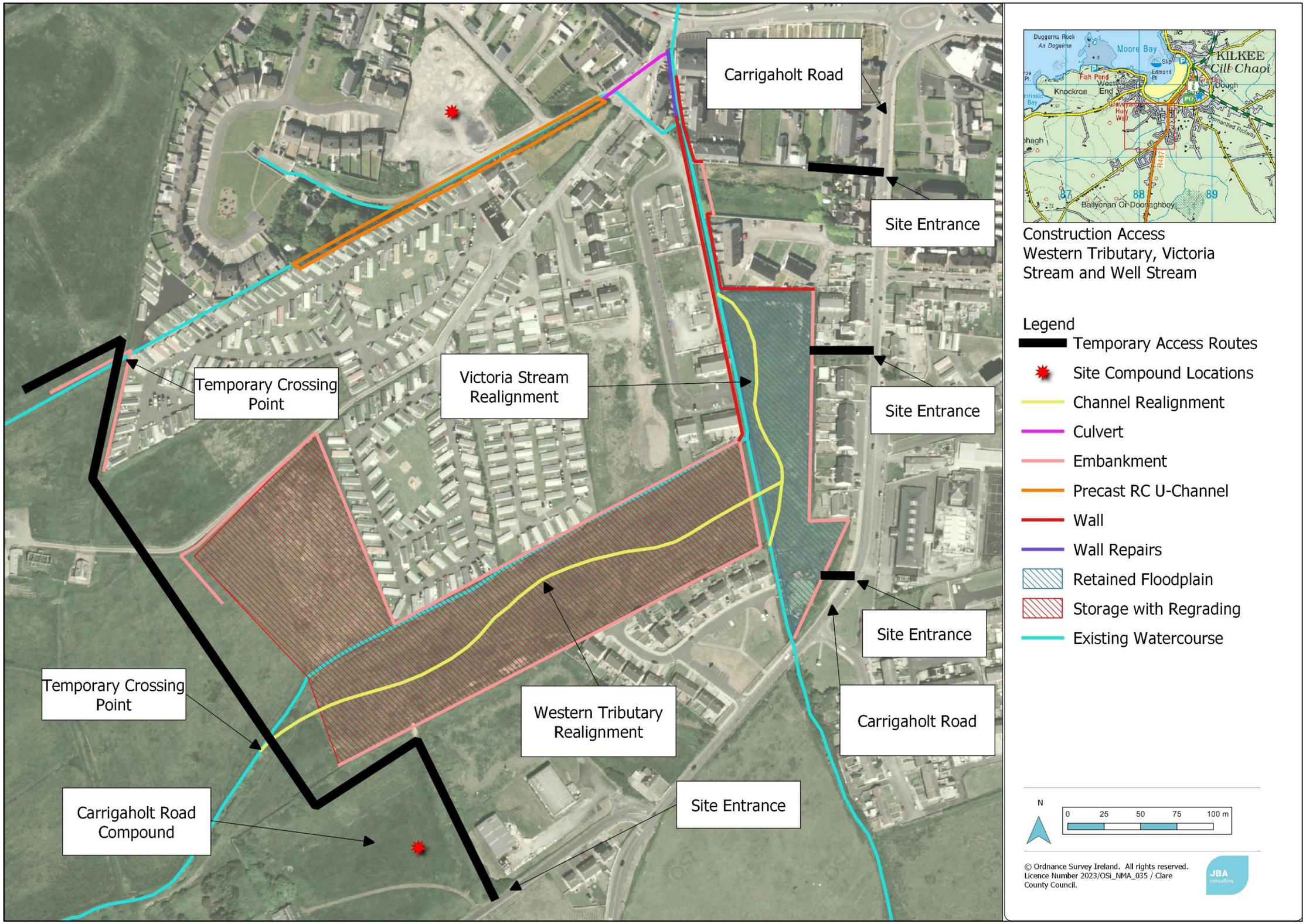


Figure 4-9: Temporary road access at Carrigaholt road.

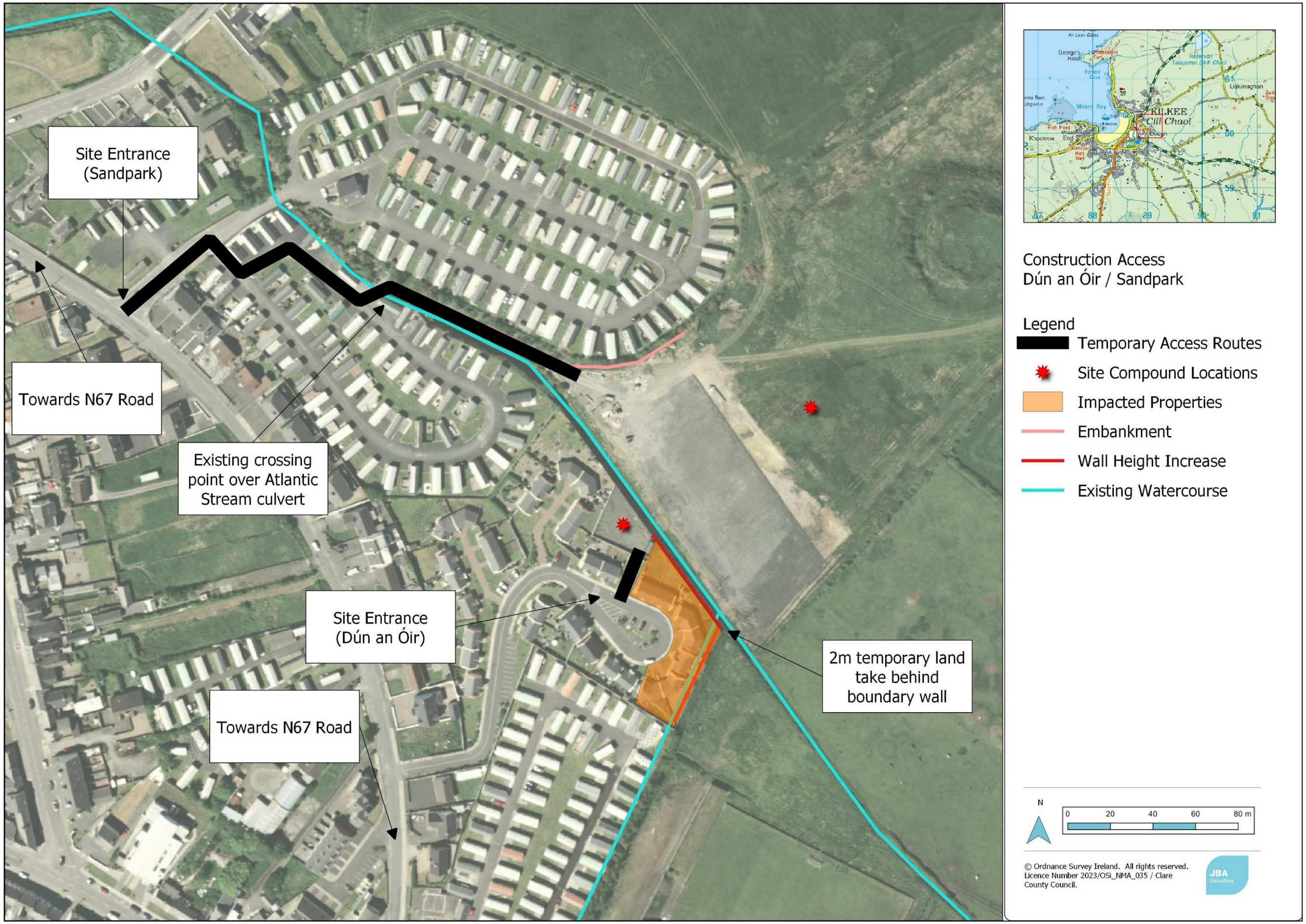


Figure 4-10: Temporary access roads at Dun an Oir and Sandpark.

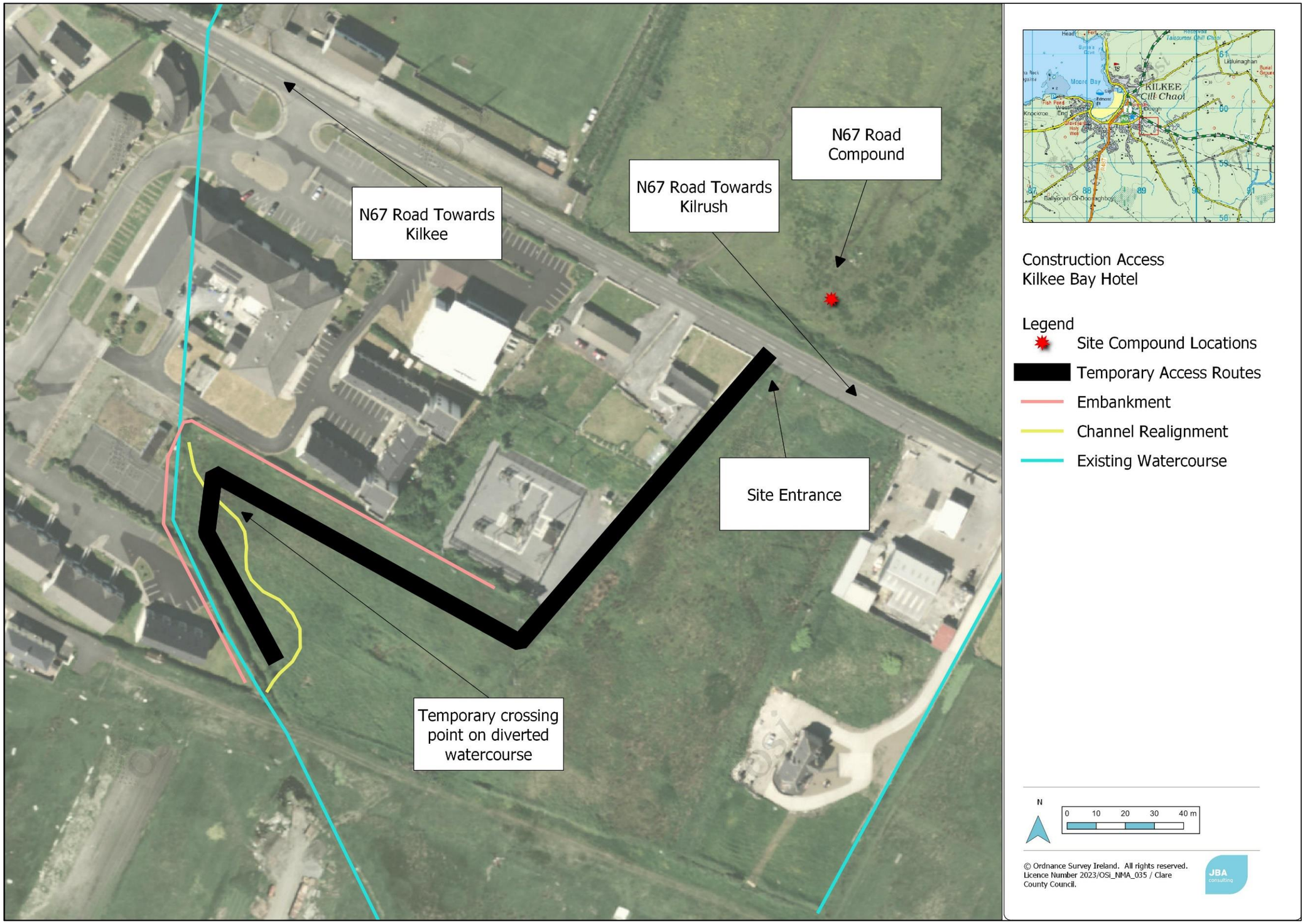


Figure 4-11: Temporary access road at Kilkee Bay Hotel.

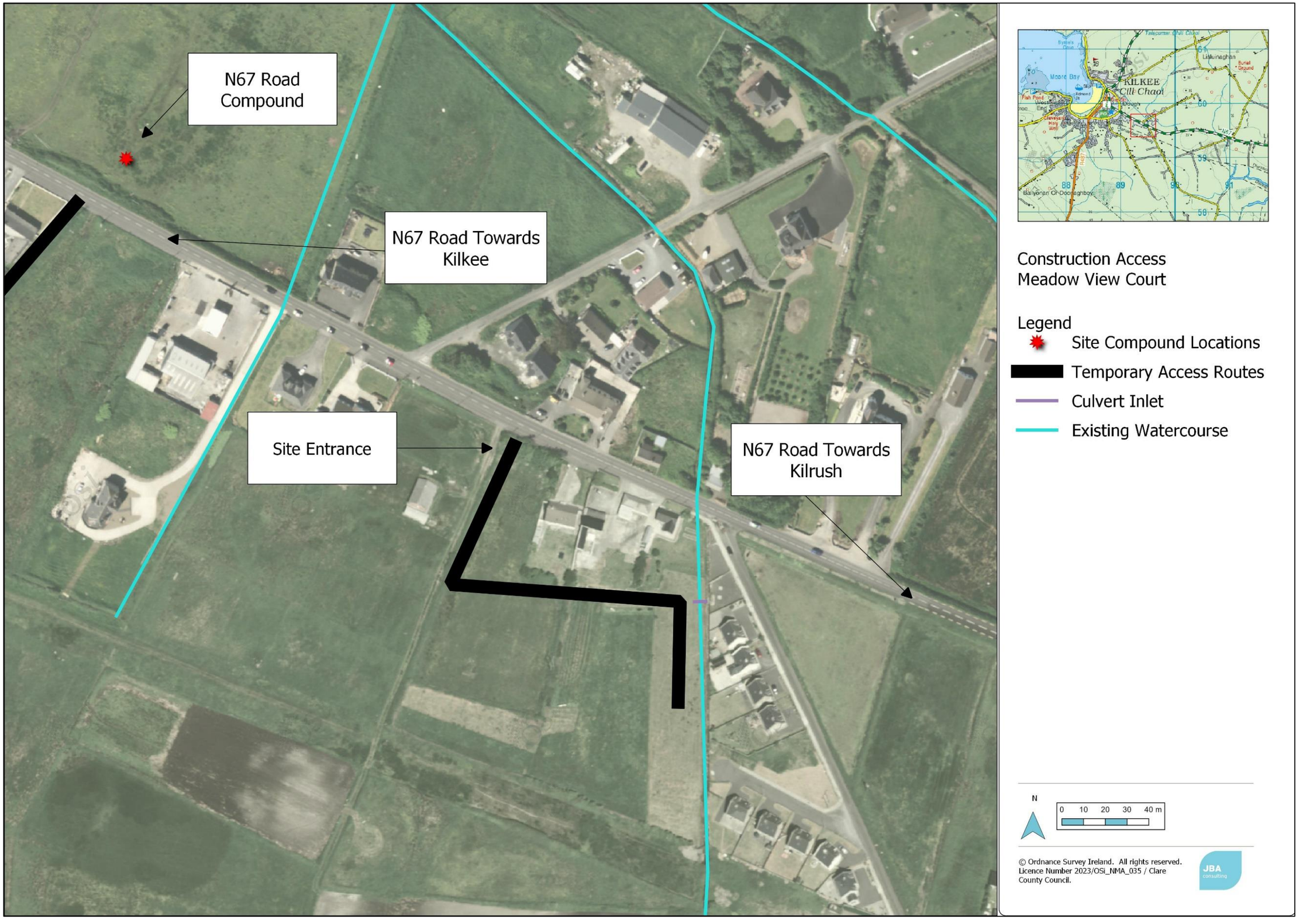


Figure 4-12: Temporary access road at Meadow View Court.

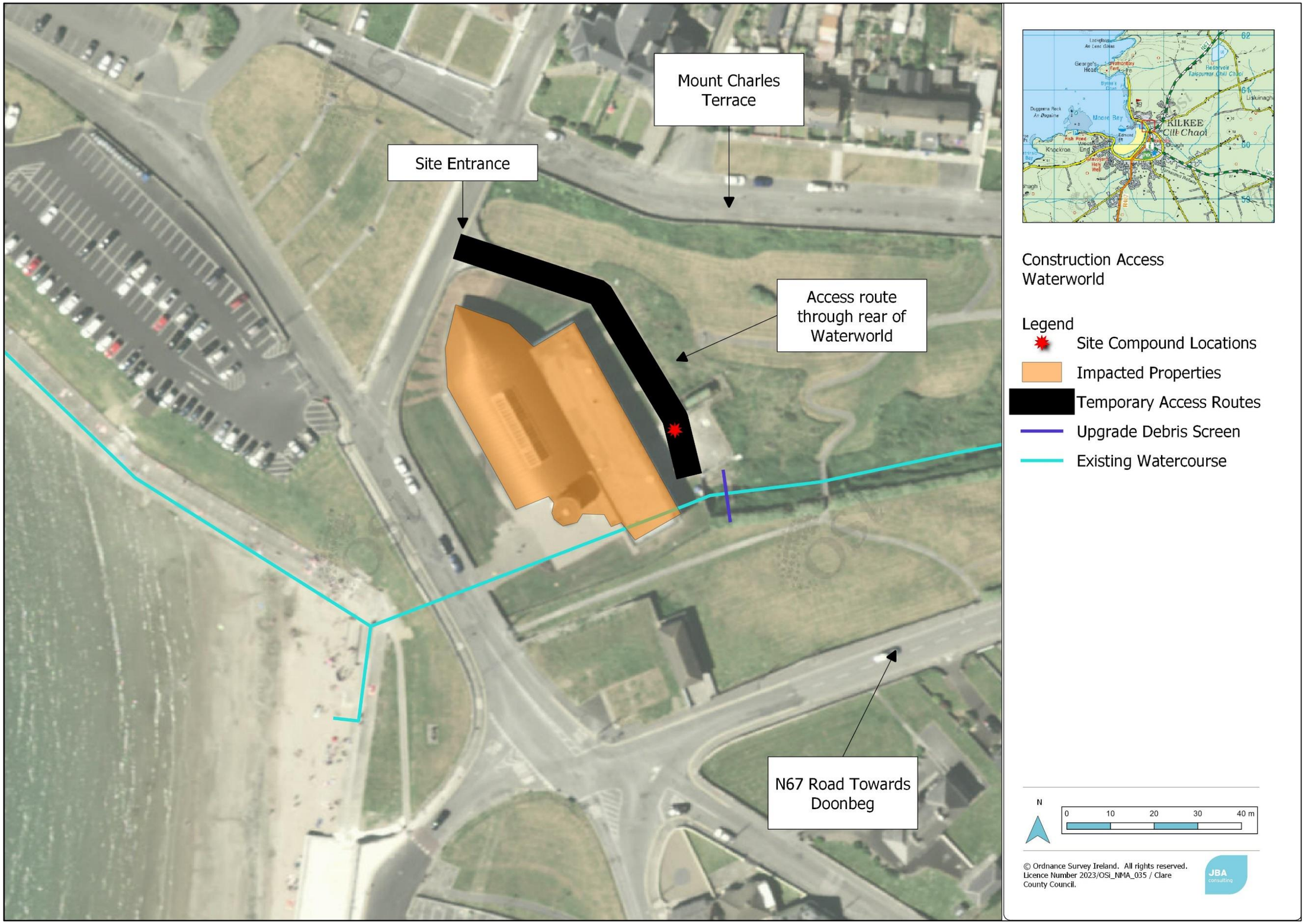


Figure 4-13: Temporary access road at Waterworld.

- Construct proposed defence embankment with imported impermeable engineered material, place topsoil on it and seed as required. Construct the 1m maintenance footpath around interior of embankment. Regrade storage area to required contour.
- Place temporary bridge over Atlantic Stream diversion channel.

Dún an Óir

- Form site compound in the public area in front of property no. 20 with temporary fencing/hoarding.
- Access rear garden of property no 20 by removing required number of timber fence panels on northwest boundary.
- Relocate home heating oil tank adjacent to northwest boundary fence if necessary. Remove required number of boundary timber fence panels between subsequent properties to gain access to properties no 21-25. Remove garden furniture and other obstacles from works area. Install temporary fencing with signage to enclose works area, minimum 2 metres from rear boundary. Remove existing timber fence panels from the boundary wall, for reuse if suitable. If unsuitable remove offsite to an approved location.
- Import required building material through rear garden of property no 20 and construct 300 mm wall extension on top of existing boundary wall. All deliveries to be brought via estate entrance and Circular Road.

Sandpark mobile park

- Install hoarding around the construction area.
- Undertake ground preparation works to accommodate the new embankment.
- Excavate topsoil beneath the footprint of the proposed embankment. The final excavation depth will be dependent on the ground conditions. The alignment of the embankment be along part of the boundary of the Sandpark mobile home site.
- Remove any construction waste to an approved location.
- Construct the embankment by importing and placing impermeable clay.
- Construct the 1m maintenance footpath around the north side of the embankment.
- Place topsoil on the embankment and grass seedling.

Waterworld

- Establish temporary access. Temporarily locate the site compound to the rear of Waterworld, where an existing area for a site compound is readily available.
- Partially dam the watercourse prior to works. The temporary lay down area will require a layer of geogrid to be placed on the existing surface. A stone layer as detailed by the temporary works designer should be placed over this.
- Establish silt mitigation measures prior to the excavation within the stream.
- Remove the existing gabion baskets.
- Excavate the banks and foundations to the extent and depth required.
- Provide concrete mitigation measures for the construction of the foundations for both wing walls. The wing walls themselves are proposed to be precast structures. These will be lifted into place using an excavator.
- Assemble the steel elements in-situ, due. An element of scaffolding will need to be constructed in-stream to allow access to each wall. This access will be required to install the horizontal support beams for the screen and permanent platforms. Once the horizontal supports are installed, the lower access platform will be installed, and the scaffold removed. The remaining screen elements will be installed from the lower access platform.
- Backfill the screen walls and install the handrails.

Atlantic Stream Outfall

The required works at the Atlantic Stream outfall include:

- Establish a compound around the manhole in question using heras fencing.
- Brake out the existing manhole cover and frame of its concrete surround. Care is to be taken not to damage the biscuit below. An area 1m x 1m centred on the lid is to be broken out and exposed down to the manhole biscuit.
- Install a new rising shaft with masonry, constructed off the surface of the biscuit. Using concrete lintels, openings are to be left in the masonry wall. Additional manhole steps are to be installed as

required. The manhole lid is to be bedded back onto the new rising shaft, with bolted fixings through the masonry.
- Fix non-return valves to the external face of the elevated faces of the manhole.
- Render and reinstate the entire external surface of the promenade.

Victoria Stream

The required works per area along the Victoria Stream include:

Well Stream (and Well Stream Tributary)

- Undertake tree and shrub clearance within the private property at the end of the Well Road.
- Temporary fencing installed to contain the works from public access. This will involve a 5m temporary land take along the length of the stream on the southern bank. The installation of the culvert in stream brings a high risk of siltation. Mitigation measures to prevent the impact of this risk on downstream receptors will be detailed further in the EIAR.
- Temporarily divert the Well Stream by means of a pluvial carrier pipe.
- Install of the u-channel. This will involve an initial over-widening and deepening of the existing stream. The precast channels will require a dry environment to be initially installed in. Once the existing stream has been widened to the requirement dimensions, a temporary series of pipes are to be installed on the south side of the stream. An upstream bund is then to be established to control flow through these temporary pipes. Once the dam is in place, the foundation for the u-channel can be established. This involves the placement and compaction of engineered fill. On completion, the u-channels can be lifted into place. The channels will be sealed as the works progress. Remove temporary stream diversion works The left-hand bank of the channel, between the existing boundary wall and the culvert, will be backfilled as the works progress. Install handrails once the u-channel is in place.
- At Crescent Place establish a temporary access road. This temporary traffic diversion would need to be complemented by access arrangements for the residents in Cardinal Place. Excavate to expose all known services along the route of the culvert across Crescent Place. Necessary protections are to be put in place to maintain these services during the first half of the culvert installation. Demolish the outlet, the existing Victoria Stream wall and the boundary wall of one property in Crescent Place, to allow room for culvert installation. Excavate culvert to depth and install the culvert sections. The culvert sections will be installed using a 10t excavator, installing the sections as they are delivered to site. The outlet section is to be installed first, and the boundary wall reconstructed. This will involve scaffolding within the Victoria Stream. This scaffolding can remain in place for the works being undertaken further upstream on the Victoria Court property.
- Backfill the culvert and reinstate the carriageway.

Victoria Court

- Place temporary hoarding/fencing in the public area in front of house no 20 and beside no 21.
- Construct scaffolding within Victoria Stream outside the wall to be demolished. This will require a section 50 for any scaffolding located in-stream.
- Remove any garden furniture etc in construction area.
- Install hoarding/fencing at the rear of the properties to enclose working area.
- Establish a segregation zone within this site identifying the extent of the Japanese Knotweed (JKW) present. Following the relevant to JKW recommendations, clear vegetation around existing wall. Carefully remove the proposed area of the existing wall down to the top of old rubble stone wall.
- Excavate to the required depth of embankment foundation. Engineered fill will be placed up to ground level. Install new rising main to Victoria Stream from attenuation tank. The embankment will then be constructed using a suitable clay material as its core, with general fill used to complete its necessary profile. The final embankment will be dressed with excavated topsoil. The embankment will tie in with the newly constructed flood walls at Victoria Court and Victoria Crescent.
- Remove construction waste from site via the adjacent Victoria Crescent field.
- Excavate/clean off material to the base of wall. Pour RC ground beam over top of the existing rubble wall. This will form the new wall foundation. Cross stream supports fixed into the foundations of the existing walls. The testing of the fixing integrity will also be required.
- Construct the southern wall on a conventional strip foundation. This will be excavated to depth and a strip foundation poured in-situ.

- Construct the masonry wall on the new foundation structures. A masonry return is to be constructed to the south to allow for tie-in to the proposed embankment. Following construction of wall, it is to be rendered as agreed.
- Repoint stone wall where proposed. At the base of the steps within the laneways, the foundation of the wall is to be exposed down to foundation level. The foundation is to be widened by 100mm, dowelling into the existing foundation. Masonry ties are to be shot-fired into the existing masonry wall, and a 100mm masonry thickening is to be constructed onto the face of the existing wall.
- Remove scaffolding and fully reinstate the garden. Remove site compound, temporary fencing, and signage from area.

Victoria Stream

- Install temporary traffic management measures, including localised signage and advanced advertisement and site accommodation works. This element of works will disrupt the access for Uisce Eirann. It is proposed that the access here be widened to the right-hand side green area, to maintain access whilst the wall is being constructed.
- Excavate along the proposed flood wall alignment up to the required foundation depth.
- The northern tie-in point for this wall is to an existing masonry structure. A vertical water bar detail is to be included at this point.
- The RC foundation is to be poured in-situ.
- The alignment of the new wall will be running from the corner of the new embankment on the Western Tributary to the existing wall located south of crescent place. It will run adjacent to the old Victoria Stream.
- The alignment of the Victoria Crescent wall will follow the boundary of the properties at Victoria Crescent. Remove any construction waste to an approved location.
- Undertake the ground preparation works to accommodate the new flood wall. The final excavation depth is dependent on the depth of the suitable in-situ bearing stratum.
- Construct the reinforced concrete flood walls by means of in-situ concrete casting. The use of precast sections as a construction alternative will be evaluated and considered in the detailed design stage and may be dependent on the Contractor's preferred approach. No in-stream construction anticipated. The Uisce Eirann overflow connection between Victoria Stream and the Uisce Eirann pump station will need to be incorporated into the flood wall.
- Backfill the excavated area surrounding the flood wall in accordance with material notes in the design specification.
- Install cladding on walls.
- Reinstate the rear property gardens and any other developments effected by the construction.

Western Tributary

- Demolish the existing boundary walls, including their foundations, along Victoria Crescent. The new foundations are to be excavated to depth. Foundations, with concrete delivery access from the Carrigaholt Road haul road, will be poured in-situ. The lower section of the wall that acts as a flood defence is to be constructed as an RC wall. The remaining height, brought to match the existing boundary heights, are to be constructed in masonry.
- Excavate the proposed diverted two stage channel. The alignment of this diverted stream will run slightly east of the existing stream. The Western Tributary will join up to this diverted stream through the new culvert located under the Western Tributary embankment. The two-stage channel will re-join to the existing stream at the north-west corner of the Carrigaholt Road field.
- Excavate the proposed scrapes along the two-stage channel.
- A temporary crossing will need to be installed across this diverted route. This will be for material access for the infill of the existing stream. The existing stream will be infilled using an engineered fill. This is required as the flood defence wall along this route will be founded within this material. This will be imported material, brought to location by the Carrigaholt Road haul road. The foundation is to be excavated within the previously placed engineered fill on the existing stream's footprint.
- Continue the wall along the Victoria Stream to tie in with the proposed embankment in the tributary field. The wall is an RC structure, up to flood defence height. This will be constructed in-situ, with concrete deliveries via the Carrigaholt Road haul road. It is not anticipated that the Victoria Road estate roads will be used for site access. A handrail is then to be installed on top of this wall up to

guarding height. Once complete, this removes the need for the temporary access crossing, therefore this can be removed, and the channel and field reinstated on the new RHB.

- Construct the perimeter embankment core with imported impermeable clay material on the haul road that is to double as its foundation. The remaining body of the embankment is to be completed using general fill. Tie the embankment in with the Victoria Crescent wall and boundary at Cluain na Mara.
- Construct the 1m maintenance footpath around western side of the embankment.
- Place a permanent access ramp to the Carrigaholt Road Field over the embankment beside Garvey's Fuels on the Carrigaholt Road. Place topsoil and grass seedling on the embankment. All garden furniture and structures are then to be reinstated.

Works relating to Coastal Overtopping Mitigation measures

- Marine Parade junction reprofiling.
- Victoria Stream and Well Stream Sluice Gates.

5 Consultation

5.1 Introduction

Consultation is an on-going part of the EIAR process and is implemented from the Scoping Stage onwards. There are two required elements of consultation prior to the submission of an EIAR. The first avenue for consultation is to seek opinions and input from statutory bodies that have an interest or who may be affected by parts of the development, including government bodies and regulatory bodies. Non-governmental organisations and other relevant organisations were also contacted as part of this consultation process. These consultees were identified in the Scoping stage of the EIAR and were contacted as specified. The second avenue is to consult with local residents, business owners, and locals who may be impacted by the development or any member of the public who has an interest in the proposed FRS.

5.2 Consultation on Scoping Stage

In accordance with the EIA Directive (85/337/EEC) as amended in 2011 Directive (2011/92/EU) and 2014 Directive (2014/52/EU) under Article 6 and the Aarhus Convention, statutory and non-statutory bodies, local authorities, and relevant stakeholders must be consulted on the specific characteristics of the project and its likely impacts on the environment.

The EIAR requirements for consultation are defined in the EIA Directive (85/337/EEC) as amended in 2011 Directive 2011/92/EU and 2014 Directive 2014/52/EU under Article 6.

Article 6 (1)

Member States shall take the measures necessary to ensure that the authorities likely to be concerned by the project by reason of their specific environmental responsibilities are given an opportunity to express their opinion on the information supplied by the developer and on the request for development consent.

Statutory and non-statutory consultees were issued the EIAR Scoping Report via email on the 11th of July 2023, and were asked to submit any comments, observations, or submissions in relation to the proposed scope and level of information to be included in the EIAR by the 8th of August 2023, though responses received after this date were also included, refer to Appendix C.

The list of consultees who were consulted on the Scoping Report are:

- An Taisce - The National Trust for Ireland;
- Bat Conservation Ireland;
- Birdwatch Ireland;
- Coillte;
- Dept. of Agriculture, Food, and Marine;
- Dept. of Environment, Climate and Communications;
- Dept. of Housing, Planning, and Local Government;
- Dept. of Transport, Tourism, and Sport (DTTAS);
- Environmental Protection Agency (EPA);
- Fáilte Ireland;
- Geological Survey Ireland (GSI);
- Health Service Executive (HSE);
- Inland Fisheries Ireland (IFI);
- Irish Environmental Network;
- Irish Heritage Trust;
- Irish Wildlife Trust;
- Local Authorities Water Programme (LAWPRO);
- National Monuments Service;
- National Parks and Wildlife Service;
- National Transport Authority;
- Office of Emergency Planning;
- Office of Public Works (OPW);

- Sustainable Water Network Ireland (SWAN);
- Teagasc;
- The Heritage Council;
- Transport Infrastructure Ireland; and
- Uisce Éireann.

Consultation Responses

Of the consultees contacted, the following responses were submitted (Table 5-1).

Table 5-1: List of responses received from EIAR Scoping Consultation

Consultee	Response	Response Date
Department of Environment, Climate and Communications	Email – Department does not comment on individual projects	11/07/2023
Department of Housing, Local Government and Heritage – Development Applications Unit (DAU)	Email with letter detailing recommendations related to heritage and nature assessment within the EIAR.	09/08/2023
Department of Transport, Tourism, and Sport	Email – no comments	25/10/2023
Geological Survey Ireland (GSI)	Email with general GSI EIAR Guidelines	02/08/2023
Fáilte Ireland	Email with general Failte Ireland EIAR Guidelines	04/08/2023
Health Service Executive (HSE)	Email with general environmental health guidelines for inclusion in the EIAR	14/08/2023
Irish Water/Uisce Éireann	Email with attached recommendations with regard to water infrastructure for EIARs	09/08/2023
Transport Infrastructure Ireland (TII)	Email with general guidance for the preparation of an EIAR, which may affect the national road network	03/11/2023
Inland Fisheries Ireland		

Responses are further summarised and addressed in the following table (Table 5-2).

Table 5-2: Detailed summary of EIAR Scoping Responses

Consultee	Summary of issues raised	How the issue is addressed in the EIAR
Development Applications Unit (DAU)	**<u>Cultural Heritage</u>** Notwithstanding previous campaigns of dredging, reclamation and other flood alleviation works within and in the environs of the proposed flood relief area, both the river channel and the banks of the rivers and the foreshore area can therefore be regarded as being of high archaeological potential and this requires careful consideration in the assessment and design process for the Kilkee Flood Relief Scheme. Archaeological monuments are afforded statutory protection in the Record of Monuments and Places (RMP) established under section 12 (Recorded Monuments) of the National Monuments (Amendment) Act 1930-2014.	Potential impacts to nearby archaeological monuments are assessed in the Cultural Heritage chapter of the EIAR, Chapter 11
	It should be noted, also, that the RMP is not an exhaustive list of all archaeological and cultural heritage in existence, and it is the published policy of the DEPARTMENT (Framework and Principles for the Protection of the Archaeological Heritage (Government of Ireland 1999) and is stated in Section 3.3.6 of the Environmental Protection Agency's Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA 2022, 32), that archaeological assessment must include a broad range of cultural heritage assets, beyond those that are subject to statutory protection(s): ▪ Cultural Heritage – Archaeology – Known archaeological monuments – Areas of archaeological potential (including unknown archaeology) – Underwater archaeology ▪ Architectural heritage – Designated architectural heritage – Other significant architectural heritage ▪ Folklore and history – Designations or sensitivities ▪ The landscape – Landscape Appearance and Character – Landscape Context – Views and Prospects – Historical Landscapes	The Cultural Heritage chapter of the EIAR, Chapter 11, includes a consideration of the listed topics.
	The cultural heritage section of the EIAR needs to include all elements of archaeological, built heritage and cultural heritage, including post-c. 1700 receptors, to be sufficiently accurate to provide a reliable reference against which effects of a project can be assessed. This should include a detailed underwater cultural heritage assessment that seeks to assess all watercourses, not just the main river channels but all streams and the foreshore that may be within the flood relief works area and its environs. It is vital that the maximum amount of archaeological mitigation possible should be carried out in advance, ideally at design stage (Stage I), of the commencement of the main works at Stage IV, thus reducing the risk of adverse effects on archaeological heritage and, potentially, attendant delays to the construction programme.	The Cultural Heritage chapter of the EIAR, Chapter 11, includes all elements of archaeological, built heritage and cultural heritage, including post-c. 1700 receptors.
	The developer shall commission an Underwater Archaeological Impact Assessment (UAIA) report,	An Underwater Archaeological Impact

	which shall include a desktop assessment and a licenced/divewade assessment, accompanied by a hand-held metal detection survey.	Assessment forms part of the Cultural Heritage chapter of the EIAR, Chapter 11.
	The developer shall commission an Archaeological Impact Assessment (AIA), which will include an assessment of the effects of the proposed development, if any, on the setting of archaeological monuments and cultural heritage, and mitigation measures. The final AIA will be furnished to the Department for review and comment and will include a comprehensive Archaeological Impact Statement (AIS).	An Archaeological Impact Assessment forms part of the Cultural Heritage chapter of the EIAR, Chapter 11.
	The Construction Environment Management Plan (CEMP) shall include the location of any and all archaeological or cultural heritage constraints relevant to the proposed development as set out in the EIAR and by any archaeological investigations associated with the project. The CEMP shall clearly describe all identified likely archaeological impacts, both direct and indirect, and all mitigation measures to be employed to protect the archaeological or cultural heritage environment during all phases of site preparation and construction activity	A preliminary CEMP has been prepared for the proposed development. Chapter 11 of this report includes the location of cultural heritage constraints relevant to the proposed development, identified likely impacts, and mitigation measures to be employed.
	A Project Archaeologist shall be appointed to oversee and advise on all aspects of the scheme from design, through inception to completion	
	Nature Conservation The receiving environment should be described in terms of terrestrial and aquatic habitats including map, and flora and fauna, as appropriate. There should be an evaluation of the conservation interests of all aspects of the ecology of the receiving environment. Surveys should include all areas that are likely to be impacted, directly or indirectly, as a result of the proposal. Correspondence with, or the presence of, priority or non-priority Annex I habitats should be indicated.	The Biodiversity chapter of the EIAR, Chapter 7, includes an assessment of terrestrial and aquatic habitats, flora, and fauna, likely impacts, and Annex I and II designations.
	It should be clear what habitats will be impacted and to what extent. Habitat loss should be quantified, where possible. Any losses of biodiversity habitat such as woodland, scrub, hedgerows and other habitats should be mitigated for. If any buildings are likely to be demolished or altered, or if any large trees are likely to be felled as part of this scheme, bat surveys should be carried out by an expert, at an appropriate time of year. If any bat roosts are located, mitigation measures should be included, as appropriate.	The Biodiversity chapter of the EIAR, Chapter 7, includes a full assessment of habitats relevant to the proposed development.
	Riverbanks and riverine wetlands are important areas for biodiversity and ground and surface water quality should be protected during construction and operation. Any watercourse or wetland impacted on should be surveyed for the presence of protected species and species listed on Annexes II and IV of the Habitats Directive. These species could include but not limited to; Otters (*Lutra lutra*) which are protected under the Wildlife Acts and listed on Annexes II and IV of the Habitats Directive, Frogs (*Rana temporaria*) and Newts (*Trituris vulgaris*) protected under the Wildlife Acts and Kingfishers (*Alcedo atthis*) protected under the Wildlife Acts and listed on Annex I of the Birds Directive (Council Directive 79/409 EEC).	The Biodiversity chapter of the EIAR, Chapter 7, includes an assessment of riverbanks and riverine wetlands and associated protected species.
	It should be considered whether the proposal will give rise to some or all of the impacts and effects listed below (this is not an exhaustive list): ▪ Permanent and/or temporary habitat loss ▪ Permanent and/or temporary habitat fragmentation ▪ Habitat deterioration	The Biodiversity chapter of the EIAR, Chapter 7, includes an assessment of potential impacts, including those listed. Potential changes to drainage, hydrology, hydromorphology, sub-surface flows, and

	▪ Vegetation or community changes ▪ Changes to physical structure of habitats ▪ Disturbance or damage to breeding, roosting, feeding areas ▪ Changes to distribution of species ▪ Introduction or expansion of barriers to movement, dispersal, migration ▪ Impacts that may affect productivity and breeding success of protected species ▪ Changes to water quality ▪ Changes to natural processes of sedimentation and erosion ▪ Changes to drainage, hydrology, hydromorphology, sub-surface flows, flooding regimes etc. ▪ Changes to ecosystem services and functions, such as pollination, water attenuation and flood mitigation, climate change mitigation and adaption (such as carbon storage and sinks etc.) ▪ Introduction or spread of invasive species.	flooding regimes are included in the Water chapter of the EIAR, Chapter 9.
	The proposed project must be assessed in combination and cumulatively with other such schemes, existing developments and water management projects	An assessment of potential cumulative impacts is included in the Biodiversity chapter of the EIAR, Chapter 7, and in the Cumulative Impacts chapter, Chapter 14.
	An Invasive Species Survey and Management Plan should be completed.	The Biodiversity chapter of the EIAR, Chapter 7 includes an Invasive Species Survey and Management Plan.
	Nature-based solutions (NBS) should be considered with regard to surface water in the catchment /sub-catchment and upstream management of flow and water retention which may reduce the need for hard engineering solutions. Dispersal of impacts over a wide landscape area can reduce the need for and contribute to better flood management at pinch points.	Nature-based solutions (NBS) were considered as part of the Options Selection stage of the FRS. This process is summarised in the Examination of Alternatives chapter, Chapter 3, and discussed in the Biodiversity chapter, Chapter 7.
	The EIA Directive requires an EIAR to contain 'A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.' The potential role for non-structural measures, including NBS, should also be included in the consideration of alternatives.	This process is summarised in the Examination of Alternatives chapter, Chapter 3. The alternatives considered included NBS and other non-structural approaches.
	Details of proposed maintenance and after care of the embankments and flood relief measures should be set out clearly and assessed. This should include details of any envisaged future use of the embankments (e.g. for recreation), particularly noting that artificial lighting can have direct impact on species within the associated European sites. If lighting is proposed then a Lighting Impact Assessment will be required.	The operational phase of the proposed development is fully considered throughout the EIAR, including maintenance requirements.
	Biodiversity enhancement measures should be considered which could include enhancement of ecological corridors (such as wet woodland, wetland creation and hedgerows where appropriate).	Potential for enhancement is assessed in the Mitigation and Monitoring sections of the Biodiversity Chapter 7.
	Complete project details including Construction Management Plans (CMPs) need to be provided in order to allow an adequate EIAR and appropriate assessment to be undertaken. CMPs should contain	The Biodiversity chapter and the Natura Impact Statement (NIS) both include the

	sufficient detail to avoid any post construction doubt with regard to the implementation of mitigation measures, timings and roles and responsibilities for same. Any mitigation needs to be included in detail and if being relied upon to reach conclusions must be proved to be achievable and likely to be effective in any given scenario it is needed. Proof of effectiveness will be required with examples of where similar techniques have been employed previously	complete project details.
	The scoping document states "These designated sites (most notably Kilkee Reefs SAC) along with other valued local ecological receptors may be subject to significant adverse impacts via surface water, groundwater, or air source-receptor pathways. These impacts could extend downstream, impacting aquatic habitats and the aquatic and semi-aquatic species which inhabit them. There is potential for the spread of non-native invasive species during the construction phase. This could lead to significant negative impacts, particularly within the Kilkee Reefs SAC." The document then states "An Appropriate Assessment (AA) Screening Report and Ecological Impact Assessment (EcIA) have been prepared by JBA Consulting and have identified any potential for impacts to Natura 2000 sites and other ecological receptors, respectively. This EIA Screening document, along with the AA Screening and EcIA, will be submitted as part of the planning application". As there is potential for significant effects on a Natura 2000 site, a stage 2 Appropriate Assessment will be required. The Department recommends a Natura Impact Statement (NIS) be submitted as part of the planning application. The NIS should present a robust and reasoned scientific assessment and analysis of the implications of the proposals for the relevant conservation objectives of relevant European sites. Best scientific knowledge in the field should be applied to the understanding of the likely effects, and to the assessment and analysis of the implications of the proposals for the conservation objectives and integrity of the sites. When carried out by the competent authority, the appropriate assessment cannot have lacunae and must contain complete, precise and definitive findings and conclusions capable of removing all reasonable scientific doubt as to the effects of the project on European sites.	An NIS has been prepared and submitted along with the EIAR.
	The scoping document states "JBA ecologists have undertaken a Fossitt habitat survey of the scheme area and defined the habitats in the areas to be affected. The survey results (detailed further in Section 4.2.2) note that approximately 0.94 hectares of wetland are within the scheme area, but are unlikely to be impacted by the FRS". The Department notes that the survey results are not included in this document.	Habitat survey results are included in the Baseline Environment section of the Biodiversity chapter.
	Finally, the Department takes this opportunity to remind Clare County Council of their obligations under Article 6 of the Habitats Directive (92/43/EEC). Competent national authorities, are to authorise activity only if they have made certain that it will not adversely affect the integrity of a European site and, consequently, not likely to give rise to deterioration or significant disturbances within the meaning of Article 6(2).	The NIS found that, with the proposed mitigation measures implemented in full, the proposed development is not likely to give rise to deterioration or significant disturbances within the meaning of Article 6(2) of the Habitats Directive.
Geological Survey Ireland (GSI)	Our records show that there is a County Geological Site (CGS) on the margins of the proposed flood relief scheme: Foohagh Point, Co. Clare (GR 86093, 159886). With the current plan, there are no envisaged impacts on the integrity of current CGSs by the proposed development. However, if the proposed development plan is altered, please contact Clare Glanville (Clare.Glanville@gsi.ie) for further information and possible mitigation measures if applicable	The presence of the CGS at Foohagh Point is noted and it was assessed as part of the baseline environment in the Land and Soils chapter of the EIAR, Chapter 8.
	The Groundwater Data Viewer indicates an aquifer classed as a 'Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones' underlies the proposed flood relief scheme	The Groundwater Vulnerability map was used in the preparation of the Land and

	development. The Groundwater Vulnerability map indicates the range of groundwater vulnerabilities within the area covered is variable. We would therefore recommend use of the Groundwater Viewer to identify areas of High to Extreme Vulnerability and 'Rock at or near surface' in your assessments, as any groundwater-surface water interactions that might occur would be greatest in these areas.	Soils chapter, Chapter 8, as recommended.
	<u>Geological Mapping</u> GSI maintains online datasets of bedrock and subsoils geological mapping that are reliable and accessible. We would encourage you to use these data which can be found here, in your future assessments.	The GSI online datasets were used in the preparation of the Land and Soils chapter, Chapter 8, as recommended.
	<u>Geohazards</u> Geohazards can cause widespread damage to landscapes, wildlife, human property and human life. In Ireland, landslides, flooding and coastal erosion are the most prevalent of these hazards. We recommend that geohazards be taken into consideration, especially when developing areas where these risks are prevalent, and we encourage the use of our data when doing so.	Geohazards were taken into consideration in the preparation of the Land and Soils chapter, Chapter 8, as recommended.
	<u>Natural Resources (Minerals/Aggregates)</u> The Active Quarries, Mineral Localities and the Aggregate Potential maps are available on our Map Viewer. We would recommend use of the Aggregate Potential Mapping viewer to identify areas of High to Very High source aggregate potential within the area. In keeping with a sustainable approach we would recommend use of our data and mapping viewers to identify and ensure that natural resources used in the flood relief scheme are sustainably sourced from properly recognised and licensed facilities, and that consideration of future resource sterilization is considered.	The Aggregate Potential Mapping viewer was used in the preparation of the Land and Soils chapter, Chapter 8, as recommended.
	Ireland's national maritime mapping programme (INFOMAR) has a range of datasets which may be useful for the EIAR, such as Shipping & Navigation, Fisheries management, Aquaculture, Off-shore Renewable Energies, Marine Leisure & Tourism and Coastal Behaviour. These should be consulted where relevant.	The INFOMAR datasets were consulted during the preparation of the Land and Soils chapter, Chapter 8, as recommended.
	<u>Guidelines</u> The following guidelines may also be of assistance: • Institute of Geologists of Ireland, 2013. Guidelines for the Preparation of the Soils, Geology and Hydrogeology Chapters of Geology in Environmental Impact Statements. • EPA, 2022. Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)	Chapter 8, Land and Soils made use of the recommended guidelines.
	Should development go ahead, all other factors considered, Geological Survey Ireland would much appreciate a copy of reports detailing any site investigations carried out. The data would be added to Geological Survey Ireland's national database of site investigation boreholes, implemented to provide a better service to the civil engineering sector. Data can be sent to the Geological Mapping Unit, at GeologicalMappingInfo@gsi.ie, 01-678 2795.	These will be sent post-planning and prior to construction.
Fáilte Ireland	In response to the changes to the EIAR requirements under Directive EU 2014/52, the Environmental Protection Agency (EPA) developed Guidelines on the information to be contained in Environmental Impact Assessment Reports in May 2022.	The EPA's May 2022 Guidelines were used in the preparation of the EIAR.
	The process of EIA is set out in the EPA EIAR Guidelines, this document should be read in conjunction	The EPA EIAR Guidelines, including the

	with and used as supplementary guidance to the EPA EIAR Guidelines. As outlined in the EPA EIAR Guidelines, the fundamental principles to be followed when preparing an EIAR, including screening and scoping, are: ▪ Anticipating, avoiding and reducing significant effects ▪ Assessing and mitigating effects ▪ Maintaining objectivity ▪ Ensuring clarity and quality ▪ Providing relevant information to decision makers ▪ Facilitating better consultation. Environmental assessment should be undertaken in accordance with the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018.	fundamental principles listed, were followed during the preparation of the EIAR.
	While tourism projects may be diverse, the projects which can impact tourism are considerably more wide ranging, from large infrastructural developments to local energy developments. Disruption to or suppression of a tourist resource or amenity can have very local or more strategic impacts, directly or indirectly- for example energy projects in a rural area can have both a negative and positive impact in different regards. There can be temporary, periodic or even seasonal impacts occurring during construction or operational periods. According to the Fáilte Ireland Tourism Facts 2019 Report, the most important factors in determining the attractiveness of tourism destinations for visitors to Ireland are; ▪ Beautiful Scenery and Unspoiled Environment ▪ Hospitality ▪ Safety ▪ Nature, Wildlife and Natural Attractions ▪ History and Culture ▪ Pace of Life These factors used for the promotion of tourism in Ireland are also barometers of sensitivity to change in tourism sensitive or dominant locations where development may have an impact upon the tourism asset. The potential for development to impact these sensitivities, and the environmental criteria under which they can be considered, are identified in section 7 of the guidelines.	These aspects were taken into consideration in the Population and Human Health section of the EIAR, which forms part of Chapter 6, Construction Impacts, and in Chapter 12, LVIA.
	Contributors to the preparation of environmental impact assessment reports, including screening and scoping assessments, should be qualified and competent. Sufficient expertise, in the relevant field of the project concerned, is required for the purpose of its examination by the competent authorities in order to ensure that the information provided by the developer is complete and of a high level of quality so that a full and proper assessment can be undertaken. For tourism related projects, or projects likely to affect tourism assets, competent experts in the area of tourism should be utilised in the environmental assessment. The competency of all involved in the production of an EIAR or any related report (e.g. Screening and scoping) is required to be stated at the beginning of the EIAR report with further details as necessary in each following chapter. Where tourism projects involve for example heritage or cultural components, input from heritage consultants, conservation architects, or historians may be required.	Table 1-1 in Chapter 1 includes the list of experts who prepared the EIAR. Whilst this is not a tourism-related project, this includes heritage consultants who prepared Chapter 11.

	EIAR Requirements The following are the key requirements for an EIAR under the current guidance. This is not a definitive list and should be read in conjunction with regulations. • project description; • assessment of alternatives considered; • baseline assessment; • assessment of effects; • cumulative impact; • interaction of impacts; • mitigation & monitoring; and • residual impacts The requirements for these topics are further outlined in Fáilte Ireland's response.	The key requirements as listed, and as outlined in the EPA EIAR Guidelines, were followed throughout the EIAR.
	Sources of information on Tourism The following sources of information on tourism are given: • Fáilte Ireland website • Discover Ireland website • Tourism Ireland website • Local Authorities • Regional Assemblies • Central Statistics Office	The sources listed were consulted during the preparation of the Population and Human Health section, Chapter 6 of the EIAR.
Health Service Executive (HSE)	The following documents should be taken into consideration when preparing the Environmental Impact Assessment Report (EIAR): Guidelines on the information to be contained in Environmental Impact Assessment Reports (2022), EPA. Advice Notes on Current Practice in the preparation of EIS (2003), 435kb Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment EU publication: Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report, EU, 2017	The listed guidelines were referred to during the preparation of the EIAR, in particular for the Population and Human Health section, Chapter 6.
	The Environmental Health Service (EHS) recommends that the following matters are included and assessed in the EIAR ▪ Public consultation ▪ Population and Human Health ▪ Noise and Vibration ▪ Air Quality ▪ Surface and Groundwater Quality ▪ Climate and Material Assets including waste ▪ Ancillary facilities	The listed topics were considered in the EIAR.

	▪ Cumulative Impacts	
	The Environmental Health Service recommends that the public are consulted specifically on the public health aspects of the scheme by asking questions for example, such as 'what are the potential health benefits/challenges from the scheme' and 'what opportunities can the scheme deliver for health gain'.	Three rounds of public consultation have taken place to date. These are summarised in Section 5.3 of this chapter.
	The EIAR should consider an assessment of alternatives. The Environment Health Service recommends that alternative measures should be assessed as part of the EIAR.	The assessment of alternatives is included in Chapter 3 of the EIAR.
	The Environmental Health Service (EHS) wishes to highlight the potential negative impact on the recreational quality of the area, so vital to health and well-being, during the construction phase. The EHS advises that measures are put in place to minimise this impact and minimise the period of impact.	Potential for impacts on recreational quality during the construction phase are assessed in Chapter 6 of the EIAR.
	The EHS recommends that opportunities are identified to enhance potential health gain by perhaps enhancing the recreational value of the area. Suggestions include adding to those listed in the scoping report by including cycling for example or enhancing those activities such as cliff walks etc.	Positive impacts likely to result from the scheme, which may lead to indirect benefits for public health, are assessed in Chapter 6, and Chapter 12.
	The EHS recommends that the full EIAR assess the potential effect of the proposed development which may be disruptive to recreation and active travel, the wastewater infrastructure, the water supply infrastructure and waste management.	Potential disruptions to recreation and active travel through impacts to other features such as wastewater infrastructure, water supply, or waste management, are assessed in several chapters in the EIAR, including the Water Chapter 9 and the Material Assets Chapter 10.
	The EHS recommends the inclusion of a Construction Environmental Management Plan (CEMP) in the EIAR to protect the local environment from potential contamination due to the waste generated during construction. The EHS recommends the inclusion of a Construction Environmental Management Plan (CEMP) to spell out measures that will be adopted to mitigate the risk of impact during the construction phase. The EHS also recommends that the full EIAR assess the potential impacts including positive impacts associated with additional quantities of water in surface water bodies at times of heavy precipitation. The EHS recommends that the risks to groundwater as assessed and measures to mitigate that risk are included in the CEMP. The EHS recommends the inclusion of noise and vibration in the CEMP and that mitigation measures are employed to minimise nuisance and health effects on people in noise and vibration sensitive locations. Particular attention should be paid to limiting the hours in which construction activities can take place. The CEMP should be included in the EIAR which details emissions and dust control measures, including the potential emissions reduced from zero emission or low emission vehicles and machinery. Dust control measures to include are: ▪ Sweeping of hard road surfaces ▪ Provision of a water bowser on site, regular spraying of haul roads ▪ Wheel washing facilities at site exit ▪ Restrict speed on site ▪ Provide covers to all delivery trucks to minimise dust generation	A preliminary CEMP has been prepared and submitted along with the EIAR. The CEMP includes the measures and potential impacts listed by the EHS.

	▪ Inspect and clean public roads in the vicinity if necessary ▪ Material stockpiling provided with adequate protection from the wind ▪ Dust monitoring at the site boundary ▪ Truck inspection and maintenance plan	
	The Environmental Health Service recommends that a walk-over survey of the site is undertaken in addition to a desktop analysis of Geological Survey of Ireland data in order to identify the location of private wells used for drinking water purposes. Any potential significant impacts to drinking water or bathing water sources should be assessed. Details of bedrock, overburden, vulnerability, groundwater flows, aquifers and catchment areas should be considered when assessing potential impacts and any proposed mitigation measures. Any impacts on surface water as a result of the construction should be identified and addressed in the EIAR	The presence of wells and groundwater abstractions is outlined in Chapter9.
	The EHS recommends that the issue of climate change/breakdown in the full EIAR is taken into consideration. For example, attenuation of flood waters could be used to combat dry spells or the provision of trees could be used to provide shade in heatwave events, as well as sequester carbon.	Consideration of climate was included in the assessment of options stage of the FRS.
	The EIAR should include details of the location of all site office, construction compound, fuel storage depot, sanitary accommodation and canteen, First Aid facilities, disposal of wastewater and the provision of a potable water supply to the site canteen	The location of all construction compounds, site offices, storage depots, and other construction areas is included in Chapter 6 Material Assets.
	The EIAR should include a detailed assessment of any likely significant cumulative impacts of the proposed development	Cumulative Impacts are included in Chapter 14.
	A detailed Resource and Waste Plan should be prepared and submitted in the EIAR for assessment. Emissions from material flows can be minimised by using a waste hierarchy approach consistent with the Waste Framework Directive 2008/98/EC; establishing where there is scope for equipment and material re-use and recycling, with disposal only taking place where no feasible alternative is available.	The preliminary CEMP discusses waste management measures.
Uisce Éireann/ Irish Water	Where the development proposal has the potential to impact an Uisce Éireann Drinking Water Source(s), the applicant shall provide details of measures to be taken to ensure that there will be no negative impact to Uisce Éireann's Drinking Water Source(s) during the construction and operational phases of the development. Hydrological / hydrogeological pathways between the applicant's site and receiving waters should be identified as part of the report.	The potential for impacts to drinking water sources is assessed in the Water chapter of the EIAR, Chapter9.
	Where the development proposes the backfilling of materials, the applicant is required to include a waste sampling strategy to ensure the material is inert.	Material import has been assessed in Chapter 6. The mitigation measures in this chapter include testing of this material to ensure it is inert, prior to its delivery to the site.
	Mitigations should be proposed for any potential negative impacts on any water source(s) which may be in proximity and included in the environmental management plan and incident response.	The water environment has been assessed in Chapter 9. This chapter outlines mitigation measures for the protection of water, including water sources.
	Any and all potential impacts on the nearby reservoir as public water supply water source(s) are assessed, including any impact on hydrogeology and any groundwater/ surface water interactions.	The water environment, including groundwater, has been assessed in Chapter 9. This chapter outlines mitigation

		measures for the protection of surface and groundwater, including water sources.
	Impacts of the development on the capacity of water services (i.e., do existing water services have the capacity to cater for the new development). This is confirmed by Uisce Éireann in the form of a Confirmation of Feasibility (COF). If a development requires a connection to either a public water supply or sewage collection system, the developer is advised to submit a Pre-Connection Enquiry (PCE) enquiry to Uisce Éireann to determine the feasibility of connection to the Irish Water network. All pre-connection enquiry forms are available from https://www.water.ie/connections/connection-steps/.	The proposed development as described in Chapter 4 does not require a connection to either a public water supply or sewage collection system.
	The applicant shall identify any upgrading of water services infrastructure that would be required to accommodate the proposed development.	Proposed changes to water services infrastructure are outlined in Chapter 9.
	In relation to a development that would discharge trade effluent – any upstream treatment or attenuation of discharges required prior to discharging to an Uisce Éireann collection network.	No discharge of trade effluent is required.
	In relation to the management of surface water; the potential impact of surface water discharges to combined sewer networks and potential measures to minimise and or / stop surface waters from combined sewers.	No surface water discharges to combined sewers are required.
	Any physical impact on Uisce Éireann assets – reservoir, drinking water source, treatment works, pipes, pumping stations, discharges outfalls etc. including any relocation of assets. When considering a development proposal, the applicant is advised to determine the location of public water services assets, possible connection points from the applicant's site / lands to the public network and any drinking water abstraction catchments to ensure these are included and fully assessed in any pre-planning proposals. Other indicators or methodologies for identifying infrastructure located within the applicant's lands are the presence of registered wayleave agreements, visible manholes, vent stacks, valve chambers, marker posts etc. within the proposed site.	The locations of public water services assets have been assessed by the design team. Potential impacts on these assets have been assessed in the Water chapter, Chapter 9 and Material Assets chapter, Chapter 10 of the EIAR.
	Any potential impacts on the assimilative capacity of receiving waters in relation to Uisce Éireann discharge outfalls including changes in dispersion / circulation characterises. Hydrological / hydrogeological pathways between the applicant's site and receiving waters should be identified within the report. Any potential impact on the contributing catchment of water sources either in terms of water abstraction for the development (and resultant potential impact on the capacity of the source) or the potential of the development to influence / present a risk to the quality of the water abstracted by Uisce Éireann for public supply should be identified within the report.	Hydrological and hydrogeological pathways have been assessed in the Water chapter of the EIAR, Chapter 9.
	Where a development proposes to connect to an Uisce Éireann network and that network either abstracts water from or discharges wastewater to a "protected"/ sensitive area, consideration as to whether the integrity of the site / conservation objectives of the site would be compromised should be identified within the report.	This potential is assessed in the Biodiversity chapter of the EIAR, Chapter 7, and in the NIS.
	Mitigation measures in relation to any of the above ensuring a zero risk to any Uisce Éireann drinking water sources (Surface and Ground water).	Mitigation measures are included in relation to the above in Chapter 9 and Chapter 10.
Transport	Consultations should be had with the relevant Local Authority/National Roads Design Office, with regard	The Design Team consulted with the Local

Infrastructure Ireland (TII)	to the locations of existing and future national road schemes in the area.	Authority Roads Department throughout the scheme design phase.
	TII would be specifically concerned as to potential significant impacts the development would have on the national road network (and junctions with national roads) in the proximity of the proposed development, N67 national road.	Potential for impacts on the national road network are included in the Material Assets chapter of the EIAR, Chapter 10.
	The developer should assess visual impacts from existing national roads.	Visual impacts are assessed in the LVIA chapter of the EIAR, Chapter 12.
	The developer should have regard to any Environmental Impact Assessment Report/Statement and all conditions and/or modifications imposed by An Bord Pleanála regarding road schemes in the area. The developer should, in particular, have regard to any potential cumulative impacts.	Potential for impacts on road schemes are included in the Material Assets chapter of the EIAR, Chapter 10. No relevant road schemes have been identified in the area.
	The developer, in conducting Environmental Impact Assessment, should have regard to TII Publications (formerly DMRB and the Manual of Contract Documents for Road Works).	Noted.
	The developer, in conducting Environmental Impact Assessment, should have regard to TII's Environmental Assessment and Construction Guidelines, including the 'Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes' (National Road Authority (NRA), 2006).	Air Quality has been assessed in Chapter 6, Construction Impacts. The methodologies used in the assessment of air quality are up to date best practices.
	The EIAR should consider the 'Environmental Noise Regulations 2006 (SI 140 of 2006)' and, in particular, how the development will affect future action plans by the relevant competent authority. The developer may need to consider the incorporation of noise barriers to reduce noise impacts (see 'Guidelines for the Treatment of Noise and Vibration in National Road Schemes' (1st Rev., NRA, 2004)).	Noise Impacts have been assessed in Chapter 6, Construction Impacts. The methodologies used in the assessment of noise are up to date best practices.
	Where new structures may be proposed on national roads, the developer is reminded of the requirements of TII Standard: 'Technical Acceptance of Road Structures on Motorways and Other National Roads'. This Standard specifies the procedures to be followed in order to obtain Technical Acceptance for structures on motorway and other national road schemes and for the submission of as built records. The procedures cover the design of all road structures, including bridges, tunnels, subways, culverts, buried corrugated steel structures, retaining walls, reinforced earth structures, gantries, environmental noise barriers and temporary structures under or over motorways or other roads carrying public traffic.	No new structures are proposed on national roads.
	The developer should also be aware that there are Technical Acceptance requirements relating to the assessment, alteration, modification, strengthening and repair of all existing road structures (national roads) and same shall be agreed with the Bridge Management Section of TII. In that regard, TII has identified the following national road structures on the N67, national secondary road, within the Flood Relief AFA. Structure ID: CL-N67-008.00 (Kilkee Bridge).	No works are proposed to existing national road structures.

	A hydraulic analysis should be undertaken to identify the impact of proposed flood alleviation works on the hydraulic capacity of any TII Structures impacted and the potential for scour at the structure. An assessment of scour and other hydraulic actions on national road structures in accordance with UK BD 97/12 should be undertaken where necessary. Scour prevention measures will be required if the assessment illustrates the potential for scour beneath the foundations.	Hydraulic analysis and scour potential has been carried out and assessed throughout the design phase of the scheme. Scour prevention measures were not found to be required as part of the design of the scheme.
	It would be important that, where appropriate, subject to meeting the appropriate thresholds and criteria and having regard to best practice, a Traffic and Transport Assessment (TTA) be carried out in accordance with relevant guidelines, noting traffic volumes attending the site and traffic routes to/from the site, with reference to impacts on the national road network and junctions of lower category roads with national roads. TII's 'Traffic and Transport Assessment Guidelines' (2014) should be referred to in relation to proposed development with potential impacts on the national road network. The scheme promoter is also advised to have regard to Section 2.2 of TII's TTA Guidelines, which addresses requirements for sub-threshold TTA.	The Buildability Report and CEMP addresses construction vehicle movements and potential impacts on the national road network and local access roads.
	The designers are asked to consult TII Publications to determine whether a Road Safety Audit is required.	Road Safety Audit is not required because the proposed development does not result in any permanent changes to the existing road layout.
	In the interests of maintaining the safety and standard of the national road network, the EIAR should identify the methods/techniques proposed for any works traversing/in proximity to the national road network.	Chapter 10 Material Assets addresses the construction-related traffic and the routes affected.
	In relation to haul route identification, the applicant/developer should clearly identify haul routes proposed and fully assess the network to be traversed. Where abnormal loads are a feature of the proposed development, separate structure approvals/permits and other licences may be required in connection with the proposed haul route and all structures on the haul route should be checked by the applicant/developer to confirm their capacity to accommodate any abnormal load.	Proposed haul routes have been identified in Chapter 6. No abnormal loads are required as part of the proposed development.

5.3 Public Consultation

Consultation has taken place throughout the development of the FRS. This included formal consultation (as detailed below) as well as the sharing of information and updates through the scheme's dedicated website. Newsletters were issued throughout the project to provide an update on project progress, and these were posted to the scheme website.

Public Engagement Event

A Public Engagement and Information event held during August 2020, during the Covid-19 pandemic. Due to the pandemic restrictions, the event took place online, with an information video on the scheme shared.

Second Public Participation Day

The second PPD was held on 18th of August 2022, in Kilkee Community Centre. The purpose of the event was to present:

- the work carried out to that date in developing flood maps
- the measures that were considered
- how the measures were grouped into options
- the measures and options which were discounted
- the options which were progressing forward

Public opinion was sought on the three emerging options, looking for constraints to their implementation and suggestions for changes or alternatives. The environmental issues and constraints of the various options were also presented, and public feedback on them sought. Nine representatives from the project team were present throughout the day, and 33 attendees were recorded on the sign-in sheet.

Preferred Option Public Consultation Day

The third Public Consultation Day (PCD) for the Kilkee Flood Relief Scheme was held on Thursday 13th of April 2023.

The purpose of the Preferred Option PCD was to present:

- the preferred fluvial flood relief option for the Atlantic and Victoria streams
- the areas benefitting from the scheme.
- how the preferred option was decided on.
- how feedback from the previous Public Participation Day (PPD) was incorporated into the preferred option.
- the indicative planning roadmap and estimated construction timeline

Public opinion on the preferred fluvial option was sought and how this would be implemented in reality. It was also highlighted how implementation of the scheme would result in improvement of the water quality of the Atlantic and Victoria streams, as poor water quality is a long-standing issue in Kilkee.

Pre-planning public consultation

In advance of submitting the scheme for planning, a draft set of planning documents were put on public display. The documents were available between the 26th February to 6th March 2024 and was open to all members of the public. This included an afternoon session on the 6th March where members of the design team and steering group were available to take questions relating to the planning documents.

The purpose of this consultation was to get further engagement in advance of planning and incorporate any final concerns before the submission.

Landowner liaison

In advance of submitting the scheme for planning, landowners directly impacted by the scheme (both in a temporary or permanent capacity) were contacted directly by the local authority. This provided a direct contact line for those affected properties and the local authority. This liaison will continue through the planning and detailed design processes.

5.4 Additional Consultation with DAU

Biodiversity

A meeting took place on 15/01/2024 between members of the Design Team, EIAR Team, the Department of Housing, Local Government and Heritage Ecological Guidance and Advisory Unit, and the National Parks and Wildlife Service (NPWS). The Divisional Ecologist for the Mid-West Division, and the Regional Manager were present.

In this meeting, the Biodiversity assessment of the proposed development was outlined in full, and the proposed mitigation measures discussed. JBA summarised the scheme biodiversity assumptions and results of assessment:

- Operation impact is negligible. None of the preferred options were predicted to have significant impact on the Natura 2000 sites.
- Cumulative impact to consider the WWTP and the new recreational area in near Kilkee Waterworld.
- Minimal need for licensing – restricted to EcCoW translocation of fish during work on work on the walls in the Victoria Stream (foundations).
- Mitigation includes control of sediments during works, general best practice. U-channel in place on well stream with translocated natural bed, and coir riparian buffer initially.
- Biosecurity will be put in place. Clare Co. Co. have an eradication plan in place for JKW Kilkee.
- Inland Fisheries Ireland (IFI) consultation is partially complete, and IFI commit to presence during stream diversion.
- All water courses are heavily modified. Some enhancement of Victoria to provide in sinuosity and more naturalness. Water quality will improve and allow for continuation of Blue Flag status.

The following points were highlighted by the NPWS during the meeting, with the JBA Response or Action within this EIAR also recorded below.

- Wildflower areas - NPWS asked if wildflower seed would be sown in enhancement areas and to make this clear in the work.

  Response: JBA explained that Annex 1 grassland where orchid was located will be avoided – and as it is a Marsh Orchid this should tolerate any change in wetness. Some areas in the rest of the field will be reprofiled for flood retention and certain areas will be lost however turf would be stored and replaced in the same general area and areas lacking species richness will be targeted. The grassland regime will maintain the meadow and will aim to retain 60:40 grass:herb ratio, driven in by some stands of Meadowsweet. Hay meadow will be maintained by management. No trees will be planted. The Carrigaholt Road Field will be maintained and not reprofiled. Any seeds on embankments..

  Action: Some translocation of orchids may be required in those areas directly within the footprint of the embankment. Regarding seed: Use of seed of local provenance, and use of seed from existing meadow field for seeding within bare soil areas associated with work. See Section 7.6.

Monitoring programme - NPWS requested a monitoring program be proposed.

Response: JBA confirmed that a monitoring programme will be proposed pre-application and implemented post-construction and monitored by an EcCoW. The scheme aims to promote Net Gain, but no formal analysis has been done.

Action: Monitoring is proposed in Section 7.6.

Nature Restoration Law - NPWS noted the recent Nature Restoration Law (which is still under legal scrutiny, will be adopted possibly in 2024) may require Annex 1 habitat outside the designated area to have stricter mitigation.

Response: Mitigation in place for ex-situ Annex I habitat within the project (annex 1 quality grasslands)

Ownership of land for mitigation – NPWS asked that ownership of any area outlined for mitigation be confirmed in the EcIA due to problems for implementing mitigation if left in private ownership and noted that ABP would require this clarification.

> Response/Action: *Relating to Annex I quality grassland*. A variety of options are present relating landownership or agreement regarding management. Compulsory Purchase Order (CPO) or general agreement are two of the options available. The current management of land is resulting in Annex 1 quality grassland, and the ideal scenario is that this would be continued either by agreement with the current landowner, through the leasing of land to a land manager facilitating an environmentally sympathetic management style, or through direct management. The current proposals will not result in a significant loss of Annex I quality habitat, so ongoing management is only relevant insofar as the land is required as flood storage areas, which is not anticipated to have a negative impact on those fields.

Invasive species - NPWS asked for clarification on Japanese Knotweed and to specify that a full 5-year maintenance be carried out with a 7m buffer zone around any visible stands of the species during construction of the defences.

> Response/Action: Mitigation measures for Invasive species are present in Section 7.6.

CEMP - NPWS requested that all mitigation measures be mapped in the CEMP and to show clear storage areas that would not be affected by flooding.

> Response/Action:

Cultural Heritage

A proposed archaeological method statement for a site inspection including field walking, wading, and metal detection was submitted to the National Monuments Service on 20 October 2023. The methodology was approved and a licence granted by the National Monuments Service along with the statutory consultee, the National Museum of Ireland, on 22 December 2023.

The Underwater Archaeological Impact Assessment was submitted to the National Monuments Service on 19 February 2024. An online meeting with a representative (Cóilín O'Driscoill) of the Underwater Archaeology Unit of the National Monuments Service took place on 6 March 2024 to discuss the results of the assessment. The representative confirmed that the National Monuments Service concurred with the proposed mitigation measures outlined in the EIAR chapter.

The UAIA report and the Cultural Heritage chapter of the EIAR was reviewed by the OPW Project Archaeologist who returned comments on the documents on 7 March 2024 and 07 May 2024. These suggested edits were incorporated into final draft of the UAIA and Environmental Impact Assessment Report chapter.

5.5 Inland Fisheries Ireland Consultation

Informal pre-planning consultation took place in winter 2023 where a general description of the scheme was outlined, and high level advice on stream re-alignment sought. The constraints provided by the Blue Flag beach and associated flood gate were discussed at this time. Advice received was integrated into the draft EIAR. The draft EIAR and electrofishing report were sent by email to IFI on 14/02/24. A response was received on 25/03/24. The main elements covered in the consultation were as follows:

- Highlighting the importance of the riparian zone, especially with respect to climate change. Use of general measures within "Planning for watercourses in the urban environment" [29]
    - Response/Action: The nature of riparian zone is influence by the existing environment at this site – because of the low level of trees at this coastal site and narrow channel, tree planting is now proposed. Instead the existing reedbeds will be retained, natural colonisation of riparian zone, as well as emergent vegetation will provide cover for fish, and protect from overheating

[29] IFI, "Planning for Watercourses in the Urban Environment. A Guide to the Protection of Watercourses through the Use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning," 2020.

of watercourses from the effects of climate change. Translocation of riparian material is included within the mitigation measures in Section 7.6.

- Flood protection structures such as walls and embankments limit connectivity with the floodplain. If water is no longer able to spill out into floodplains, the volume of water in the channel increases and flood peaks are much greater. IFI have also published the following guidelines which should also be referenced for river restoration works[30]. IFI promotes soft engineering solutions, nature based solutions, and featues such as meanders to slow the flow.
    - Response/Action: The flood storage areas proposed in this project are essentially a reconnection of the watercourses with some of their former flood-plains, and the flood extent is limited by outer embankments at the edges of the of the storage areas. Monitoring protocols for these works for fisheries related works have taken into those outlined in the above documentation.
    - Response/Action: Introduction of meanders and natural water retention are included in the plan. Final aligments will be overseen by the IFI.

- The flood gate at Marine Parade Rd. represents a barrier to fish migration and one that is particularly important in light of the population of European eel in the channel. A variety of passage option are available, but all will require some water flow over/through the barrier to facilitate passage.
    - Response/Action: The presence of the stop-log on the Victoria Stream provides a barrier to migration during the bathing season (June-September). The stop-log is in order to safeguard the blue flag beach from risk of contamination, particularly from microbiological elements. The current measures proposed within the plan will allow for improved water quality within the Victoria Stream. However, removal of the stop-log gate was not within the scope of this project. Clare Co. Co. intend to put in place measures to facilitate eel passage, but secondary to this scheme, rather than as part of the scheme. No loss of migration is anticipated as part of the works, and an improvement in habitat quality is expected due to the measures proposed.

- U-shaped channel upgrades to the Well Stream IFI note that culverting will reduce the hydraulic and hydromorphological diversity of the stream. The final design of the Victoria stream and Western Stream re-alignments shall be agreed with IFI
    - Mitigation measures have been outlined in Section 7.6, including translocation of riparian vegetation, bed material and macroinvertebrates. Proposed gradient is the same as is present gradient, in order to provide natural bed within the U channel. Works will be agreed with IFI.

- Debris screen should be clearly identified in the planning application. The post-construction monitoring shall also include monitoring of the impact of barrier mitigation for fish passage.
    - Monitoring is outlined in Section 7.6. Maintenance of debris screens will be carried out by Clare Co. Co.

- The ECoW shall have the authority to stop works if a potential pollution event is identified.
    - Implemented in Section 7.6.

[30] IFI, “River Restoration Works - Science Based Guidance Centred on Hydromorphological Principles in an Era of Climate Change” (3044 Lake Drive, Citywest Business Campus, Dublin 24, Ireland: Inland Fisheries Ireland, 2020).

6 Construction Impacts

The project Scoping Report identified that the proposed development would affect the following environmental aspects only during construction and that it would result in no operational impacts. Operational phase impact assessment guidelines have been followed to confirm that impacts will only occur during construction. The Project Buildability Report[31] provided construction related data for use in assessing the potential environmental effects. The assessed aspects are:

- Air Quality and Dust;
- Climate;
- Noise and Vibration; and
- Population and Human Health.

6.1 Air Quality and Dust

This section of the EIAR assesses the air quality and dust impact of the proposed development during the construction and operational phases.

Methodology

Dust Deposition Guidelines

Dust particles can be classified into those that are easily deposited and those that remain suspended in the air for long periods. This division is useful as deposited dust is usually the coarse fraction of particulates that causes dust annoyance, whereas suspended particulate matter is implicated more in exposure impacts. Airborne particles have a large range of diameters, from nanoparticles and ultrafine particles (diameters less than 0.1µm) to the very large particles with diameters up towards 100µm. There is no clear dividing line between the sizes of suspended particulates and deposited particulates, although particles with diameters >50µm tend to be deposited quickly and particles of diameter <10µm (PM10) have an extremely low deposition rate in comparison. Therefore, the size of suspended and deposited dust particles affects their distribution and as such requires two very different approaches to sampling these fractions. PM10 is the fraction of airborne (suspended) particulates which contains particles of diameter less than 10µm. PM2.5 is the fraction of airborne (suspended) particulates which contains particles of diameter less than 2.5µm. PM10 and PM2.5 particles can penetrate deep into the respiratory system increasing the risk of respiratory and cardiovascular disorders. Total Suspended Particles (TSP) is the term used when referring to larger particles which do not have a specified size limit. It is common for TSP to be measured alongside PM10 and PM2.5 particularly at industrial sites when dust monitoring is undertaken.

Particulate matter can emanate from natural and anthropogenic sources. Natural sources include sea salt, forest fires, pollen and moulds. Natural sources are unregulated and harder to control. Anthropogenic sources can be regulated and understanding the sources of particulate matter is very important. PM10 is most commonly associated with road dust and construction activities. Wear and tear of brakes and tyres on vehicles and crushing activities at construction sites can all contribute to a rise in PM10. PM2.5 is associated with fuel burning, industrial combustion processes and vehicle emissions. Larger particles (100µm diameter) are likely to settle within 5-10m of their source under a typical mean wind speed of 4-5 m/s, and particles between 30-100µm diameter are likely to settle within 100m of the source. Smaller particles, particularly those <10µm in diameter, i.e. PM10, have a greater potential to have their settling rate impeded by atmospheric turbulence and to be transported further from their source. Dust emissions are exacerbated by dry weather and high wind speeds. The impact of dust, therefore, also depends on the wind direction and the relative location of the dust source and receiver.

Currently no Irish statutory standards or limits exist for the assessment of dust deposition and its tendency for causing nuisance. Similarly, no official air quality criterion has been set at a European or World Health Organisation (WHO) level, although a range of national 'yardstick' criteria from other countries is found in literature.

[31] JBA Consulting for Clare County Council (July 2024) *Buildability Report for Kilkee Flood Relief Scheme,* unpublished

The Quarries and Ancillary Activities, Guidelines for Planning Authorities states that following with regard to the control of dust;

"There are currently no Irish statutory standards or EPA guidelines relating specifically to dust deposition thresholds for inert mineral/aggregate dust. (See, however, the Air Quality Standards Regulations 2011 for measurement standards). There are a number of methods to measure dust deposition (such as the Frisbee method) but only the German TA Luft Air Quality Standard relates a specific method (i.e. Bergerhoff) of measuring dust deposition with dust nuisance. On this basis it is recommended that the following TA Luft dust deposition limit value be adopted at site boundaries near quarry developments:

Total dust deposition (soluble and insoluble): 350 milligram per square metre per day (when averaged over a 30-day period).

Best practice dust control measures should be proposed by the applicant".

In England and Wales, a *'custom and practice'* limit of 200 mg/m^2/day is sometimes referenced using Frisbee-type Deposition Gauges. This value was derived by multiplying a historical, typical UK median background by 3.5 (which was the ratio of the 95th percentile to the median). It should be noted that because background dust levels can vary significantly from place to place and with season, the authors Vallack & Shillito were clear that the preferred approach is to calculate a bespoke site-specific "complaints likely" dust guideline, where sufficient local baseline monitoring data is available (at least 12-months) based on 3.5 times the median background level. However, such bespoke local baseline data is often not available and in such cases the authors recommended using as a fall-back the 95th percentile of typical UK background data. It is important that the limitations of the 200 mg/m^2/day benchmark are appreciated: firstly, it is simply a custom and practice yardstick and it was never based on actual dose-response data; secondly, in deriving this default "complaints likely" guideline, the authors used a dataset that was quite old and not necessarily indicative of today's background levels.

The German TA Luft Regulations, "Technical Instructions on Air Quality Control" state that total dust deposition (soluble and insoluble, measured using Bergerhoff type dust deposit gauges as per German Standard Method for determination of dust deposition rate, VDI 2119) should not exceed a dust deposition rate of 350 mg/m^2/day (when averaged over a 30+/- 2-day period). The use of this limit value is appropriate to minimise the impact of airborne dust levels on the receiving environment beyond the site boundary. The German TA Luft criteria for '*possible nuisance'* and *'very likely nuisance'* are 350 mg/m^2/day and 650 mg/m^2/day, respectively.

Criteria from other countries that can be referred to include;

- In the USA, Washington has set a state standard of 187 mg/m^2/day for residential areas.
- Western Australia also sets a two-stage standard, with '*loss of amenity first perceived'* at 133 mg/m^2/day and '*unacceptable reduction in air quality*' at 333 mg/m^2/day.
- The Swedish limits promoted by the Stockholm Environment Institute, and used regularly in Scotland, range from 140 mg/m^2/day for rural areas to 260 mg/m^2/day for town centres.

These go some way to addressing the view that the annoyance impact (and hence potential for complaints) depends on the worsening of dust levels above existing background levels.

In 2005, the UK Highways Agency released an Interim Advice Note[32] as a supplement to the Design Manual for Roads and Bridges (DMRB) Guidelines. This interim guidance states that dust or particles falling onto plants can physically smother the leaves affecting photosynthesis, respiration and transpiration. The literature suggests that the most sensitive species appear to be affected by dust deposition at levels above 1,000 mg/m2/day which is considerably greater than the level at which most dust deposition may start to cause a perceptible nuisance to humans. As such, once dust deposition rates are maintained within the guidelines for human nuisance the impact of dust deposition on sensitive ecosystems is considered negligible. Therefore, the following dust deposition limits are typically recommended;

[32] UK Highways Agency (2005) Interim Advice Note 61/05 '*Guidance for Undertaking Environmental Assessment of Air Quality for Sensitive Ecosystems in Internationally Designated Nature Conservation Sites and SSSIs'*

- Dust Deposition Rate limit = 350 mg/m^2/day (averaged over a 30 +/- 2-day period using Bergerhoff Gauge Method).
- Dust Deposition Rate limit affecting sensitive ecological receivers = 1,000 mg/m^2/day
- PM_{10} 24 Hour Mean concentration limit = 50 µg/m^3 not to be exceeded more than 35 times a calendar year
- PM_{10} Annual Mean concentration limit = 40 µg/m^3
- $PM_{2.5}$ Annual Mean concentration limit = 25 µg/m^3

Guidance on the assessment of dust from demolition and construction

As prescribed within Environmental Protection UK and the Institute of Air Quality Management, Land-use Planning & Development Control: Planning For Air Quality (January 2017) the proposed Kilkee Flood Relief Scheme has been assessed in accordance to the "Guidance on the Assessment of Dust from Demolition and Construction (IAQM) January 2024 (Version 2.2). This guidance has been referenced to assess the potential impact of the vehicle movements and the earthworks phase of the proposed works. Good practice construction mitigation measures are recommended to be implemented to minimise emission quantities during construction.

Receiving Environment

Baseline Air Quality

No baseline air quality or dust deposition survey has been undertaken. Reference has been made to EPA data to quantify the existing air quality in proximity to the proposed development site.

The EPA has divided the country into zones for the assessment and management of air quality. The zones adopted in Ireland are Zone A, the Dublin conurbation; Zone B, the Cork conurbation; Zone C, comprising 21 large towns in Ireland with a population >15,000; and Zone D, the remaining area of Ireland. The background air quality in the area of the development is of good quality and the site is located in 'Zone D' as denoted by the EPA.

The EPA, working with local authorities and other public bodies, has established 116 ambient air quality monitoring stations nationwide. Monitoring data from these stations is available in real time on the website, www.EPA.ie and the data is used to inform national policy, meet Ireland's commitments to European reporting and is now used as one of the key inputs to the air quality forecast. The Local Monitoring network measures real time indicative results for Particulate Matter. The network is being set up as part of the National Ambient Air Monitoring Programme (AAMP) 2017-2022. Particulate Matter (PM_{10} and $PM_{2.5}$) background concentrations from the nearest EPA Air Quality local monitoring station in Ennistymon which is c.38km northwest of Kilkee has been referenced.

The CAFE (Clean Air for Europe) Directive sets air quality standards for member states in Europe and has been transposed into Irish legislation by the Air Quality Standards Regulations 2011. Table 6-1 shows 2023 concentration levels to date (1st November 2022 – 3rd October 2023). Results show that there were no exceedances of these EU CAFE directive annual mean limits for PM_{10}. or $PM_{2.5}$.

Table 6-1: Annual Average Particulate Matter (PM_{10} and $PM_{2.5}$) concentrations at Ennistymon.

Station	Period	Measured Concentration (µg/m^3)	
		PM_{10}	**$PM_{2.5}$**
Ennistymon, Co. Clare	(1st November 2022 – 3rd October 2023).	12.24 µg/m^3	7.69 µg/m^3
	Annual Mean Limit Value	40 µg/m^3	20 µg/m^3

The Environmental Protection Agency's Air Quality Index for Health (AQIH) is a number from one to 10 that identifies the current air quality currently in a region and whether or not this might affect human health. This reading is updated twice a day, once in the morning (by 9.30am) and once in the evening (by 19.30pm). A reading of 10 means the air quality is very poor and a reading of one to three inclusive means that the air quality is good. The AQIH readings are based on five air pollutants which can harm human health: Ozone gas, nitrogen dioxide gas, sulphur dioxide gas, $PM_{2.5}$ particles and PM_{10} particles. The AQIH at the station in Ennistymon, Co. Clare is currently 1 - Good [index as of time of writing, 13:30, Monday, November 27th, 2023] (EPA, 2023).

The World Health Organization (WHO) guidelines on outdoor (ambient) air pollution levels, which are widely used as reference tools by policymakers across the world to set standards and goals for air quality management, were updated in September 2021. Across nearly all pollutants, the new recommended limits for concentrations and exposures are lower than the previous guidelines. The 2021 update reflects far-reaching evidence that shows how air pollution affects many aspects of health, even at low levels.

Predicted Impact

Do Nothing Scenario

The 'Do Nothing' scenario is defined as the option involving no future expenditure on flood defences or maintenance of existing defences/channels. There is no air quality and dust impact from the 'Do Nothing scenario'.

Construction Dust Impacts

As stated above, there will be no operational air quality and/ or dust impact from the operation of the proposed development. Therefore, this chapter further summarises and assesses the nature of only proposed construction works in each area. No significant difficulties were encountered when preparing this Air Quality and Dust impact assessment.

The Dust Impact Assessment has been undertaken in accordance with Guidance on the Assessment of Dust from Demolition and Construction (IAQM) January 2024 (Version 2.2). to predict the risk of dust impacts and the level of mitigation that is required to control the residual effects to a level that is "not significant".

Activities on construction sites have been divided into four types to reflect their:

- Demolition;
- Earthworks;
- Construction; and
- Trackout.

The potential for dust emissions is assessed for each activity that is likely to take place. Obviously, if an activity is not taking place, e.g. demolition, then it does not need to be assessed. The risk assessment categories assume that the most basic project controls are applied to every project.

The assessment methodology considers three separate dust impacts:

- Annoyance due to dust soiling;
- The risk of health effects due to an increase in exposure to PM_{10}; and
- Harm to ecological receptors with account being taken of the sensitivity of the area that may experience these effects. The assessment is used to define appropriate mitigation measures to ensure that there will be no significant effect.

The assessment steps are:

Step 1: Screening the Need for a Detailed Assessment

An assessment will normally be required where there is:

- a 'human receptor' within:
  - 350m of the boundary of the site; or
  - 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s)
- an 'ecological receptor' within:
  - 50m of the boundary of the site; or
  - 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s)

Step 2: Assess the Risk of Dust Impacts

The risk of dust arising in sufficient quantities to cause annoyance and/or health and/or ecological impacts should be determined using four risk categories: negligible, low, medium and high risk. A site is allocated to a risk category based on two factors:

- the scale and nature of the works, which determines the potential dust emission magnitude as small, medium or large (STEP 2A); and

- the sensitivity of the area to dust impacts (STEP 2B), which is defined as low, medium or high sensitivity.

These two factors are combined in STEP 2C to determine the risk of dust impacts with no mitigation applied. The risk category assigned to the site can be different for each of the four potential activities (demolition, earthworks, construction and trackout). More than one of these activities may occur on a site at any one time. Where appropriate, the site can be divided into 'zones' for the dust risk assessment.

Step 2A: Define the Potential Dust Emission Magnitude

Earthworks, construction and trackout will occur during the construction phase. Table 6-2 describes the potential dust emission class criteria for each outlined construction activity.

Table 6-2: Criteria Used in the Determination of Dust Emission Class

Activity	Criteria used to Determine Dust Emission Class		
	Small	**Medium**	**Large**
Demolition	▪ Total building volume <12,000 m^3 ▪ Construction ▪ material with low potential for dust release (e.g. metal ▪ cladding or timber ▪ Demolition activities <6m above ground level ▪ Demolition during wetter months	▪ Total building volume 12,000 m^3 - 75,000m^3 ▪ Potentially dusty construction material. ▪ Demolition activities 6-12m above ground level	▪ Total building volume >75,000m^3 ▪ Potentially dusty construction material (e.g. concrete) ▪ On-site crushing and screening, ▪ Demolition activities >12m above ground level
Earthworks	▪ Total site area <18,000m^2 ▪ soil type with large grain size (e.g. sand), ▪ <5 heavy moving earth vehicles active at any one time ▪ formation of bunds <3m in height	▪ Total site area 18,000 – 110,000m^2 ▪ Moderately dusty soil type (e.g. silt) ▪ 5-10 heavy moving earth moving vehicles active at any one time. ▪ formation of bunds 3m - 6m in height,	▪ Total site area >110,000m^2 ▪ potentially dusty soil type (e.g. clay) ▪ >10 heavy earth moving vehicles active at any one time. ▪ formation of bunds >6m in height
Construction	▪ Total building volume <12,000m^3 ▪ Construction material with low potential for dust release	▪ Total building volume 12,000 – 75,000m^3 ▪ Potentially dusty construction material (e.g. concrete) ▪ On-site concrete batching	▪ Total building volume >75,000m^3 ▪ On-site concrete batching ▪ Sandblasting
Trackout	▪ <20 outward HDV trips in any one day ▪ surface material with low potential for dust release, ▪ Unpaved road length <50m	▪ 20 - 50 outward HDV trips in any one day ▪ moderately dusty surface material (e.g. high clay content), ▪ Unpaved road length 50-100m	▪ >50 outward HDV trips in any one day ▪ potentially dusty surface material (e.g. high clay content ▪ Unpaved road length >100m

The potential dust emission magnitudes for the proposed development were estimated using information provided by the Design Team and determined using the criteria detailed in Table 6-3 as follows;

Demolition:

Demolition includes any activity involved with the removal of an existing structure (or structures). There is very little demolition required for this project. Demolition incudes:

- Demolition and reconstruction of Victoria Court boundary walls in order to repurpose as flood defence walls. The total length is 36m or approximately 21.6m^3 of masonry.
- Demolition and reconstruction of Victoria Crescent boundary walls in order to repurpose as flood defences. In total, 100m of masonry wall needs to be demolished, resulting in 10m^3 of masonry.
- Removal of existing cover slab on Atlantic Stream Outfall in order to construct overflow chamber. This will result in removal of 1m^3 of concrete.

Therefore:

- Total building volume <12,000 m^3
- Potentially dusty construction material.
- Demolition activities <6m above ground level

Therefore, the dust emission magnitude for Demolition is defined as **Small.**

Earthworks:

Earthworks covers the processes of soil-stripping, ground-levelling, excavation, and landscaping. Excavated material will be generated from the stripping of surface and excavation of subsoil layers for the construction of the proposed foundations and channel works. Earthwork's material will be placed to form embankments. Excess material will be disposed offsite. Therefore:

- Total site area where earthworks will occur is 44,747 m^2.
- The underlying bedrock of the site is mainly composed of sandstone, siltstone & mudstone, with grey siltstone & sandstone in the vicinity of the coast and further inland to the east. The central region of the proposed site has made ground, shale and sandstone till (Namurian), and bedrock at surface. Blanket peat covers the northwestern, western, and southern parts of the development site.
- There will be 5-10 heavy moving earth moving vehicles active at any one time.

Therefore, the dust emission magnitude for Earthworks is defined as **Medium**.

Construction:

Construction covers any activity involved with the provision of a new structure (or structures), its modification or refurbishment. See section 0 above. Therefore:

- Total construction volume is 20,634m^3.
- Potentially dusty construction material (e.g. concrete).

Therefore, the dust emission magnitude for Construction is defined as **Medium.**

Trackout:

Trackout covers the transport of dust and dirt from the construction site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction/demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site.

- Significant bulk excavation works and construction of new embankments will generate the most HGV movements during the anticipated dig and replace works and be the busiest construction period. Based on general construction rate assumptions for excavator work rates it is recommended to allow that 8 – 12 HGV movements per hour. Should the contractor's approach be to commence with the embankment works and the structural works for the walls etc in parallel, these HGV single trip movements can potentially increase to 12 -19 per hour. Therefore, there will be > 50 outward HDV trips in any one day.
- Potentially dusty surface material
- Unpaved road length, some elements are >100m.

Therefore, the dust emission magnitude for Trackout is defined as **Large**.

Step 2B: Define the Sensitivity of the Area

The sensitivity of the area takes account of a number of factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of PM_{10}, the local background concentration; and
- site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

The criteria for determining the sensitivity of receptors are detailed in Table 6-3 for dust soiling effects and health effects of PM_{10}.

The criteria detailed in Tables 6-4, 6-5 and 6-6 were used to determine the sensitivity of the area to dust soiling effects and human health impacts.

Table 6-3: Criteria for Determining Sensitivity of Receivers

Sensitivity of Receiver	Criteria for Determining Sensitivity	
	Dust Soiling Effects	Health Effects of PM_{10}
High	Dwellings, museums and other culturally important collections, medium and long-term car parks and car showrooms	Residential properties, hospitals, schools and residential care homes
Medium	Parks, places of work	Office and shop workers not occupationally exposed to PM_{10}
Low	Playing fields, farmland, footpaths, short-term car parks and roads	Public footpaths, playing fields, parks and shopping streets

Table 6-4: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receiver Sensitivity	Number of Receivers	Distance from Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 6-5: Sensitivity of the Area to Human Health Impacts

Receiver Sensitivity	Annual Mean PM_{10} Conc	Number of Receivers	Distance from Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 µg/m^3	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m^3	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

Table 6-6: Sensitivity of the Area to Ecological Impacts

Receiver Sensitivity	Distance from Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Sensitivity of Receivers

A population of Kilkee was reported as 1,214 in the Census of Ireland 2022. Kilkee's population is highly seasonal, with numerous holiday homes and summer visitors coming to the town each year amounting to c. 10,000 during summer months. Likely sensitive receptors include residential properties, tourism facilities, and caravan parks off Well Road and Circular Road.

Table 6-7 outlines the range of numbers of properties within specific distance bands from the proposed construction activities to determine the receptor sensitivity of the area to Dust Soiling Effects on People and Property.

Table 6-7: Cumulative number of sensitive receivers within 20m to 350m of the site

Parameter	Number of Receivers within Distance from Site (m)				
	<20	**<50**	**<100**	**<200**	**<350**
No. of receivers in proximity to Site	~55 (145)	~80 (175)	>200	>200	>200
Receiver Sensitivity	High	High	Medium	Low	Low

Notes: Values in brackets are inclusive of caravans

Sensitivity of People to Dust Soiling

- Demolition, Earthworks and Construction: There are approx. 55 sensitive residential properties within 20m of the proposed construction activities on the site. Additionally, there are approx. 90 caravans within 20m of the proposed works, which arguably are included as high sensitive receptors as (*The IAQM guidance states that a high sensitivity receptor is where: users can reasonably expect enjoyment of a high level of amenity; or the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land*). There are approx. an additional 30 dwellings and 30 caravans within 50m of the proposed works.

Therefore, as a worst-case scenario the sensitivity of the Area to Dust Soiling Effects on People and Property is **High**; in terms of potential demolition, earthworks and construction dust impacts.

- Trackout: For trackout , the distances should be measured from the side of the roads used by the construction traffic. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50m from the edge of the road, As a worst case scenario as shown in Table 6-7, there are (inclusive of caravans) ~175 sensitive receptors within 50m of the site.

Therefore, as a worst-case Scenario the sensitivity of the Area to Dust Soiling Effects on People and Property is **High**; in terms of potential trackout dust impacts.

Sensitivity of the Area to Human Health Impacts

Section 6.1.2 outlines baseline air quality in the study area. The PM_{10} concentrations recorded at EPA monitoring station in Ennistymon which is c.38 Km north-west of the proposed works has been referenced for almost a year from 1st November 2022 – 3rd October 2023. This concentration value is 10.12µg/m^3 which is well below the Air Quality Standard annual limit value of 40µg/m^3 and below the recent 2021 WHO air quality guideline value of 15 µg/m^3. As a worst-case scenario, inclusive of caravans there are >100 sensitive receptors within 20 m of the site. As shown in Table 6-5, the sensitivity of the Area to Human Health Impacts is **Medium**; in terms of potential demolition, earthworks, construction and trackout dust impacts.

Sensitivity of the Area to Ecological Impacts

Dust deposition due to demolition, earthworks, construction and trackout has the potential to affect sensitive habitats and plant communities. Dust can have two types of effect on vegetation: physical and chemical. Direct physical effects include reduced photosynthesis, respiration and transpiration through smothering. Chemical changes to soils or watercourses may lead to a loss of plants or animals for example via changes in acidity. Indirect effects can include increased susceptibility to stresses such as pathogens and air pollution. These changes are likely to occur only as a result of long-term demolition and construction works adjacent to a sensitive habitat.

The proposed flood defences are in close proximity to the Kilkee Reefs SAC, with a direct hydrological connection via the two streams. A portion of the construction works; the Atlantic Stream outfall culvert is just within the boundary of Kilkee Reefs SAC (Site code: 002264).

The Atlantic Stream outfall culvert as shown in the Project Description will consist of a reconstruction of the overflow manhole with a new pressure-releasing chamber cover to allow surcharged flows to be dissipated in a controlled fashion and allow flood waters to run down the promenade terracing and onto the beach. The new chamber's dimensions are 2.7m wide x 2m long x 0.4m deep, with flap valves, new flap valves on existing outfall and overflow outfall. Other works proposed are at their closest c.100m away.

Table 6-6 outlines Sensitivity of the Area to Ecological Impacts. A high receiver sensitivity is those receivers with an international or national designation. Although Kilkee Reefs SAC is an international designation the designated features are Large shallow inlets and bays [1160] Reefs [1170] and Submerged or partially submerged sea caves [8330] and given the short term and small scale of these works to the Atlantic Stream outfall culvert, it is not expected the SAC will be affected by dust deposition. Therefore, the sensitivity of the Area to Ecological Impacts is **Low**; in terms of potential demolition, earthworks, construction and track out dust impacts.

The sensitivity of the area to dust soiling, human health impacts and ecological impacts for each activity is summarised in Table 6-8.

Table 6-8: Outcome of Defining the Sensitivity of the Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	High
Human Health	Medium	Medium	Medium	Medium
Ecological	Low	Low	Low	Low

Step 2C: Define the Risk of Impacts

In accordance with the IAQM Guidance, the dust emission magnitude (Step 2A) and sensitivity of the area (Step 2B) have been combined and the risk of impacts from demolition, construction, earthworks and trackout determined (before mitigation is applied). The risk of dust soiling, impact on human health and ecological impact before mitigation, is summarised in Table 6-9.

Table 6-9: Summary Dust Risk to Define Site-specific Mitigation

Potential Impact	Dust Emission Magnitude			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium Risk	Medium Risk	Medium Risk	High Risk
Human Health	Low Risk	Medium Risk	Medium Risk	Medium Risk
Ecological	Negligible	Low Risk	Low Risk	Low Risk

Step 3: Site-Specific Mitigation

In accordance with the IAQM Guidance, for proposed mitigation measures, the highest risk category should be applied. Therefore, the mitigation measures applicable to a **High Risk Site** should be applied as outlined in Section 6.1.4 below.

Operational Stage

There will be no air quality and/or dust deposition impact from the 'Operation Phase'.

Mitigation Measures

Construction Mitigation

The following mitigation measures are to be implemented during the construction phase:

Step 3: Site-Specific Mitigation

In accordance with the IAQM Guidance, the highest risk category should be applied when determining proposed mitigation measures. Therefore, the mitigation measures applicable to a **High-Risk site** will be applied. The proposed mitigation measures in the IAQM guidance are as follows:

General Measures

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.
- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The DMP may include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the logbook.
- If applicable, hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.

Monitoring

Monitoring is discussed separately, in Section 6.1.4.2 of this report.

Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
- Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas.
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Waste Material to be disposed of at an appropriately licensed facility.

Measures specific to demolition

- Ensure effective water suppression is used during demolition operations. Handheld sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

Measures specific to earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Only remove the cover in small areas during work and not all at once.

Measures specific to construction

- Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

Measures specific to trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site logbook.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10m from receptors where possible.

If a programme of air quality monitoring shall be implemented at the site boundaries for the duration of construction phase activities to ensure that the air quality standards relating to dust deposition and PM_{10} are not exceeded, the following limits are recommended;

- Dust Deposition Rate limit = 350 mg/m^2/day (averaged over a 30+/-2 day period using Bergerhoff Gauge Method).
- Dust Deposition Rate limit affecting sensitive ecological receivers = 1,000 mg/m^2/day
- PM_{10} 24 Hour Mean concentration limit = 50 µg/m^3 not to be exceeded more than 35 times a calendar year
- PM_{10} Annual Mean concentration limit = 40 µg/m^3
- $PM_{2.5}$ Annual Mean concentration limit = 25 µg/m^3

Where levels exceed specified air quality limit values, dust generating activities shall immediately cease and alternative working methods shall be implemented. A complaints log shall be maintained by the

construction site manager and in the event of a complaint relating to dust nuisance, an investigation shall be initiated.

Monitoring

Monitoring of Air Quality and Dust related impacts will be required during the construction stage only of the proposed development. The monitoring activities are to:

- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority if and when requested. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, with cleaning to be provided if necessary.
- Carry out regular site inspections to monitor compliance with the dust management measures, record inspection results, and make an inspection log available to the local authority if and when requested.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Agree dust deposition and/or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site.

Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.

Operational Mitigation

There are no operational impacts relating to air quality and dust, therefore there are no mitigation measures required for the operational stage.

Residual Impacts

Construction site dust control measures and good construction site management and practice is capable of effectively mitigating the potential for significant impact of fugitive dust emissions. Therefore, the potential for fugitive dust emission effects at the nearest residential properties and ecological receptors will be controlled to ensure impacts are of negligible significance.

The IAQM Guidance recommends that significance is only assigned to the effect after considering the construction activity with mitigation. Therefore, the detailed mitigation measures have been defined in a form suitable for implementation by way of inclusion within the EIAR which makes up part of the planning consent.

Using the IAQM methodology for the assessment of impacts from construction activities, the following is indicated inTable 6-9;

- the risk of dust soiling impacts is medium risk for demolition, earthworks, and construction and high risk for trackout;
- the impacts on human health are low risk for demolition, and medium risk for earthworks, construction and trackout; and
- the ecological impacts are negligible risk for demolition and low risk for earthworks, construction and trackout.

In accordance with the IAQM Guidance, the highest risk category measures have been applied in the determination of appropriate mitigation measures. The significance of impacts arising from the risks identified together with the proposed mitigation measures are summarised in Table 6-10: Summary of Significance of Impact including Site-specific Mitigation..

Together with the proposed mitigation measures and the existing low background particulate (PM_{10}) concentrations, the construction phase activities on the proposed site will not cause an exceedance of the air quality objectives at receptor locations.

Table 6-10: Summary of Significance of Impact including Site-specific Mitigation.

Potential Impact	Significance			
	Demolition	Construction	Earthworks	Trackout
Dust Soiling	Negligible	Negligible	Negligible	Negligible
Human Health	Negligible	Negligible	Negligible	Negligible
Ecological	Negligible	Negligible	Negligible	Negligible

Interactions and Potential Cumulative Impacts

Interactions

The environmental effects on air quality are interlinked with the environmental effects of:

- Chapter 6 – Construction Impacts
- Chapter 7 - Biodiversity
- Chapter 8 – Land and Soil
- Chapter 9 – Water – Surface and Groundwater
- Chapter 10 – Material Assets
- Chapter 11 – Cultural Heritage
- Chapter 12 – Landscape & Visual

Appropriate construction phase mitigation measures have been outlined in Section 6.1.4 to ensure that the potential impact on the SAC will be negligible. Therefore, the impact of dust deposition in combination with other environmental effects e.g. direct loss of habitat, pollution etc will result in a negligible effect on the SAC and any other habitats of significance.

Earthworks during the construction phase has the potential to give rise to dust impacts, potentially giving rise to water pollution and impacts on flora and fauna and the visual landscape. Potential interactive negative impacts have been identified in Chapter 13. All mitigation measures outlined in the respective chapters of this EIAR will be implemented in full to ensure the potential impact is minimised in relation to construction impacts.

Potential Cumulative Impacts

In relation to the in-combination construction and/or operational impact of the proposed Kilkee Flood Relief Scheme, with other proposed schemes planned in the area, the list of schemes noted from Chapter 14 have been reviewed. None of these schemes will result in any significant additional construction and/or operational Air Quality & Dust impact.

In section 6.1.4 Mitigation Measures above it states:

- If applicable, hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.

A list of projects listed in Chapter 14, Table 14.1 within 500m from the proposed Kilkee Flood Relief Scheme were considered:

- New Wastewater Treatment Plant at Victoria Park, Kilkee Uisce Éireann is progressing the design stage of a project to install a new wastewater treatment plant in Kilkee and end the discharge of raw sewage to the marine environment. This project is currently at planning stage and, following completion of site selection and land acquisition as well as a successful planning stage, Uisce Éireann expects to commence works in 2024 on this project.
- Planning Ref 18812: to construct an extension to the existing clubhouse building to consist of a new main entrance, referees room, gym and storage facilities, along with all associated site works. Although within 500m of proposed works, planning permission expired 17.1.2024, and even if this development has been constructed and is operational there will not be any additional construction and/or operational Air Quality & Dust impact.
- Planning Ref 20869: to build an extension to existing ground floor bedroom at the Northeastern side of existing dwelling house and for planning Permission for change of design of the porch previously granted under planning permission P18/504 to the Southeastern side of existing dwelling house with all necessary ancillary works at Well Road, Marine Parade, West End Kilkee. planning permission was granted in March 2021. It is unclear if the proposed construction works has been completed, but considering the small scale of the proposed works there will not be any additional construction and/or operational Air Quality & Dust impact.
- Planning Ref:21884: for the following development at Kilkee Sub Aqua Club, Pound Street, Kilkee, Co. Clare: 1. Permission to demolish existing Dive Centre Building and close up existing entrance; 2 Permission to construct new Dive Centre Building consisting of 2 No. Rib Storage areas, changing area, toilets office and briefing room; 3. Permission for new vehicular entrance, internal road,

footpaths and parking spaces and ancillary site works, including connection to public sewer / services at Kilkee Sub Aqua Club, Pound Street, Kilkee, Co. Clare. This proposed development is close to the proposed Atlantic Stream outfall works and the site compound to be located at the rear of Waterworld. It is uncertain at this time if the proposed development has been completed. If the construction period of this development is to overlap with the proposed FRS, there is a potential to impact of air quality in the area. This development could be considered a medium/high risk site, therefore regular liaison meetings should be held to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. Guidance on the assessment of dust from demolition and construction will be required to be put into dust mitigation measures in accordance with its planning conditions.

6.2 Climate

This Chapter of the EIAR assesses the climate impact of the proposed development during the Construction and Operational Phases.

This climate impact assessment has been prepared to assess the potential climate impact of the proposed flood relief scheme. It can be expected that the future operation of the proposed flood relief scheme will not have a significant climate impact. Therefore, the construction activities of the proposed flood relief scheme have been examined to identify those that have the potential to give rise to a short-term climate impact in terms of 'embodied carbon' and 'construction activities' carbon emissions.

The assessment and evaluation of the potential climate impact arising from the proposed flood relief scheme was based on reference to the relevant Transport Infrastructure Ireland (TII) Publications and TII Carbon Tool, for use in the assessment of climate effects for national road schemes and these are described in the Standard Document (SD) and Overarching Technical Document (OTD) for climate.

- Climate Assessment of Proposed National Roads, December 2022. This Standard Document (SD), PE-ENV-01105 sets out the required approach for Climate Practitioners to identify significant climate effects; in terms of both Greenhouse Gas (GHG) emissions and climate resilience, associated with all stages of proposed national road developments: the design, construction, and operation of national roads in accordance with TII's project planning and national planning requirements.
- The methodology outlined in this SD and the theory of climate assessment are presented in an "Overarching Technical Document" (OTD), PE-ENV-01104. The OTD should be read in conjunction with this SD. The OTD provides best practice methodology and processes for climate assessment for proposed national road developments, as well as light railway and rural cycleways (offline & greenways) projects.
- Transport Infrastructure Ireland Carbon Tool for Road and Light Rail Projects: User Guidance Document, GE-ENV-01106; and

In accordance with the TII Guidelines outlined above, the climate impact assessment has included a Greenhouse Gas (GHG) Assessment Process as follows;

- Using Table 3.21 Phase 2, Stage 2 GHG Assessment Instructions, it is a requirement to quantify available GHG data using the TII Carbon Assessment Tool. This process should include available major sources of GHGs provided to the climate practitioner by the project engineers including:
  - Cut and fill balance, etc.
  - Main materials for construction – these include pavement, earthworks, concrete, and steel, etc.
  - A Climate Change Risk (CCR) Assessment Process has been undertaken elsewhere in the EIAR in the form of detailed flood risk assessment, etc.

Methodology

Greenhouse Gas (GHG) Assessment

The GHG impact assessment for the proposed development has been assessed using the TII Carbon Assessment Tool. The Carbon Assessment Tool has been used for the calculation of emissions arising from the construction of the proposed development. The Carbon Assessment Tool aligns with TII's project

phases as well as the latest standard Carbon Management in Infrastructure[33] (PAS 2080:2023). The tool includes an emission factors library using factors developed by relevant industry bodies. The outputs from the Carbon Assessment Tool allow for comparison and evaluation of the lifecycle carbon impacts for any given national road project.

Using the Transport Infrastructure Ireland (TII) Carbon Tool for Road and Light Rail Projects: Guidance, the lifecycle carbon emissions for the flood relief scheme have been calculated. The calculation tool for lifecycle carbon emissions assesses various stages of the project as follows;

- "**Pre-Construction"** stage considers activities that will take place at the pre-construction stage of a project, specifically clearance and demolition works.
- **"Embodied Carbon"** stage considers the product stage, including materials that will be used during the construction process, their lifetime (to determine replacement cycles) and details of material transportation.
- **"Construction Activities"** stage considers construction activities that will take place during infrastructure development, including excavation activities, energy use of construction activities, water use and landscaping and vegetation.
- The **"Operational Use Carbon"** stage considers emissions associated with the operation of the infrastructure scheme such as energy, water and waste.
- The **"Operational Carbon Emissions"** of a project, considers emissions associated with the use of the scheme.
- The **"Maintenance Carbon"** stage of a project considers emissions associated with the fuel used for the maintenance of the infrastructure scheme during its use.
- "**End of Life Carbon**" stage considers the decommissioning of the scheme, including deconstruction and demolition activities and waste disposal.

During the construction phase of the proposed development, GHG emissions will potentially be generated by site preparation works, excavation, infilling works, construction activities, energy usage, etc. During the operational phase for the proposed development, no climate impacts will result from carbon emissions. Therefore, only potential climate impacts in terms of carbon emissions (tCO_2e) during construction have been considered for the proposed development.

Receiving Environment

Baseline Climate Survey

'Ireland, National Inventory Report 2023' as published by the EPA in March 2023, indicates that in 2021, total emissions of greenhouse gases including indirect emissions from solvent use (without LULUCF) in Ireland were 62,109.9 $ktCO_2eq$ and the total with LULUCF 69,448.1 $ktCO_2eq$. This value is 11.6% higher than emissions in 1990 but the total for 2021 is 13.5% lower than the peak of 71,814.5 $ktCO_2eq$ in 2001 when emissions reached a maximum following a period of unprecedented economic growth.

[33] PAS 2080:2023, BSI, ISBN:978 0 580 90155 3

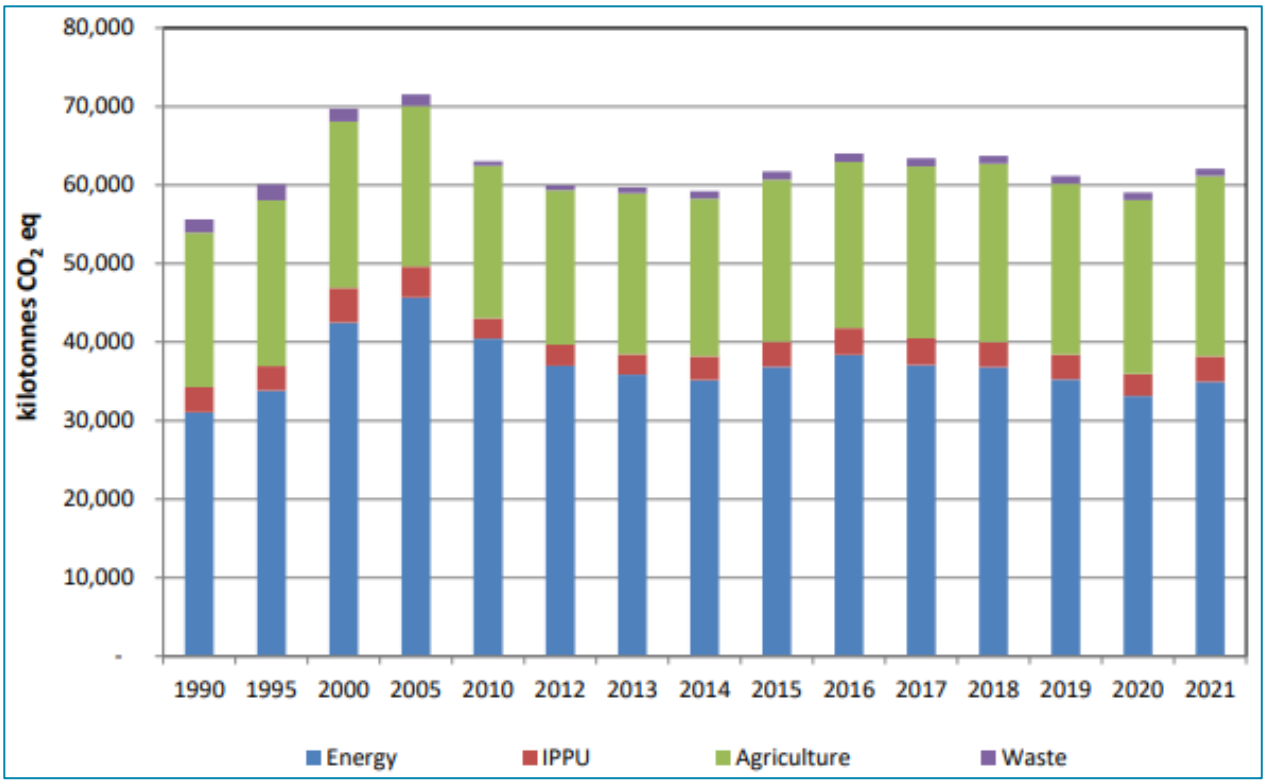


Figure 6-1: National Total Greenhouse Gas Emissions (Excluding LULUCF) 1990-2021

The Government's Climate Action Plan 2023 (CAP23) is the second annual update to Ireland's Climate Action Plan 2019. This plan is the first to be prepared under the Climate Action and Low Carbon Development (Amendment) Act 2021, and following the introduction, in 2022, of economy-wide carbon budgets and sectoral emissions ceilings. The plan implements the carbon budgets and sectoral emissions ceilings and sets a roadmap for taking decisive action to halve our emissions by 2030 and reach net zero no later than 2050, as we committed to in the Programme for Government.

CAP 23 outlines that Flood Risk Management is the responsibility of the OPW and Chapter 22. Adaptation outlines the following actions in Section 22.6 Actions. The detailed implementation maps for actions, including timelines and responsible organisations, are set out in the accompanying Annex. The relevant action numbers and actions are shown in Table 6-11 below.

Table 6-11: CAP23 Actions relating to flood risk.

Action Number	Action
AD/23/2	Produce guidance on the assessment of adaptation measures and the development of Climate Change Adaptation Plans for past and new flood relief schemes.
AD/23/3	Update the existing Minor Works Programme to ensure applications consider the potential impacts of climate change and, where necessary, that any measures proposed provide for, or are adaptable to, possible future changes in flood risk

Predicted Impact

Construction Climate Impacts

A full description of all of the proposed works can be found in Chapter 4. The main areas and works which are predicted to give rise to climate emissions during construction of the proposed development are described below. The nature of proposed construction works and quantity of materials to be used has been assessed.

The quantification of carbon emissions and the associated climate impact as a result of the construction phase of the proposed flood relief scheme has been based on the following construction quantity information provided by the project engineers;

Table 6-12: Volume of Construction Earthworks.

Earthworks (Volumes Removed) (m^3)				
Location	**Access Road**	**Embankment / U Channel / Foundation**	**Compound**	**Demolition**
Well Stream Embankment	1950	690	297	
Well Stream Upgrade		476		
Crescent Place Culvert		150		
Victoria Court Wall Rebuild				3
Victoria Court Embankment		148		
Victoria Stream and Victoria Crescent Walls	600	618		
Carrigaholt Road Field / Snipe Field Embankment		1096		
Tributary Field Storage Location		4446		
Kilkee Bay Hotel Storage Location	420	800		
Atlantic Stream Embankment	690	150		
Atlantic Stream Outfall Screen	180			
Totals	3840	8574	297	3
Total Volume Removed	**12,714 m^3**			

Construction (Volume Delivered) (m^3)				
Location	**Access Road**	**Embankment**	**Compound**	**Concrete**
Well Stream Embankment	1950	1464	297	
Well Stream Upgrade				
Crescent Place Culvert				
Victoria Court Wall Rebuild				3
Victoria Court Embankment		296		
Victoria Stream and Victoria Crescent Walls	600			175
Carrigaholt Road Field / Snipe Field Embankment		2946		
Tributary Field Storage Location		8206		
Kilkee Bay Hotel Storage Location	850	2000		
Atlantic Stream Embankment	690	350		
Atlantic Stream Outfall Screen	180			
Totals	4270	15262	297	178
Total Volume Delivered	**20,007 m^3**			

Notes:
The table covers the processes of soil-stripping, ground-levelling, excavation, and landscaping. Excavated material will be generated from the stripping of surface and excavation of subsoil layers for the construction of the proposed foundations and channel works. Earthworks material will be placed to form embankments. Excess material will be disposed offsite.

Therefore:

- The volume of excavated, backfilled and imported material is estimated to be 32,700 m^3 (~22,000 tonnes)
- It can be expected that HGV vehicle movements may be in the region of 10-15 vehicles per hour during the busiest period of construction works. HGV vehicle movements will be required for bulk excavation works and clay importation for embankment construction. This will generate the most HGV movements during the anticipated dig and replace works and be the busiest construction period. In terms of carbon emissions, this has been assessed assuming 20 litres of fuel usage per hour, for 10 hours per day and for 90 days of continuous operations.
- Table 6-13 outlines the Total Greenhouse Gas Emissions due to the construction phase earthworks for the proposed development described above, as predicted using the TII Carbon Tool.

Table 6-13: Total Greenhouse Gas Emissions (tonnes CO_2 equivalent) due to the construction phase of the proposed development.

Name	Pre-Construction	Embodied Carbon	Construction Activities	Construction Waste	Operational Use	Total (t CO_2 equivalent)
NA	0	863,708.00	16,100.47	0	0	879,808.00

Therefore, as a percentage of 2021 Annual Carbon Emissions of 69,448.1 kt CO_2 equivalent, the proposed development will account for 0.00126% of annual CO_2 emissions. This represents a **negligible** impact.

Operational Stage

There will be no operational climate impact from the operation of the proposed development. The proposed development will provide tangible benefits in terms of reduced flood impacts, reduction of financial loss and disruption as well as alleviating future development restrictions.

Mitigation Measures

Construction Mitigation

As no significant adverse effects are predicted to occur during the construction phase, no specific construction phase mitigation measures are required.

Operational Mitigation

The proposed flood relief scheme will not result in an operational climate impact. Therefore, no operational mitigation measures are deemed necessary.

Residual Impacts

As no significant adverse effects are predicted to occur during the construction or operation phase, no specific climate effects are predicted.

Interactions and Potential Cumulative Impacts

No specific construction or operation phase mitigation measures have been outlined for the proposed flood relief scheme. Climate change adaptability has been assessed as part of the scheme design and is reported in the project Options report.

The construction machinery and processes have the potential to give rise to Greenhouse Gas Emissions due to the construction phase of the proposed development as predicted using the TII Carbon Tool. In relation to the in-combination construction and/or operational impact of the proposed development, with other proposed schemes planned in the area, the list of schemes noted from the planning chapter have been reviewed. None of these schemes will result in any significant additional Greenhouse Gas Emissions

Cumulative Impacts

In relation to the in-combination construction and/or operational impact of the proposed development, with other proposed schemes planned in the area, the list of schemes noted from Chapter 14 have been reviewed. None of these schemes will result in any significant additional climate impact.

6.3 Noise & Vibration

This Chapter of the EIAR assesses the noise and vibration impact of the proposed development during the Construction and Operational Phases.

This noise and vibration impact assessment has been prepared to assess the potential noise and vibration impact of the proposed flood relief scheme on the nearest residential properties. It can be expected that the future operation of the proposed flood relief scheme will not have a significant noise impact. Therefore, the construction activities of the proposed flood relief scheme have been examined to identify those that have the potential to give rise to a short-term noise and vibration impact and a suitable construction impact assessment has been undertaken. As appropriate, construction phase mitigation measures have been outlined.

- The assessment and evaluation of the potential noise and vibration impact arising from the proposed flood relief scheme involved the following:
- Baseline Noise Survey – noise monitoring survey representative of the daytime period to determine the existing noise climate in proximity to the residential receivers in the vicinity of the proposed flood relief scheme.
- Identification and assessment of potential noise and vibration sources from the construction of the proposed flood relief scheme.
- Construction noise impact prediction using the methodology outlined in BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.
- An assessment of the predicted noise levels and the noise impact on the nearest residential receivers against relevant guidelines and standards.
- A recommendation of appropriate construction and operational noise and vibration mitigation measures.

Methodology

ISO 1996-1:2016 Acoustics — Description, measurement and assessment of environmental noise — Part 1: Basic quantities and assessment procedures

The *ISO 1996-1:2016 Acoustics — Description, measurement and assessment of environmental noise — Part 1: Basic quantities and assessment procedures* defines the basic quantities to be used for the description of noise in community environments and describes assessment procedures. It also specifies methods to assess environmental noise and gives guidance on predicting the potential annoyance response of a community to long-term exposure from various types of environmental noises. Application of the method to predict annoyance response is limited to areas where people reside and to related long-term land uses. ISO 1996: 2016 describes adjustments for sounds that have different characteristics. The term rating level is used to describe physical sound predictions or measurements to which one or more adjustments have been added. Based on these rating levels, the long-term community response can be estimated. The potential noise is assessed either singly or in combination, allowing for consideration, when deemed necessary by responsible authorities, of the special characteristics of their impulsiveness, tonality and low-frequency content, and for the different characteristics of road traffic noise, other forms of transportation noise (such as aircraft noise) and industrial noise.

BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise

BS5228 gives recommendations for methods of noise control relating to construction sites, including sites where demolition, remediation, ground treatment or related civil engineering works are being carried out, and open sites, where work activities/operations generate significant noise levels, including industry-specific guidance. The legislative background to noise control is described and recommendations are given regarding procedures for the establishment of effective liaison between developers, site operators and local authorities. This part of BS5228 provides guidance concerning methods of predicting and measuring noise and assessing its impact on those exposed to it.

Annex E of BS5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise, provides guidance on assessing the potential significance of noise effects from construction activities. In relation to construction noise limits, BS 5228-1:2009+A1: 2014 Noise and Vibration Control on Construction and Open Sites Part 1: Noise details the ‘ABC method’, which recommends a construction noise limit based on the existing ambient noise level. General and short-term construction noise impacts that are deemed typical of any construction site noise sources, including activities such as ground preparation, site clearance, foundation earthworks, erection of new buildings, etc. are assessed in accordance with the ‘ABC method’ defined in BS 5228.

For the proposed flood relief scheme, the ambient noise levels have been determined through the baseline noise survey and then rounded to the nearest 5dB to determine the appropriate category (A, B or C) and subsequent threshold value. A potential significant effect is indicated if the construction noise level exceeds the appropriate category threshold value. If the existing ambient level exceeds the threshold category values, then a potential significant impact is indicated if the total noise level, including both the ambient noise and the various contributions of construction noise, is greater than the ambient noise level by more than 3dB. Table 6-14 reproduced from BS5228, demonstrates the criteria for selection of a noise limit for a specific receiver location.

Table 6-14: Construction noise threshold levels based on the BS 5228 'ABC' method.

Assessment Category and Threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A (A)	Category B (B)	Category C (C)
Night time (23.00 to 07.00)	45	50	55
Weekdays evening (19.00–23.00) Saturdays (13.00–23.00) and Sundays (07.00–23.00)	55	60	65
Daytime (07.00 – 19.00) and Saturdays (07.00 - 13.00)	65	70	75

Notes:
Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.
Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.
Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

TII Construction Guidelines

There are no national construction noise limit guidelines. Instead, there are indicative levels of acceptability for construction noise, as contained in the National Roads Authority (now Transport Infrastructure Ireland or TII) *"Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes"* (March 2014) and outlined in Table 6-15.

Table 6-15: Maximum permissible noise levels at the façade of dwellings during construction.

Days & Times	$L_{Aeq\ (1hr)}$ dB	L_{AMax} dB
Monday to Friday - 07.00 to 19.00	70	80*
Monday to Friday - 19.00 to 22.00	60*	65*
Saturday - 08.00 to 16.30	65	75

Notes:
** 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. (Ref. TII Guidelines)*

Construction Vibration Guidelines

The relevant guidelines for vibration limits are the following:

- British Standards Institution. British Standard 7385: Evaluation and measurement for vibration in buildings. Part 1: Guide for measurement of vibration and evaluation of their effects on buildings. 1990.
- British Standards Institution. British Standard 7385: Evaluation and measurement for vibration in buildings. Part 2: Guide for damage levels from ground borne vibration. 1993.
- British Standards Institution. British Standard 6472: Guide to evaluation of human exposure to vibration in buildings. Part 1: Vibration sources other than blasting. 2008.
- National Roads Authority (now TII), Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes, March 2014.

Relevant vibration limits and guidelines can be divided into two categories; those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. Higher levels of vibration are typically tolerated for single events or events of short duration such as during construction projects compared to permanent vibration from operational industrial sources. For example, blasting (an instantaneous activity) and piling (a repetitive/continuous activity), two of the primary sources of vibration during construction projects, are typically tolerated at vibration levels up to 12mm/s and 2.5mm/s, respectively.

The TII Guidelines[34] identify limits for protection against cosmetic damage as a function of vibration frequency, and are:

- 8 mm/s (vibration frequency <10Hz)
- 12.5 mm/s (vibration frequency 10 to 50Hz)

[34] National Roads Authority, "*Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes*", March 2014

- 20 mm/s (vibration frequency >50 Hz).

Guidance relevant to acceptable vibration at the foundation of buildings is contained within BS 7385[35]. This guidance states that there should typically be no cosmetic damage to buildings if transient vibration does not exceed 15mm/s at low frequencies rising to 20mm/s at 15Hz and 50mm/s at 40Hz and above. These guidelines refer to relatively modern buildings.

Receiving Environment

Baseline Noise Survey

A daytime baseline noise monitoring survey was undertaken in proximity to the residential properties close to the proposed works areas at the Victoria Stream, Well Stream and Atlantic Stream in Kilkee on the 29th September 2023. The noise survey was undertaken in accordance with the methodologies outlined in ISO 1996 Description, measurement and assessment of environmental noise and BS 4142. A Norsonic Nor140 Sound Level Meter (Serial No. 1402988 – Calibration Date – 13/04/2023) was used during the noise monitoring survey. A wind shield was used on the microphone throughout the survey and the sound level meter was calibrated before and after the survey period. The sound level meter was placed at a height of approximately 1.25m at the selected monitoring locations. The noise monitoring survey durations in proximity to the nearest noise sensitive receiver locations were undertaken over consecutive 30-minute periods. The meteorological conditions during the noise survey periods were noted as ideal with no periods of rainfall or higher wind speeds. The weather conditions during the noise survey were noted to be relatively calm with a gentle breeze, a temperature of approximately 15°C and no rainfall.

The purpose of the noise survey was to determine a typical daytime background noise level in the area and the measurement parameters recorded and reported during the baseline noise survey are defined as follows:

- A-weighted Decibel (dBA): Decibels measured on a sound level meter incorporating a frequency weighting (A Weighting) which differentiates between sound of different frequency (pitch) in a similar way to the human ear. This takes account of the fact that the human ear has different sensitivities to sound at different frequencies.
- L_{Aeq} is the A-weighted equivalent continuous steady sound level during the sample period.
- L_{A10} is the A-weighted sound level that is exceeded for 10% of the sample period and is generally used to quantify traffic noise.
- L_{A90} is the A-weighted sound level that is exceeded for 90% of the sample period and is generally used to quantify background noise.
- L_{Amin} is the minimum A-weighted sound level measured during the sample period.
- L_{Amax} is the maximum A-weighted sound level measured during the sample period.

Baseline noise measurements were undertaken in proximity to the representative residential receivers in accordance with ISO 1996: 2016 as shown in Figure 6-2. All noise measurement data was downloaded at the company office, exported from the manufacturer's software and stored as Microsoft Excel spreadsheet files.

Table 6-16: Baseline Noise Levels

Location	Time	L_{Aeq}	L_{AMax}	L_{AMin}	L_{A10}	L_{A90}	Sources
NML 1	15:22	49.9	77.1	38.5	50.8	41.7	Occasional passing traffic on Dun and Oir. Frequent traffic on Circular Road.
	15:52	50.5	76.9	39.1	51.7	41.8	
NML 2	16:37	53.4	82.6	41.6	57.4	45.1	Occasional passing traffic on Well Road. Frequent traffic on Marine Parade. Ocean audible.
	17:07	54.3	81.3	42.7	56.6	44.8	

[35]British Standards Institution. British Standard 7385*: "Evaluation and measurement for vibration in buildings. Part 2: Guide for damage levels from ground borne vibration"*. 1993

The baseline noise measurement data indicates that Kilkee is a relatively quiet town with passing traffic on the surrounding road network the dominant noise source. Detailed noise measurements by location are shown in Appendix D.

Figure 6-2: Noise Monitoring Locations (NML)

Predicted Impact

Construction Noise Impacts

As stated above, there will be no operational noise and/or vibration impact from the operation of the proposed development. Also, as no sheet piling is proposed, it is expected that there will be no significant vibration impact during the construction. Therefore, this chapter further summarises and assesses the nature of only proposed construction works in each area and the approximate distance to the nearest noise sensitive receivers. No significant difficulties were encountered when preparing this Noise and Vibration impact assessment.

A full description of all of the proposed works can be found in Chapter 4.

Construction impacts as a result of the construction phase of the proposed flood relief scheme will be perceptible at nearby properties but this will be intermittent and temporary. Construction activities will not take place during night-time hours. The following construction practices have the potential to produce intermittent and temporary noise impacts:

- Site Clearance, Excavation and Embankment Construction - Dozers, tracked excavators and dump trucks;
- Infilling / Levelling – Dozers, excavators, wheeled loaders and rollers;
- Wall removal and construction - Concrete mixer trucks and delivery vehicles;
- General Construction - Masonry wall construction, etc.

It can be expected that HGV vehicle movements may be in the region of 10-15 vehicles per hour during the busiest period of construction works. HGV vehicle movements will be required for bulk excavation works and clay importation for embankment construction. This will generate the most HGV movements during the anticipated dig and replace works and be the busiest construction period.

Construction noise can be assessed in terms of the equivalent continuous sound level and/or in terms of the maximum level. The level of sound in the neighbourhood that arises from a construction site depends on a number of factors and the estimation procedures need to take into account the following significant factors;

- the sound power outputs of processes and plant;
- the periods of operation of processes and plant;
- the distances from sources to receiver;
- the presence of screening by barriers;
- the reflection of sound;
- ground attenuation;
- meteorological conditions (particularly wind speed and direction), and
- atmospheric absorption.

It is most likely that the above outlined construction activities will occur separately throughout periods of construction at each works location. The proposed construction works will not be continuous over the construction period at any one location. By its nature, construction phases of such a proposed development are transient in terms of locations of precise activities on site from time to time. Therefore, the predicted worst-case $L_{Aeq,1\ hour}$ noise levels at specific locations have been outlined to present a worst-case range of noise levels that have the potential to occur at various stages throughout the construction period.

Typical noise levels from construction works likely to take place during construction phase of proposed flood relief scheme are outlined in Table 6-17.

Table 6-17: Typical Noise Levels from Construction Works likely to take place during the construction of proposed development.

Ref No.	Equipment	A-weighted sound pressure level, L_{Aeq}, dB @ 10m
Table C.2 Sound level data on site preparation		
Clearing Site & Ground excavation/earthworks		
1	Dozer ж (142 kW, 20T)	75 ж
3	Tracked excavator (102 kW, 22T)	78
12	Dozer (142 kW, 20T)	80
14	Tracked excavator (226 kW, 40T)	79
Loading lorries		
27	Wheeled loader (493 kW)	80
Distribution of material		
30	Dump truck (tipping fill) (306 kW, 29T)	79
31	Dump truck (empty) (306 kW, 29T)	87
Rolling and compaction		
37	Roller (rolling fill) ж	79 ж
Table C.4 Sound level data on general site activities		
Distribution of materials		
1	Articulated dump truck ж	81 ж
Mixing & Pumping concrete		
20	Concrete mixer truck	80

Trenching		
63	Tracked excavator	77
Power for site cabins		
84	Diesel generator	74
Pumping water		
88	Water pump (diesel) (10 kW, 100Kg)	68
Sweeping and dust suppression		
90	Road sweeper (70 kW)	76
91	Dust suppression unit trailer	78
Table C.5 Sound level data on road construction works		
Breaking road surface & concrete		
1	Backhoe mounted hydraulic breaker	88
6	Hand-held pneumatic breaker	95

Notes:
ж Drive-by maximum sound pressure level in L_{Amax} (overall level) (Ref: BS 5228 Noise on Construction and Open sites)

The predicted worst-case construction noise levels at receiver locations within 50m and 100m in proximity to potential future proposed construction works are summarised in Table 6-18.

Table 6-18: Predicted worst-case 1-hour construction noise levels at receiver locations within 50m and 100m in proximity to short-term construction works.

Description	Likely Equipment / Plant expected to be required	Proximity of works to receiver and Predicted Worst-case 1 Hour Noise Level $L_{Aeq/1\ hour}$
Atlantic Stream Works - Kilkee Bay Hotel Storage	1 No. Excavator, 1 No. Dump Truck, 1 No. Dozer, Concrete Mixer Truck & Wall construction	~50m - 68 dB(A) $L_{eq,\ 1\ Hr}$ ~100m - 60 dB(A) $L_{eq,\ 1\ Hr}$
Atlantic Stream Works - Dún an Óir Walls	1 No. Excavator, 1 No. Dump Truck, 1 No. Dozer, Concrete Mixer Truck & Wall construction	~50m - 59 dB(A) $L_{eq,\ 1\ Hr}$ ~100m – 52 dB(A) $L_{eq,\ 1\ Hr}$
Atlantic Stream Works - Atlantic Stream embankment	1 No. Excavator, 1 No. Dump Truck & 1 No. Dozer.	~50m - 66 dB(A) $L_{eq,\ 1\ Hr}$ ~100m – 59 dB(A) $L_{eq,\ 1\ Hr}$
Atlantic Stream Works - Atlantic Stream Screen	1 No. Excavator, 1 No. Dump Truck, 1 No. Concrete Mixer Truck & Wall construction	~50m – 62 dB(A) $L_{eq,\ 1\ Hr}$ ~100m - 54 dB(A) $L_{eq,\ 1\ Hr}$
Victoria Stream Works - Well Stream Culvert and embankment	1 No. Excavator, 1 No. Dump Truck, 1 No. Concrete Mixer Truck & Wall construction	50m - 59 dB(A) $L_{eq,\ 1\ Hr}$ ~100m - 52 dB(A) $L_{eq,\ 1\ Hr}$
Victoria Stream Works - Well Stream Upgrade	1 No. Excavator, 1 No. Dump Truck, 1 No. Dozer, 1 No. Concrete Mixer Truck & Wall construction	~50m - 68 dB(A) $L_{eq,\ 1\ Hr}$ ~100m - 60 dB(A) $L_{eq,\ 1\ Hr}$
Victoria Stream Works - Crescent Place Culvert	1 No. Excavator, 1 No. Dump Truck, 1 No. Dozer, 1 No. Concrete Mixer Truck & Wall construction	~50m - 68 dB(A) $L_{eq,\ 1\ Hr}$ ~100m - 60 dB(A) $L_{eq,\ 1\ Hr}$
Victoria Stream Works - Victoria Court Wall re-build	1 No. Excavator, 1 No. Dump Truck, 1 No. Concrete Mixer Truck & Wall construction	~50m - 62 dB(A) $L_{eq,\ 1\ Hr}$ ~100m - 54 dB(A) $L_{eq,\ 1\ Hr}$
Victoria Stream Works - Victoria Court embankment	1 No. Excavator, 1 No. Dump Truck, 1 No. Concrete Mixer Truck & Wall construction	~50m - 62 dB(A) $L_{eq,\ 1\ Hr}$ ~100m - 54 dB(A) $L_{eq,\ 1\ Hr}$

Victoria Stream Works - Victoria Stream Walls	1 No. Excavator, 1 No. Dump Truck, 1 No. Concrete Mixer Truck & Wall construction	~50m - 62 dB(A) $L_{eq,\ 1\ Hr}$ ~100m - 54 dB(A) $L_{eq,\ 1\ Hr}$
Victoria Stream Works - Carrigaholt Road field	1 No. Excavator, 1 No. Dump Truck, 1 No. Dozer, 1 No. Concrete Mixer Truck & Wall construction	~50m - 68 dB(A) $L_{eq,\ 1\ Hr}$ ~100m - 60 dB(A) $L_{eq,\ 1\ Hr}$
Victoria Stream Works - Tributary Field Storage	1 No. Excavator, 1 No. Dump Truck, 1 No. Dozer, 1 No. Concrete Mixer Truck & Wall construction	~50m - 68 dB(A) $L_{eq,\ 1\ Hr}$ ~100m - 60 dB(A) $L_{eq,\ 1\ Hr}$

Construction Noise Impact Significance

In accordance with the BS 5228-1:2009+A1: 2014 Noise and Vibration Control on Construction and Open Sites Part 1: Noise 'ABC method', the ambient noise levels (rounded to the nearest 5 dB) in the area of the proposed construction works range from 45 - 60 dB $L_{Aeq,T}$ during daytime. As a result, the noise sensitive receivers fall into Category A of the 'ABC' assessment methodology.

It is important to note that construction noise impacts will occur during daytime hours only and will be short-term at each area of construction along the proposed flood relief scheme. Not all construction noise sources will operate at once and construction noise levels are likely to vary throughout the typical working day.

A pragmatic approach needs to be taken when assessing the significance of noise effects of any construction project. The significance of the construction noise from the project has been determined by considering the change in the ambient noise level with the construction noise on-going. BS5228 states that noise levels generated by construction activities are deemed to be significant if the total noise (pre-construction ambient noise level plus construction noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut-off values of 65 dB, 55 dB and 45 dB $L_{Aeq,\ Period}$, from construction noise alone, for the daytime, evening and night-time periods, respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact. BS5228 also states that for public open space, impact might be deemed to be significant if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient noise ($L_{Aeq,\ Period}$) by 5 dB or more for a period of one month or more.

Based on the BS 5228 'ABC' assessment methodology, the contractor should aim to limit daytime construction noise to 65 dB $L_{Aeq,12\ Hour}$ at all works areas with the application of appropriate mitigation measures.

Based on the expected short-term duration of works at each location there will be a short-term noise impact at the nearest sensitive receivers to the proposed works. In some of the works areas, the predicted worst-case 1-hour construction noise levels may briefly be in excess of the recommended maximum noise level of 70 dB L_{Aeq} / 80 dB L_{AMax} at the nearest residential properties as outlined by the TII Guidelines (March 2014).

Noise from construction works will fluctuate throughout the course of a typical working day as well as over the course of the construction works being undertaken in any one location. Therefore, the daytime construction noise limit of 65 dB $L_{Aeq,12\ Hour}$ should be achieved at the nearest residential properties. The construction noise impacts will be short-term and will not be significant, as the works are most likely to occur in one area for no more than 1 month.

Appropriate construction mitigation measures outlined below will be implemented as part of the Construction Environmental Management Plan (CEMP).

Construction Vibration at Sensitive Receivers

Construction vibration impacts have the potential to occur if piling works are undertaken in very close proximity to sensitive receivers. Piling works are not proposed to be required for the Kilkee FRS project. Therefore, there is no potential for a vibration impact at nearby properties.

Operational Stage

There are no mechanical elements such as removable flood defences proposed in the proposed flood relief scheme. Therefore, there will be no operational noise impact.

Mitigation Measures

Construction Mitigation

Appropriate mitigation measures have been identified to ensure the Construction Phase target noise limits are not exceeded. The contractor will be required to implement the control measures recommended in BS 5228 and apply the appropriate measures where applicable. Other measures will include:

- Working hours during site construction operations will be restricted to daytime hours from 07:30 hours to 16:30 hours (Monday to Friday) and as may be required, from 08.00 hours to 13.00 hours (Saturdays). Evening and night-time work is not expected to take place although it is possible that limited 24 hours working may be required to take place on occasion. This will only take place with the prior agreement of CCC.
- An on-site speed limit will be enforced for all traffic. Drivers of vehicles will be advised of the speed limits through the erection of signs *i.e*. a typically recommended on site speed limit is 10 km/hr.
- Where practicable, the use of quiet working methods and the most suitable plant will be selected for each activity having due regard to the need for noise control.
- Best practicable means will be employed to minimise noise emissions and will comply with the general recommendations of BS 5228. To this end operators will use "*noise reduced"* plant and/or will modify their construction methods so that noisy plant is unnecessary.
- By positioning potentially noisy plant as far as possible from noise sensitive receivers the transmission of sound can be minimised. Earth mounds and/or stockpiles of material or perimeter hoarding on site can be used as a physical barrier between the source and the receiver.
- Mechanical plant used on site will be fitted with effective exhaust silencers. Vehicle reverse alarms will be silenced appropriately in order to minimise noise breakout from the site while still maintaining their effectiveness.
- All plant will be maintained in good working order. Where practicable, machines will be operated at low speeds and will be shut down when not in use.
- Compressors will be of the "noise reduced" variety and fitted with properly lined and sealed acoustic covers.
- In all cases engine and/or machinery covers will be closed whenever the machines or engines are in use.
- All pneumatic percussive tools will be fitted with mufflers or silencers as recommended by the equipment manufactures. Where practicable, all mechanical static plant will be enclosed by acoustic sheds or screens.
- Employees working on the site will be informed about the requirement to minimise noise and will undergo training on the following aspects:
    - The proper use and maintenance of tools and equipment.
    - The positioning of machinery on-site to reduce the emission of noise to the noise sensitive receivers.
    - Avoidance of unnecessary noise when carrying out manual operations and when operating plant and equipment.
    - The use and maintenance of sound reduction equipment fitted to power pressure tools and machines.
- Cognisance will also be taken of the *Environmental good practice site guide* 2005 compiled by CIRIA and the UK Environment Agency. This guide provides useful and practical information regarding the control of noise at construction sites.
- Where excessive noise levels are recorded, further mitigation measures will be employed which may include temporary wooden hoarding / acoustic screening to be installed to a height of no less than 2m around areas of construction where loud noise levels occur.
- The contractor will ensure that the TII Guidelines which identify limits for protection against cosmetic damage as a function of vibration frequency are not exceeded through the use of the selected low vibration piling method.
- Responsible Person –The Contractor will appoint a responsible and trained person who will be present on site and who will be willing to answer and act upon complaints and queries from the local public.

- Night-time Working - If there are items of plant (*e.g*. dewatering pumps and similar) in use during night-time hours they will be chosen, sited and enclosed such that levels at the nearest properties do not exceed the measured background noise levels.

Monitoring

Where deemed necessary due to excessive impact or complaints received, noise monitoring will be undertaken during construction works to determine noise levels at noise sensitive receivers. On the basis of the findings of such noise monitoring, appropriate noise mitigation measures will be implemented to reduce noise impacts.

Operational Mitigation

The proposed flood relief scheme will not result in an operational noise impact. Therefore, no operational mitigation measures are deemed necessary.

Cumulative Impacts

In relation to the in-combination construction and/or operational impact of the proposed development, with other proposed schemes planned in the area, the list of schemes noted from Chapter 14 have been reviewed. None of these schemes will result in any significant additional noise and/or vibration impact.

6.4 Population and Human Health

Introduction

This chapter describes the likely impacts of the proposed FRS on the human environment including the potential effects on human health and disruptions to the population of Kilkee and the surrounding area. This chapter primarily addresses the potential effects of the proposed scheme on human health, demographics, receptors such as schools and existing community facilities, and recreation and tourism. Other sections of the EIAR are also closely linked to effects on population and human health, therefore all of these sections should be also read to gain a full understanding of the impacts on human health.

Methodology

This chapter has been prepared having regard to the EIA Directive 2014/52/EU and the associated Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2022), as well as the Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment, 2018. It is noted that Article 3 of the 2014 Directive effectively defines the EIA process as identifying, describing and assessing in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on a series of specified environmental factors. The first of these is “population and human health” which replaces “human beings” in the 2011 Directive. The term “human health” is not defined in the 2014 Directive.

Consideration of human health effects resulting from the construction and operation of a project should focus on health issues arising in the context of the other environmental factors including:

- Population;
- Biodiversity, with particular attention to protected species and habitats;
- Land, soil, water, air and climate;
- Material assets, cultural heritage and the landscape; and
- Interaction between the above factors.

European Commission guidance relating to the implementation of the 2014 Directive, in reference to “human health” states “Human health is a very broad factor that would be highly Project dependent. The notion of human health should be considered in the context of other factors in Article 3(1) of the EIA Directive and thus environmentally related health issues (such as health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living conditions, effects on vulnerable groups, exposure to traffic noise or air pollutants) are obvious aspects to study. In addition, these would concern the commissioning, operation, and decommissioning of a Project in relation to workers on the Project and surrounding population”.

A desktop study has been carried out to establish the baseline associated with economic activity, employment opportunities, settlement and social patterns. Noise and dust generation during construction have been assessed in Sections 6.1 and 6.3.

The proposed development site is located within the Kilkee Electoral Division and within the Local Authority Area of Clare County Council. Baseline information with respect to the demographic and employment characteristics of the resident population within the area was sourced from the 2022 Census from the Central Statistics Office. The data included information on population, structure, age profile, and household size, number of persons at work and employment profile. Information was also sourced from the Clare County Development Plan 2022-2028[36].

Receiving Environment

Kilkee

Kilkee is situated approximately 50 kilometres south-west of Ennis and 60 kilometres north-west of Limerick City and is served by the N67 national road running from Killimer on the northern bank of the River Shannon to Galway. The Strand Line on the beach front is the terminus of the R487 which runs to the southwest tip of Loop Head. Other roads in the town centre include; O'Curry Street, Marine Parade and O'Connell Street.

Kilkee town centre has a semicircular shape with Moore Bay to the west and Circular Road in the east, itself surrounding a large section of the main town centre. The town is surrounded by rural agricultural pasture. Kilkee is identified in the Clare settlement hierarchy as a small town and its role is an important service centre. The town is a popular, well established seaside resort situated on the Wild Atlantic Way.

The surrounding dramatic coastline offers plenty of opportunity for niche activities including deep sea diving, bird watching, landscape painting, and tourism based on the geological heritage of the Loop Head Peninsula. There are two main watercourses in the town, the Victoria Stream and the Atlantic Stream, both of which discharge into Moore Bay.

During the summer months, the tourist population is much larger than the local population, putting a significant pressure on the town's road infrastructure. Throughout Kilkee, traffic congestion and parking issues are caused by the volume of cars. However, it is essential to remember that during most of the year, the majority of the traffic is local. The town's Traffic Management Plan addresses both seasonal and daily traffic management needs, by implementing alternative traffic routes.

Demographics

The smallest geographical units distinguished by the Central Statistics Office (CSO) are Electoral Divisions (EDs) and Small Areas (SAPS). The following statistics about Kilkee is achieved by using the Kilkee electoral division and a comparison to CCC.

Table 6-19 outlines the population change between 2016 and 2022 in the State, Clare County Council and Kilkee. This table demonstrates the population increases are largely consistent across all regions, with Kilkee seeing the same increase in population as across the State and county councils, however the Kilkee area three times the state increase and Clare County Council slightly lower.

Table 6-19: Population Trends between 2016 and 2022

District	2016	2022	Change from 2016-2022 (%)
State	4,761,865	5,149,139	+8.1
Clare	118,817	127,938	+7.7
Kilkee	917	1,214	+24

The majority of the population of Kilkee are in the age 20-64 cohort, with 651 of the 1214 people in that group (53.6%).

[36] *Clare County Council (2017) Clare County Development Plan 2017 – 2023 Available at: clare-county-development-plan-2017-2023-volume-3d-west-clare-municipal-district-written-statement-and-maps-24151.pdf (clarecoco.ie) [Accessed: 07/12/2023].*

Table 6-20: Kilkee age cohort

Age cohort	Population No.
Pre-school children (0 to 4 years)	55 (4.5%)
School children (5 to 19 years)	188 (15.4%)
Adults (20 to 64 years)	651 (53.6.%)
Adults over 65	320 (26.3%)

Households

Table 6-21 below outlines the average household size in each of the geographical areas assessed. The statistics illustrate that Kilkee has not followed the State-wide or Co. Clare trend of slight decreases in household size, with a large increase from 2.03 to 2.44.

Table 6-21: Average Household Size (persons per household).

District	2016	2022
State	2.75	2.74
Clare	2.69	2.64
Kilkee	2.03	2.44

There were 496 households in Kilkee Electoral Division in 2022 an increase of 46 from the 450 households in 2016

Employment

Recent trends in employment were evaluated using CSO information generated from the 2016 and 2022 Census statistics. The information was compiled on the basis that:

- The labour force is defined as the sum of people aged 15 years and over who are at work or who are employed; and
- The participation rate is the proportion of persons in the labour force aged 15 years and over expressed as a percentage of all persons in that age group.

Statistics shown in Table 6-22 below outlines the employment figures for Clare County Council, and Kilkee.

Table 6-22: Employment Figures for Clare and Kilkee.

Area	At Work		Unemployed (ex 1st time job seekers)		% Rates of Participation in Labour Force	
	2016	2022	2016	2022	2016	2022
Clare	49,511	56,144	6,352	4,154	53.09	54.54
Kilkee	287	419	101	81	35.25	40.52

This indicates that the number at work in Kilkee increased during that period, though at lower rates than the county-wide trend.

Table 6-23: Distribution of employment by broad industrial group in Clare and Kilkee (Number of persons aged 15 and over) 2022.

Industry	Clare	Kilkee
Administrative and Secretarial Occupations	5,569	27
Associate Professional and Technical Occupations	6,589	43
Caring, Leisure and Other Service Occupations	4,631	40
Elementary Occupations	4,594	49
Managers, Directors and Senior Officials	4,415	43
Process, Plant and Machine Operatives	4,553	26
Professional Occupations	11,416	51

Sales and Customer Service Occupations	3,259	17
Skilled Trades Occupations	9,509	168
Not stated	5,763	137
Total	60,298	500

The majority of employment in Kilkee in 2022 was in skilled trades occupations.

General Health

The population was surveyed in the 2022 Census and asked if they considered their health to be bad or very bad. 32 people in Kilkee answered bad or very bad, or 2.63% of the population.

Principal Potential Receptors

An assessment of the principal potential receptors within the environs of the proposed development including homes, schools, tourism, agriculture and commercial and industrial premises was conducted in detail below.

Homes

According to the most recent 2022 Census, the principle households by type of accommodation in Kilkee contain 954Nr dwellings, the vast majority (882Nr) being houses or bungalows. There are a small number of flats or apartments (70Nr), and 0Nr bed-sit's and 2Nr caravan/mobile homes, however this statistic does not take into account the many holiday caravans in the town, which amount to approximately 718Nr.

Below are the houses, housing estates and businesses will be affected by the flood relief scheme

Atlantic Stream

- Kilkee Bay Hotel Storage - A temporary way leave will be required on the ESB substation road during the works.
- Dún an Óir Walls – The rear gardens of properties 20-25Nr will be temporary reduced with temporary fencing / hoarding for the duration of works.
- Atlantic Stream embankment – 200Nr mobile home units are in the vicinity where a private road at lower section of the park will need to be used for access during construction.
- Atlantic Stream Screen and Outfall - The rear of Waterworld will be temporarily closed and used as access point and site compound.
- New manhole at Meadow View Court – construction works will take place close to several houses at Meadow View Court and the adjacent N67. No operational impact is likely at this location.

Victoria Stream

- Well Stream Culvert and embankment - an existing property at the end of Caravan Park Road. A temporary way leave, and a road crossing will be required through these lands during the works.
- Well Stream Upgrade – 3Nr properties affected, one as above - a way leave and road crossing, a rear access to a second property will be closed during the works and a new access installed, a third property at the eastern extent of the Well Road will require a temporary fence line to be established within their property.
- Crescent Place Culvert – A temporary traffic management plan consisting of a diversion through the existing Well Field Estate will be required for access to the well Road. The property at No. 1 Well Road will require a temporary land-take through part-removal of their boundary wall. 14Nr properties will require to have temporary hoarding and fencing.
- Victoria Court Wall re-build – 2Nr properties are in close proximity nos. 20 and 21 Victoria Court.
- Victoria Stream Walls –9Nr properties at Victoria Park and 6 properties at Victoria Crescent are in the vicinity of this section and restricted access will be given to the Uisce Éireann road.
- Carrigaholt Road field – A temporary land take at will be required for the boundary wall construction at the Victoria Crescent walls, 6Nr properties will be affected, becoming flood defence assets once constructed.
- Tributary Field Storage - A property at the end of Well Road will be affected, a temporary way leave will be required on the road during the works.

Along with these groups of properties, homes in other parts of Kilkee will also potentially be affected during the construction and/or operation of the scheme.

Schools

There are 4Nr school located in the vicinity of the proposed development. This is shown below in Table 6-24.

Table 6-24: Educational facilities in the area

School type	Name
Secondary school	Kilkee Community College
Primary School	Scoil Réalt na Mara
Secondary school	Saint Joseph's Community College
Primary School	Carrigaholt Mixed National School

Childcare Facilities

There is one childcare facility within Kilkee, Sea Horses Chilcare Facility, Smith's lane, Kilkee, located within 350m of the proposed development.

Health, Social, Community, and Recreational Facilities

The health, social, community and recreational facilities in Kilkee are shown below in Table 6-25Table 6-25: Health, Social, and Community Facilities in Kilkee.

Table 6-25: Health, Social, and Community Facilities in Kilkee

Name	Address
Medical Facilities	
Dr Bláthnaid Regan	The Surgery, Chapel Street, Kilkee, Co. Clare
Social Facilities	
St Theresa's Nursing Home, Kilrush	Leadmore East, Kilkee Road, Kilrush
Churches	
Church of the Immaculate Conception and St Senan Catholic Church	Circular Road, Kilkee
Recreational Facilities	
Kilkee Diving And Water sports Centre	East End, Byrnes Cove, Kilkee
Kilkee Waterford Partnership	East End Kilkee
Nevsail Watersports	Strand Line, Kilkee
Kilkee Golf Club	East End Kilkee
Cultúrlaan Sweeney	O' Connell Street, Kilkee

The seaside resort of Kilkee has a large influx of tourists during the summer season, during which the population of Kilkee town increases from approximately 1,200 in the low season to 15,000 during the peak holiday months[37]. Situated in a bay, to the south is Pollock Holes natural swimming pools surrounded by a reef and in the north is Georges Head. Kilkee is placed close to natural beauty spots such as Bishops Island, Loophead Peninsula and the Kilkee Cliffside Walk.

Predicted Impact

Do Nothing Scenario

Under the Do-Nothing Scenario, it is likely that flooding will continue to occur in Kilkee. Flooding has the potential to affect up to 118 homes, as well as 16 non-residential properties.

[37] Clare County Council (2017) Clare County Development Plan 2017 – 2023 Available at: clare-county-development-plan-2017-2023-volume-3d-west-clare-municipal-district-written-statement-and-maps-24151.pdf (clarecoco.ie) [Accessed: 07/12/2023].

Flooding is likely to compromise human health directly through destruction of property, and indirectly through social and economic damages.

Impacts to population and human health under the do-nothing scenario, through continued flooding in Kilkee, would be **significant, negative, long-term.**

Construction Phase

The potential construction phase impacts on local residences and businesses associated with the proposed development will relate mainly to traffic, noise, air emissions and visual impacts, all of which are outlined in Chapter 6 (Construction Impacts), Chapter 10 (Material Assets), and Chapter 12 (LVIA) of this EIAR.

During construction there is a risk to the health and safety of workers on the development, as with any construction project. There is also potential for negative impacts and disturbance to the community from construction.

Impacts on Economic Activity

During the construction phase, construction workers will be employed at the site and their potential use, both personal and business-related, of local retail, leisure and accommodation services will potentially stimulate economic activity for local businesses. In addition to direct construction employment, it is anticipated that the proposed project will lead to indirect employment via related services during the construction phase.

The impact on economic activity during construction will be **temporary positive.**

Impacts on Human Health and Safety

As with any construction site there will be potential risks to the health and safety of construction personnel on-site due to the use of large, mobile machinery and heavy equipment and materials. However, health and safety procedures will be put in place as part of the construction management plan with the appointed contractor. There will be no significant offsite health and safety risks, and the proposed development site will be securely fenced from the public during the construction phase. During construction of the Crescent Place culvert wastewater will be redirected to the pumping station to the rear of Victoria Park, this is discussed further in chapter 8.

The impact on human health and safety during construction will be **temporary, imperceptible, negative.**

Impacts on Residential, Recreational, Commercial, and Community Amenity

The construction phase of the development will impact on residential, recreational, commercial, and community amenity in Kilkee as outlined above and through construction-specific impacts outlined in Chapter 4. Procedures will be put in place to address local concerns as part of the construction management plan with the appointed contractor. Impacts to private access roads and traffic will also occur, as outlined in Chapter 8 Material Assets.

This impact will be **temporary slight negative.**

Operational Phase

Impacts on Population and Economic Activity

Kilkee will be less vulnerable to flooding, which will make the area more desirable for residents and business owners of the town. **Long-term positive impacts** are likely from the operation of the scheme as it will increase the level of flood protection for homes and businesses.

Mitigation Measures

Construction Phase

While under construction, there will be potential risks to the health and safety of construction personnel. A comprehensive Health and Safety Programme will be put in place on the site prior to commencement of construction to minimise any risks to site personnel and visitors. The requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013) will be complied with at all times. A Construction Stage Traffic Management Plan will be developed and agreed with CCC and the relevant property owners prior to commencement of the works.

The following mitigation measures are proposed during the construction phase:

- During pre-construction and construction phases safety will be managed in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013). A Project Supervisor Construction Stage (PSCS) will be appointed as part of the proposed project;
- Safety will be a primary concern during the construction phase of the proposed FRS. The contractor will implement a safety management program to identify potential hazards associated with the proposed work from the design stages, through to the completion of the construction and maintenance phases.
- The design of the final proposal will be subject to safety design reviews to ensure that all requirements of the project are safe. A Project Supervisor for the Design Process (PSDS) will be appointed as part of this process;
- Temporary contractor facilities and areas under construction will be enclosed and fenced off from the public with adequate warning signs of the risks associated with entry to these facilities. Entry to these areas will be restricted and will be kept secure when construction is not taking place;
- Measures to ensure public safety with respect to air quality and dust, and noise and vibration, are detailed in sections 6.1 and 6.3 respectively;
- Measures to ensure public safety with respect to construction traffic, are detailed in Chapter 10 Material Assets.

Operational Phase

When the scheme is operational, a maintenance and monitoring schedule will be put in place to verify that the proposed flood defences are operating to the appropriate design standard. Repairs will be made as necessary. This will ensure that there is no risk to human health as the scheme ages.

Residual Impacts

Do Nothing Scenario

The nature of the development is to protect homes and businesses from flooding, as floods have been known to cause significant damage in Kilkee in the past. If the proposed development does not go ahead, flooding is likely to continue impacting Kilkee into the future.

Under the Do-Nothing Scenario the impact on population and human health is likely to be **significant and negative**, with residual impacts lasting into the long-term.

Construction Phase

While under construction, there will be a positive benefit to employment in Kilkee, which can have cascading effects for local businesses as a result of the increased number of workers in the area. There will be potential risks to the health and safety of construction personnel. Mitigation measures in place include adequate Health and Safety standards to ensure that no injury or accidents occur during the construction phase. The population of Kilkee will experience disruptions to daily life and to their recreational facilities due to associated impacts on Traffic, Air, Noise, and the Visual amenity during the construction phase. Mitigation measures are described further in associated chapters of the EIAR. These impacts will be temporary and lasting only a part of the duration of the construction phase (i.e., most locations will not be disrupted for the entire 18- 24 months of construction). The residual impact of the construction phase on population and human health is predicted to be **temporary, imperceptible, negative.**

Operational Phase

The proposed development aims to protect both homes and businesses from flooding, and to improve surface water drainage in the town. There is potential as a result of the proposed FRS for Kilkee to become more desirable as a residential and business area due to the reduced risk of flooding. The residual impact to population and human health during the operation of the scheme is predicted to be **Positive, with Long Term effects.**

Interactions and potential Cumulative Impacts

Interactions

The environmental effects on population and human health are interlinked with the environmental effects of:

- Chapter 6 – Construction impacts

- Chapter 8 – Land and Soil
- Chapter 9 – Water – Surface and Groundwater
- Chapter 10 – Material Assets

All mitigation measures outlined in the respective chapters of this EIAR will be implemented in full to ensure the potential impact is minimised in relation to traffic, noise and vibration, air quality and water.

Predicted Cumulative Impacts

There is one development proposed or is under construction at the main storage compound N67 on the outskirts of Kilkee, as outlined in Chapter 14. If the construction periods of these developments are to overlap, there is a potential to impact on population and human health through disruptions Kilkee. These effects will be **temporary** while the construction phase progresses.

Once operational, the proposed FRS, when considered cumulatively with the above developments, will have a **positive** impact on population and human health.

7 Biodiversity

This chapter assesses the impact of the proposed Kilkee Flood Relief Scheme on biodiversity during the construction and operation phases.

This chapter provides an overview of field methodologies including; receiving ecological environment, description of the nature, scale of potential direct/indirect impacts. Furthermore, an assessment on significance of effects to the receiving environment, detailing mitigation and biodiversity enhancement measures, is recommended as part of this EIAR. An assessment regarding significance of residual impacts with respect to the project is provided.

This Chapter should be read in conjunction with the Appropriate Assessment (AA) Screening[38] and Stage 2 Natura Impact Statement (NIS)[39] that have been carried out for this FRS and addresses relevant information for the Natura 2000 sites.

7.1 Study Area

The study area is defined in Chapter 1 and the study area is shown in Figure 1-1. The two streams have a number of tributaries and drainage channels which contribute to the flow through the area. Both watercourses are tidal. Kilkee is susceptible to both coastal and fluvial flood risk. There have been several recent instances of flooding in Kilkee. The Victoria Stream is noted to overflow its banks over a length of 200-300m on an annual basis, causing flooding of Carrigaholt Road and Well Road, and putting a number of residential and commercial properties at risk.

7.2 Methodology for Valuation of Receptors, Significance of Impact and Zone of Influence

Valuation

The valuation of designated sites considers different levels of statutory and non-statutory protection. Assessment of habitat depends on several factors, including the size of the habitat, its conservation status and quality. The assessment also takes account of connected off-site habitat that has the potential to increase the value of the on-site habitat through association. Valuation of species depends on a number of factors including distribution, status, rarity, vulnerability, and the population size present. Criteria are presented in Table 7-1.

Valuation of the importance of an ecological feature follows *Guidelines for Assessment of Ecological Impacts of National Roads Schemes* [40], and *Guidelines for Ecological Impact Assessment in the UK and Ireland* [41]. This valuation is in conjunction with specific red lists or specialist advice where appropriate.

Table 7-1: Examples of criteria used to define the value of ecological features[37]

Level of Value	Examples of Criteria
International	An internationally important site e.g. Special Protection Area (SPA), Special Area of Conservation (SAC), Ramsar (or a site considered worthy of such designation). A regularly occurring substantial population of an internationally important species (listed on Annex IV of the Habitats Directive). Designated shellfish waters. Major fisheries area.

[38] JBA, "Kilkee Flood Relief Scheme - AA Screening Report," Appropriate Assessment (JBA Consulting Engineers and Scientists Ltd, 2024).

[39] JBA, "Kilkee Flood Relief Scheme - NIS," Natura Impact Statement (JBA Consulting Engineers and Scientists Ltd, 2024).

[40] NRA, "Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes" (National Roads Authority, 2009), http://www.tii.ie/technical-services/environment/planning/Ecological-Surveying-Techniques-for-Protected-Flora-and-Fauna-during-the-Planning-of-National-Road-Schemes.pdf.

[41] C.I.E.E.M., *Guidelines and checklist for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine* (Chartered Institute of Ecology and Environmental Management', 2018).

National	A nationally designated site e.g. Natural Heritage Area (NHA), a proposed Natural Heritage Area (pNHA), statutory Nature Reserve, or a site considered worthy of such designation. A viable area of a habitat type listed in Annex I of the Habitats Directive or of smaller areas of such habitat which are essential to maintain the viability of a larger whole. A regularly occurring substantial population of a nationally important species, e.g. listed on The Wildlife Act 1976 or The Wildlife (Amendment) Act 2000. A species included in the Irish Red Data Lists/Books. Significant populations of breeding birds.
Regional (Co. Clare)	Species and habitats of special conservation significance within County Clare, as identified in Clare Biodiversity Action Plan 2017-2023. An area subject to a project/initiative under the County's Biodiversity Action Plan. A regularly occurring substantial population of a nationally scarce species.
Local	Areas of internationally or nationally important habitats which are degraded and have little or no potential for restoration. A good example of a common or widespread habitat in the local area. Species of national or local importance, but which are only present very infrequently or in very low numbers within site area.
Less than local (works site and its vicinity)	Areas of heavily modified or managed vegetation of low species diversity or low value as habitat to species of nature conservation interest. Common and widespread species.

Ecological Valuation may also be considered of Local Importance (higher value) or Local Importance (lower value) shown in Table 7-2.

Table 7-2: Examples of criteria used to define the value of ecological features of local importance[42]

Level of Value	Examples of Criteria
Local Importance (higher value)	Locally important populations of priority species or habitats or natural heritage features identified in the Local Biodiversity Action Plan (BAP), if this has been prepared. Resident or regularly occurring populations (assessed to be important at the Local level) of the following: ▪ Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; ▪ Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; ▪ Species protected under the Wildlife Acts; and/or ▪ Species listed on the relevant Red Data List. Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality. Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value
Local Importance (lower value)	Sites containing small areas of semi-natural habitat that are of some local importance for wildlife; Sites or features containing non-native species that are of some importance in maintaining habitat links

Birds are assessed following the BoCCI status [43], Annex I Species of the Birds Directive or species listed in Article 4(2) of the Birds Directive. In the absence of information on the population size, Red listed

[42] NRA (2009) Guidelines for Assessment of Ecological Impacts of National Roads Schemes, available: https://www.tii.ie/technical-services/environment/planning/Guidelines-for-Assessment-of-Ecological-Impacts-of-National-Road-Schemes.pdf.

[43] Gillian Gilbert, Andrew Stanbury, and Lesley Lewis, “Birds of Conservation Concern in Ireland 4: 2020–2026,” *Irish Birds* 45 (2021): 1–22.

species are deemed of National Importance; Amber listed species of Regional Importance; Green listed species of Local (High Value) importance.

Following NRA Guidelines populations of mammals protected under the Wildlife Act 1976-2021 and Wildlife (Amendment) Act 2023 are assessed as Nationally Important, unless otherwise stated.

An internationally important site e.g. Special Protection Area (SPA), Special Area of Conservation (SAC), Ramsar are valued as Internationally Important. A nationally designated site e.g. Natural Heritage Area (NHA), a proposed Natural Heritage Area (pNHA), statutory Nature Reserve are considered Nationally Important. Species and habitats of special conservation significance within County Clare, as identified in Clare Biodiversity Action Plan 2017-2023 are considered at Regional level. Non designated habitats are assessed on a local level. These are highlighted throughout the text within the Receiving Environment.

Significance of impact

Significance of impact follows the guidance laid out in Chapter 1, Section 1.5 of this document i.e. *Guidelines on the information to be contained in Environmental Impact Assessment Reports* [44], which utilises a combination of an assessment of the impact and the importance or sensitivity of the receptor to determine the Significance of the Impact.

Residual Impact

The project is assessed including some designed-in mitigation. This is done where mitigation is proven to be effective and will be implemented effectively with a high certainty. Where significant residual impacts are still identified, further mitigation measures will be proposed as part of the EIA process to avoid, reduce or minimise them. Residual ecological impacts are those that remain once the development proposals have been implemented. The main aim of ecological mitigation is to minimise or eliminate residual impacts.

A post-mitigation or final significance level is assigned to the impact described, which considers and includes the implementation of any stated mitigation measures; these are the residual impacts.

Cumulative Impacts

The cumulative impact assessment identifies other developments that may give rise to cumulative effects e.g. any other projects planned within the same area or timeframe that may contribute to cumulative effects. Cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location. Cumulative effects are particularly important as ecological features may be already exposed to background levels of threat or pressure.

Cumulative effects include all development and activity associated with the proposal to enable assessment of the impacts of the project as a whole. The cumulative assessment is conducted on the Residual effects of the project and will determine significance of any cumulative effects.

Zone of Influence

The Zone of Influence (ZoI) for the proposed Scheme is determined on a judgement of the likely extent of the ecological impacts on key ecological receptors. The ecological impacts will vary for different ecological receptors, depending on their sensitivities to environmental change. The ZOI for each impact on ecological receptors is detailed in the Table 7.3 overleaf.

[44] EPA, “Guidelines on the Information to Be Contained in Environmental Impact Assessment Reports” (Environmental Protection Agency (EPA), 2022), https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf.

Table 7-3: Zone of Influence for ecological receptors

Impact characterisation	ZOI Distance	Reasoning for ZOI on ecological receptors
Direct impact to habitats	Footprint/ adjacent	For terrestrial habitats, impacts will be limited to the lands within the boundary of the proposed Scheme, as well as the immediate surrounding environs (e.g., soil compaction and disturbance, habitat loss, and changes to local hydrological regimes, stream diversion/redirection).
Hydrological connections	Variable- up to 15km downstream	Hydrological connections (e.g., drainage ditches, wetlands and rivers) can be the most far-reaching impacts due to their lotic or semi-lotic nature. It becomes increasingly difficult to precisely predict the likely significance of adverse water-borne pollutants as they travel downstream from the emission source, given potential dilution and retention factors along the course of the impacted watercourse. Under the precautionary principle any designated sites, protected habitats or species (flora and fauna) located downstream of the watercourse which pass through the footprint of the proposed Scheme, will be considered to be within the hydrological ZoI of this scheme. Precautionary approach.
Dust/ Air pollution	250m	Air pollution (emissions and dust), Natura 2000 sites within a 500m buffer zone of the proposed Scheme were considered as per the Institute of Air Quality Management [45] including ex-situ foraging habitats utilised by QI species associated with local Natura 2000 sites.
Mammals- disturbance	100-150m	In relation to physical (vibration and clearance works); audible and visual disturbance, faunal species will be considered on a species-by-species basis. Generally, smaller mammal species (e.g., Pygmy Shrew) will be given 100m disturbance zones, which is reflective of their relatively small territories. For larger mammals, such as Otter, a 150m disturbance zone can be established in the scenario, where there is an active breeding holt.[46], [47].
Bats – Roosts (and lighting)	Footprint / adjacent	Centred around lighting impacts within and adjacent to the footprint of the proposed Scheme, as well as the scheme's proximity to known bat roosts within the locality [48], [49].
Bats – sustenance zone (foraging area)	3km	Impacts are likely to occur within a 3km radius sustenance zone around each known bat roost. Species based approach to determine ZoI, will be fully determined by professional judgement as required.
Birds- habitat loss	Footprint	Generally linked with direct habitat loss within the footprint of the proposed Scheme.
Disturbance to birds	Up to 600m	Additional adverse impacts for breeding and wintering birds will likely arise from the disturbance from construction works, which can extend up to 600m [50]
Designated Sites	15km	Data on all designated sites within 15km is gathered to allow comparison with baseline data at a screening stage. The zone of influence in relation to designated sites is considered on a site by site basis, in conjunction an analysis of the impact sources and the pathways for effect (land, hydrological connection and groundwater) i.e. source > pathway > receptor model. [51].

[45] IAQM, "Guidance on the Assessment of Dust from Demolition and Construction" (London: Institute of Air Quality Management, 2024).

[46] NRA, "Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes," Environmental Series on Construction Impacts (National Roads Authority, 2005).

[47] NRA, "Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes," Environmental Series on Construction Impacts (National Roads Authority, 2006).

[48] Christian C Voigt et al., *Guidelines for Consideration of Bats in Lighting Projects* (Unep/Eurobats, 2018).

[49] Ferdia Marnell, Conor Kelleher, and Enda Mullen, "Bat Mitigation Guidelines for Ireland - v2. Irish Wildlife Manual No. 134" (National Parks and Wildlife Service /Department of Environment, Heritage and Local Government, 2022), https://www.npws.ie/sites/default/files/publications/pdf/IWM134.pdf.

[50] N. M. Goodship and R. W. Furness, "NatureScot Research Report 1283-Disturbance Distances Review: An Updated Literature Review of Disturbance Distances of Selected Bird Species," 2022.

[51] OPR, "Appropriate Assessment Screening for Development Management" (Office of Planning Regulator, 2021).

7.3 Methodology – Data Collection and Surveying

Desktop Study

A desktop study was conducted of available published and unpublished information, along with a review of data available on the National Parks and Wildlife Service (NPWS) and National Biodiversity Data Centre (NBDC) web-based databases, to identify key habitats and species (including legally protected and species of conservation concern) that may be present within ecologically relevant distances from the project as explained below. A baseline habitat assessment was performed using satellite imagery of the site. The data sources below (last accessed November 2023) were consulted for the desktop study:

- Aerial photography (Google Satellite imagery and Esri World Imagery).
- NPWS for Natura 2000 site details (www.npws.ie) and freely available monitoring datasets such as the Coastal Monitoring datasets, Irish Semi-Natural Grasslands.
- NBDC species data within a custom polygon covering the study area with an additional 5km buffer.
- NBDC Biodiversity Maps (maps.biodiversityireland.ie).
- Catchments (www.catchments.ie).
- Environmental Protection Agency Maps (https://gis.epa.ie/EPAMaps).
- Geological Survey Ireland (GSI) (www.gsi.ie).
- Planning Applications (myplan.ie, Strategic Housing Development (SHD) database, An board Pleanála (ABP) web site).
- Check for Irish Wetland Bird Survey (I-WeBS) sites (https://birdwatchireland.ie/our-work/surveys-research/research-surveys/irish-wetland-bird-survey/).
- Inland Fisheries Ireland (IFI) data hub: https://opendata-ifigis.hub.arcgis.com/datasets/1034e20d4cce499695a5bd020e594331_0/explore.

A standalone desktop study is not presented as part of this report, but results from the desktop research is incorporated into the survey results sections (Section 7.3.2), as relevant.

Ecological Site Surveys

Ecological site surveys were performed by JBA Ecologists Joe Freijser, Johanna Healy, Eilis Hogan, Damien McAndrew, Hannah Mulcahy, Anne Mullen, Colm O'Leary, Dominic Tilley, and Karen Van Dorp. A specialist electrofishing/aquatic survey was carried out by Triturus Environmental. Surveys covered key ecological receptors, including habitats, mammals, aquatic receptors, birds, with additional notes recorded during non-specific site visits.

Walkover Surveys

A multi-disciplinary walkover survey (habitat mapping, protected and invasive species) was undertaken in June 2020 to identify project constraints; broadly identify sensitive habitats and other sensitive receptors that may need additional surveying, and identify invasive species to allow early treatment and identify potential storage areas at a catchment level. This pre-design walkover also allowed for the mitigation hierarchy to be implemented from an early stage e.g. by avoiding sensitive areas.

During the development of options, more specific habitats surveys were undertaken. These are described below.

Habitats Surveys

Habitat surveys were conducted during summers 2021, 2022 and 2023 to Fossitt Level 3, building species lists and elaborating on any links to Annex I habitats, or habitats of importance. Species cover and abundance was determined using the DAFOR scale (D = Dominant; A = Abundant; F = Frequent; O = Occasional; R = Rare). This form of habitat description is subjective, and commonly used in conjunction with habitat classifications.

Grassland surveys were conducted on site, primarily in summer 2022, with compilation of species lists. Where surveys indicated a possible link to Annex I 6510 grassland, this was examined using Irish

Vegetation Classification (IVC) classification using methodologies adapted from Irish Semi-Natural Grasslands Surveys [52].

Table 7-4 contains further details on survey dates and type of survey undertaken.

The ecological walkover survey recorded habitats and protected species, following the methods outlined in the documents below:

- Heritage Council (2011). Best Practice Guidance for Habitat Survey and Mapping [53].
- Fossitt, J. (2000). A Guide to Habitats in Ireland. The Heritage Council, Kilkenny [54].
- Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes[55].

Specialist surveys followed established methodologies, as described in the individual reports.

Habitats have been named and described following Fossitt (2000). Nomenclature for higher plants principally follows that given in The New Flora of the British Isles 4th Edition [56]. Identification of Irish plants generally follows that given in Webb's An Irish Flora[57].Aerial photographs and site maps assisted the surveys.

The surveys carried out represent spatial and temporal overview of the baseline ecological conditions within the area around Kilkee. It's worthy of note that some limitations may occur. As such recommendations as suggested within this document to overcome these potential constraints.

Table 7-4: Ecological surveys undertaken in the study area.

Survey	Date	Surveyor(s)
Multi-disciplinary walkover survey (habitat mapping, protected and invasive species)	29/05/2020	KvD, JF
Wintering bird habitat suitability scoping surveys	24/02/2021	AM, EH
Options Assessments (Habitats walkover)	19/11/2021	AM
Wintering bird surveys	20/01/2022, 22/02/2022, 30/03/2022, 22/11/2022, 12/01/2023, 02/03/2023	AM, JF, DM, JH
Dusk bird survey	20/01/2022	AM, JF
Nesting bird surveys (and camera trapping)	13/05/2022	HM, DM
Additional habitat surveys (grassland)	01/07/2022	AM
Fisheries and in-stream electrofishing surveys	15/09/2022	*Triturus Environmental Ltd.*
Breeding Snipe surveys	04/05/2023, 05/05/2023, 26/06/2023, 27/06/2023	DT
Additional habitat surveys	04/08/2023	JH, MH
Camera trapping	30/03/2022 - 09/05/2022 26/06/2023 - 19/07/2023	Images processed DT
Bat survey	19/10/2023 – 03/11/2023	Static detector / data processed DT

JBA Ecologists: JF = Joe Freijser, EH = Eilis Hogan, JH = Johanna Healy, MH = Mia Heigh, DM = Damien McAndrew, HM = Hannah Mulcahy, AM = Anne Mullen, COL = Colm O'Leary, DT = Dominic Tilley.

[52] F. H. O'Neill et al., "The Irish Semi-Natural Grasslands Survey 2007-2012," Irish Wildlife Manuals (Ireland: National Parks and Wildlife Service / Department of Arts, Heritage and the Gaeltacht, 2013), https://www.npws.ie/sites/default/files/publications/pdf/IWM-78-Irish-semi-natural-grassland-survey.pdf.

[53] George F. Smith et al., "Best Practice Guidance for Habitat Survey and Mapping," *The Heritage Council: Ireland*, 2011.

[54] Julie A. Fossitt, *A Guide to Habitats in Ireland*, Heritage Council of Ireland Series (Kilkenny: Heritage Council/Chomhairle Oidhreachta, 2000).

[55] NRA, "Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes," 2009.

[56] Clive Stace, *New Flora of the British Isles*, 4th ed. (C&M Floristics, 2019).

[57] J. Parnell and T. Curtis, *Webb's An Irish Flora* (Trinity College Dublin, 2012).

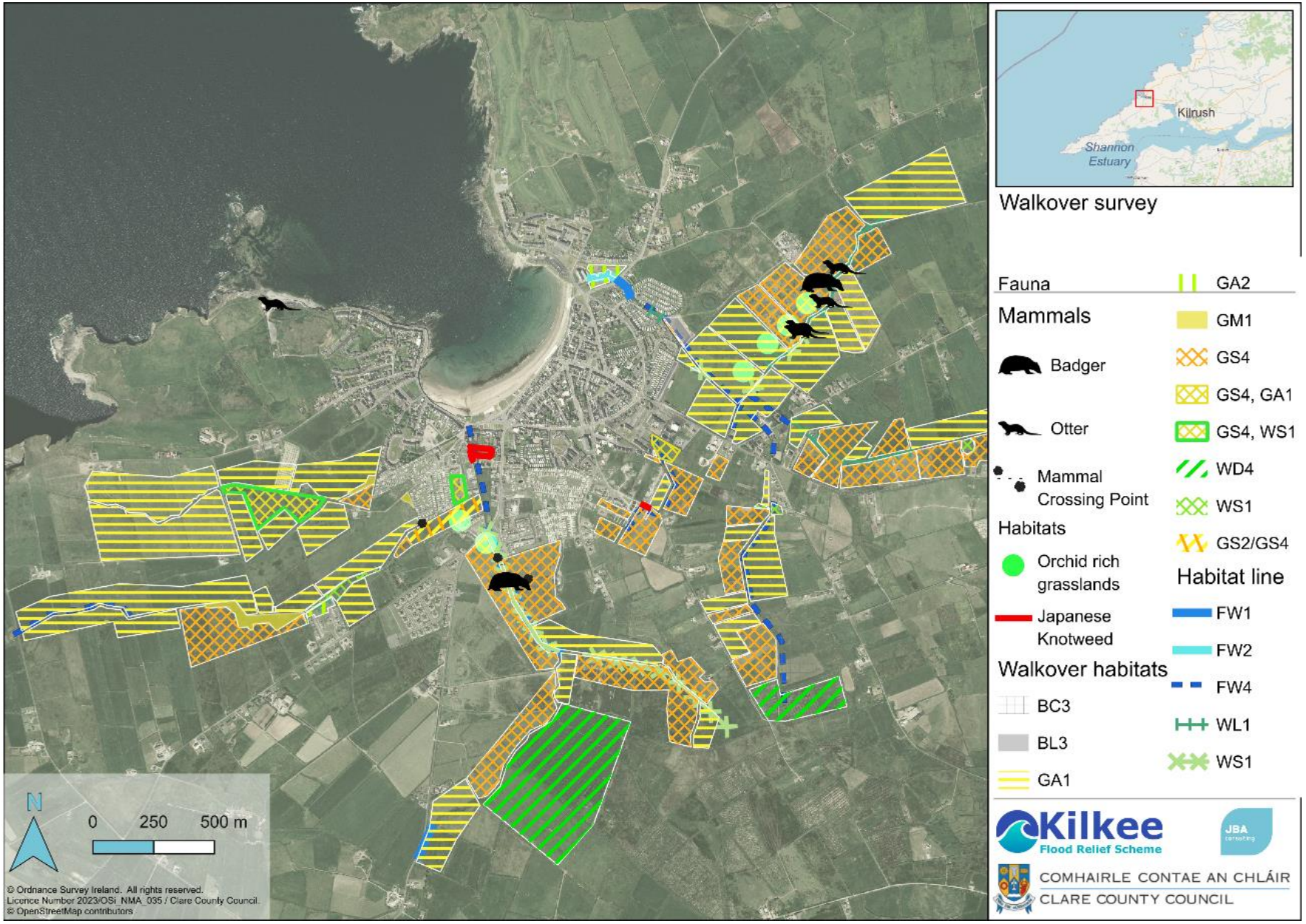


Figure 7-1: Constraints level habitat mapping completed in summer 2020.

Surveys of the reefs was conducted in summer 2023. Classification continued to follow Fossitt 2023 and linked to Annex I habitat "Reefs".

No surveys of sub-tidal benthic marine habitats were considered necessary or undertaken, but a comprehensive review of existing information on marine habitats was undertaken using information from the NPWS such as *Kilkee Reefs SAC (site code: 2264) Conservation objectives supporting document - Marine Habitats* [58].

Instream habitats and suitability for fish were surveyed as part of the electrofishing survey carried out by Triturus Environmental in autumn 2022, refer to Appendix E.

Bird Surveys

An initial scoping exercise for bird habitat was carried out in Jan 2021 by Eilis Hogan and Anne Mullen. This identified areas for further wintering bird surveys during the options appraisal process.

Wintering birds:

Wintering bird surveys, breeding bird surveys and ad-hoc recordings were carried out between May 2020 and November 2023.

A dusk survey 20/01/22 of the reefs and the proposed works sites was carried out as part of the wintering bird surveys to determine roost usage at dusk i.e. any link between birds using the reefs for foraging and the fields proposed for storage for roosting at night.

Winter bird surveys were conducted following Irish Wetland Bird survey (I-WeBS) methodology using a Look-See method, with counts taken at high, mid and low tides.

These surveys were carried out on 20/01/2022, 22/02/2022 and 30/03/2022 to inform the options reports. Surveys were carried out in winter 2022/2023 also on the following dates: 22/11/2022, 12/01/2023, 02/03/2023 (delayed from Feb survey due to icy road conditions).

These included, point count surveys from viewpoints along the coast and along the areas identified in the options report. Flightlines were recorded where appropriate. A walkthrough of the reed habitat and grassland habitats was also undertaken during the wintering bird surveys, and numbers of flushing snipe were recorded.

Breeding bird survey:

As a preferred option emerged targeted surveys for potential breeding birds was undertaken.

A transect and point counts were carried out across the scheme. During the surveys, notes on all other species were recorded. Birds were identified by sight and song, and general location and activity were recorded within the QField GIS Android application. The conservation status of the bird species was later recorded as per:

- Birds of Conservation Concern in Ireland (BoCCI) lists which classify bird species into three categories: Red List – birds of high conservation concern; Amber List – birds of medium conservation concern; and Green List – birds not considered threatened[59]
- Bird species listed on Annex I of the EU Birds Directive (2009/147/EC); and
- QI species of SPAs within the ZoI of the proposed Project.

Surveying techniques were in line with those outlined in the Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes [60] / Breeding Bird Survey (BBS) methodology [61].[62].

[58] NPWS, 'Kilkee Reefs SAC (Site Code: 2264) Conservation Objectives Supporting Document - Marine Habitats' (NPWS, 2014).

[59] Gilbert, Stanbury, and Lewis, "Birds of Conservation Concern in Ireland 4: 2020–2026."

[60] NRA, "Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes" (National Roads Authority, 2009).

[61] Sinéad Cummins et al., "Assessment of the Distribution and Abundance of Kingfisher Alcedo Atthis and Other Riparian Birds on Six SAC River Systems in Ireland" (Birdwatch Ireland / National Parks and Wildlife Service, 2010).

[62] J. J. N Heywood et al., "The Breeding Bird Survey 2022," *BTO Research Report* 756 (2022).

The watercourses that fall within the survey extent were surveyed for any breeding bird activity with a focus on riparian vegetation and woodland. Areas of scrub along the ditches were also surveyed for breeding activity where it was possible to gain access. Riparian breeding bird surveys follow the same general methodology [63].

Breeding Snipe Surveys

Snipe surveys were carried out from vantage points allowing for a clear view of suspected breeding habitats. Accessible fields were also walked to assess habitat and to ensure that the vantage points used would allow for a clear view of the entire site. Two dusk followed by two dawn surveys were carried out, with the first set of surveys between mid-April- and mid-May, and the second between mid -May and mid-June, with a minimum of 2 weeks between surveys. Each survey lasted approximately 3 hours, with 1 hour spent at each vantage point. Surveys were carried out in the morning in the three hours following first light (approximately 06:00-09:00), and in the evening, during the 3 hours preceding last light (19:00-22:00). All Common Snipe were recorded in the field, with geolocalisation, activity and weather conditions noted. As Common Snipe tend not to display in windy conditions, days with weather forecasts of wind <20 km/h were chosen, with surveys not carried out in winds forecast to be >30km/h This follows standard monitoring methods set out in Snipe Conservation Alliance http://snipeconservationalliance.org/snipe-breeding-survey-2019/[64].

Surveys were carried out from one vantage point in the Long Field (Point 1, with a view across the Long Field and the adjacent one to the West), Point 2 on the edge of the Carrigaholt Road Field, and Point 3 overlooking the Atlantic Field. The observer was sufficiently far from the target locations or obscured from the field so as not to disturb any birds in the area. All vantage points allowed for unobstructed views of the sites being monitored.

The wintering bird surveys were carried out in 2022 and 2023 and is considered to be representative of the current situation. JBA ecologists have been present at the site regularly since surveys have been undertaken and through casual observation, no substantial differences in numbers, species or locations of birds particularly in relation to the Scheme, has been observed.

Fisheries Surveys

A specific electrofishing survey was carried out by Triturus Environmental Ltd in September 2022 with a focus on the Western Tributary, the Victoria Stream and the Atlantic Stream. The electro-fishing methodology followed accepted European standards [65] and adhered to best practice (e.g. [66], and under the conditions of a Department of the Environment, Climate and Communications (DECC) licence.

Three primary species groups were targeted during the survey, i.e., salmonids, Lamprey, and Eel, the electro-fishing settings were tailored for each species, and electro-fishing used the rapid electro-fishing technique. For salmonid species and European Eel, as well as all other incidental species, electro-fishing was carried out in an upstream direction for a 10-minute Catch per Unit Effort. Electro-fishing for Lamprey ammocoetes was conducted using targeted box quadrat-based electro-fishing (as per [67] in objectively suitable areas of sand/silt, where encountered.

[63] Cummins et al., “Assessment of the Distribution and Abundance of Kingfisher Alcedo Atthis and Other Riparian Birds on Six SAC River Systems in Ireland.”

[64] Andrew N. Hoodless, John G. Inglis, and David Baines, “Effects of Weather and Timing on Counts of Breeding Snipe *Gallinago Gallinago*,” *Bird Study* 53, no. 3 (November 2006): 205–12, https://doi.org/10.1080/00063650609461435; Andrew N. Hoodless, Julie A. Ewald, and David Baines, “Habitat Use and Diet of Common Snipe *Gallinago Gallinago* Breeding on Moorland in Northern England,” *Bird Study* 54, no. 2 (2007): 182–91, https://doi.org/10.1080/00063650709461474.

[65] CEN, ‘Water Quality Sampling of Fish with Electricity’ (CEN EN 14011:2000. Brussels. European Committee for Standardization, 2003).

[66] Central Fisheries Board, “Methods for the Water Framework Directive. Electric Fishing in Wadeable Reaches.” (Unpublished report, 2008).

[67] Harvey J & Cowx I, “Monitoring the River, Brook and Sea Lamprey, Lampetra Fluviatilis, L. Planeri and Petromyzon Marinus. Conserving Natura 2000 Rivers Monitoring Series No. 5” (Life in UK Rivers, 2003).

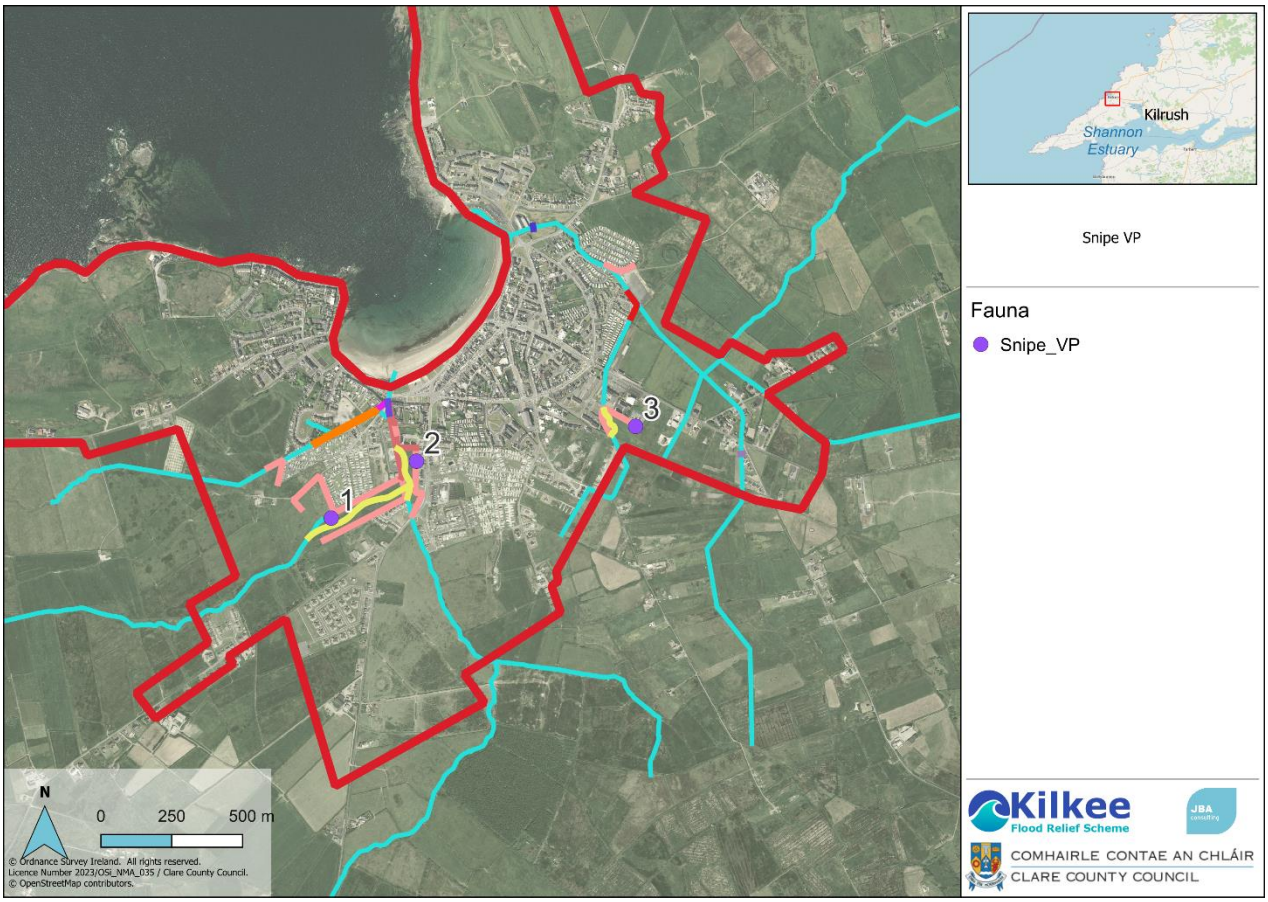


Figure 7-2: Vantage point locations for Snipe surveys.

A broad appraisal / overview of the upstream and downstream habitat at each site was also undertaken to evaluate the wider contribution to salmonid and lamprey spawning and general fisheries habitat. River habitat surveys and fisheries assessments were also carried out utilising elements of the approaches in the River Habitat Survey Methodology [68] and Fishery Assessment Methodology [69] to broadly characterise the riverine sites (i.e., channel profiles, substrata etc.).

An Environmental Deoxyribonucleic Acid (eDNA) survey was conducted on the Well Stream to determine presence of the three Lamprey species, Eel and/or Smooth Newt. Twenty water samples of 50ml were collected from the Well Stream intermittently while moving upstream, mixing the samples together. These 20 samples were combined through a single dense filter to extract filtrate. This sample was sent for testing at SureScreen Scientifics for analysis. During Deoxyribonucleic Acid (DNA) testing, the filter is incubated to obtain any DNA within the sample. A Polymerase Chain Reaction (PCR) test is preformed to identify the DNA of the targeted species, subsequently primers are then used to amplify target DNA, allowing it to be detected.

Amphibians – Spawn

Ecological surveyors examined the proposed Scheme area in spring for the presence of amphibian species Common Frog *Rana temporaria* and Smooth Newt *Lissotriton vulgaris*, as well as suitable waterbodies and wetlands to support breeding amphibian populations. Surveying techniques were in line with those outlined

[68] Environment Agency, “River Habitat Survey in Britain and Ireland: Field Survey Guidance Manual.,” 2003, https://assets.publishing.service.gov.uk/media/62dff4138fa8f564a21dcd5e/RHS-manual-2003_2022-reprint-LIT-1758.pdf.

[69] M.F. O’Grady, “Channels and Challenges: Enhancing Salmonid Rivers. Irish Fresh- Water Fisheries Ecology and Management Series: Number 4.” (Central Fisheries Board, Dublin., 2006), https://www.fisheriesireland.ie/sites/default/files/migrated/docman/Channels%20%26%20challenges-enhancing%20salmonid%20rivers%2072secure.pdf.

in the Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes [70].

Mammal Surveys

Bat Surveys

Preliminary Bat Roost and Habitat Suitability Surveys were undertaken as part of the project following:

Collins (2023)[71]: Bat Surveys for Professional Ecologists: Good Practice Guidelines.

The walkover surveys recorded any preliminary bat roost features that may be impacted by the scheme. Any key bat features or habitats within the footprint of the scheme were noted, and habitat suitability surveys were conducted as part of a desktop study.

A static bat detector was placed in a tree in the hedge along the boundary between the Long Field and Cunninghams' Holiday Park, as it presents foraging opportunities and is within 500m of a wooded area that presents some bat potential. The static detector was left to record for 16 days.

Camera trapping

The walkover survey revealed different locations that presented mammal runs and areas susceptible to be used by mammals. Three areas were targeted for camera trapping to determine which species are present, distribution and impact possibility from the scheme (Ref Figure 7-3).

Camera traps were deployed on the following dates at the following locations:

- 1. Victoria Stream, upstream location no. 1. 30/03/2022 to 13/05/2022
- 2. Victoria Stream, upstream location no. 2. 30/03/2022 to 13/05/2022
- 3. Victoria Stream, upstream location no. 3. 13/05/2022 to 28/06/2022
- 4. Western Tributary, location no. 1 13/05/2022 to 28/06/2022
- 5. Western Tributary, location no. 2 26/06/2023 to 19/07/2023

[70] NRA, "Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes," 2009.

[71] J. (ed.) Collins, *Bat Surveys for Professional Ecologists: Good Practice Guidelines*, 4th ed. (London: The Bat Conservation Trust, 2023).

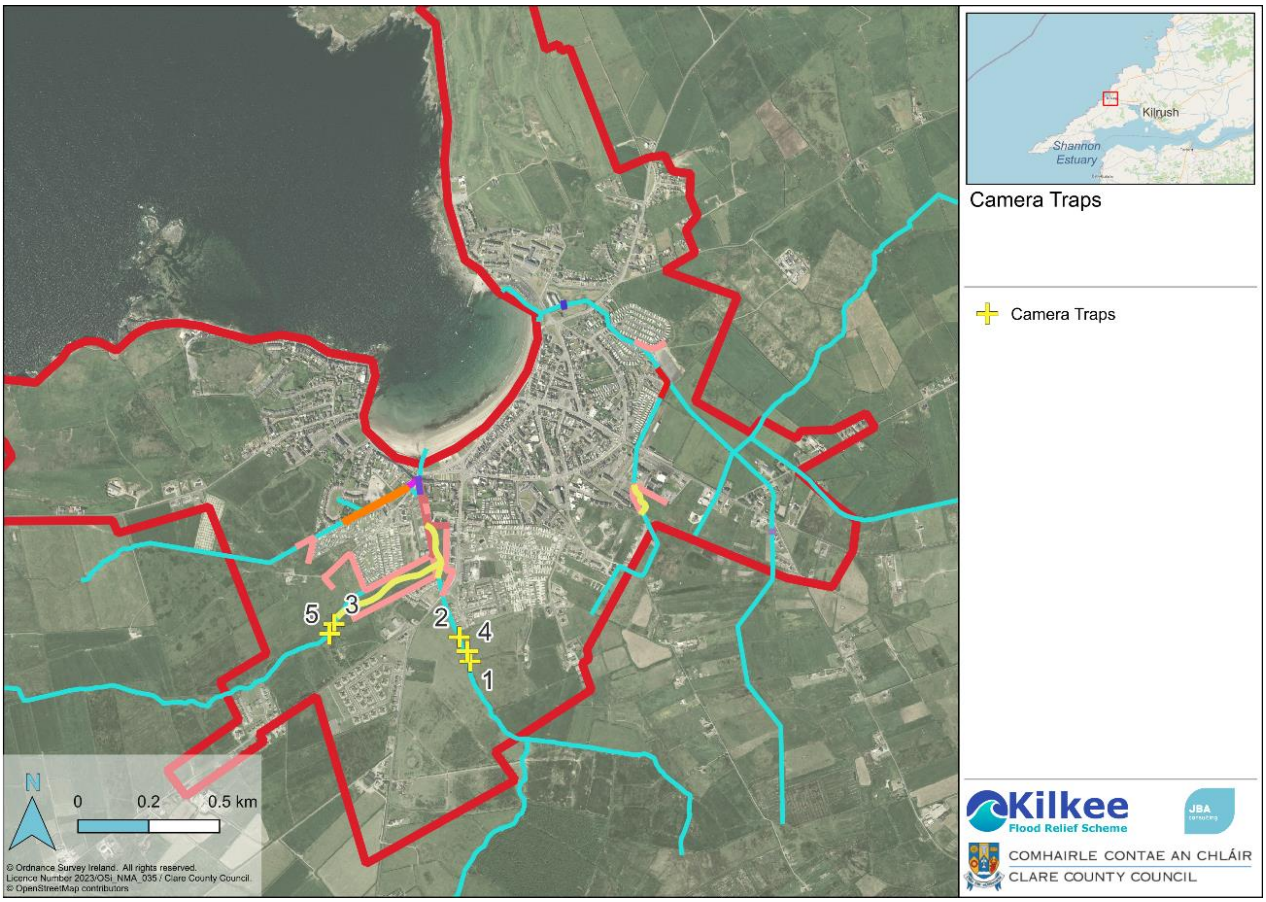


Figure 7-3: Camera trapping locations.

Limitations and Constraints:

The assessment necessarily relies on some assumptions, and it was inevitably subject to some limitations. These do not affect the conclusion, but the following points are recorded in order to ensure the basis of the assessment is clear:

- Information on the works and conditions on site are based on current knowledge at the time of writing. Changes to the site since this report was drafted cannot be accounted for.
- This assessment is based on the methodology for proposed works as described in this report. Where changes to construction methodology occur, a JBA designer and an ecologist will need to be consulted to determine if the changes need reassessment.
- NBDC records were generated as part of the desktop review to identify potentially protected species in the area. NBDC records may be incomplete. This is taken into account during surveying and interpretation of results.
- Site surveys followed Chartered Institute of Ecology and Environmental Management CIEEM guidance provided on suitable lifespan for surveys[72] Advice note on the lifespan of ecological reports and surveys: at present surveys are considered to be within the lifespan, but at the time of construction surveys may be out of date. This has been considered in the need for pre-construction surveys, as identified within the text.
- Bats: Given the lack of roost features, lack of trees/hedgerows at the site no activity surveys were carried out. The precautionary principle is used to value of these species using their protected stats, and is based on presumed presence foraging throughout the site. Static detectors were not placed at an optimal time of year, but still recorded some species to inform a short species list. Other species may be present, and bats are not considered on a species by species basis.

[72] CIEEM, “On the Lifespan of Ecological Reports and Surveys” (CIEEM, 2019).

- Annex II habitat 6510 was via a species list and an estimation of herb:grass ratio at a field level, and a short check against negative indicators, rather than the formal quadrats based approach outlined in Martin *et al*, 2018[73]. The precautionary principle was utilised in valuing as Annex I status.
- Estimation of value for Snipe at National level was based on Red-list Status. There is incomplete data on breeding snipe within Co. Clare, although it is likely under-recorded. Thus, the precautionary principle was used to determine value.

7.4 Receiving Environment

The works will be carried out over a range of different habitats and receiving environments; generally speaking, this includes built urban, aquatic and marsh, grassland and scrubland areas. The screening for each receptor is assessed on its importance and value as indicated in Section 7.2 Methodology for Valuation of Receptors, Significance of Impact and Zone of Influence.

European Designated Sites

Natura 2000 sites (Special Areas of Conservation (SAC) and Special Protection Areas (SPA)) within 15km of the proposed development are shown in Table 7-5. No Ramsar or UNESCO sites were present within 15km of Kilkee. The AA Screening and NIS assessed the Natura 2000 sites, and QIs associated with these sites.

Table 7-5: European Designated sites within 15km of the proposed development

Designated Site	Code	Approximate distance from site	AA Screening result
Kilkee Reefs SAC	002264	0.0km	Considered in the NIS
Lower River Shannon SAC	002165	1.3 km	Considered in the AA Screening – screened out
River Shannon and River Fergus Estuaries SPA	004077	2.4 km	Considered in the AA Screening – screened out
Tullaher Lough and Bog SAC	002343	4.4 km	Considered in the AA Screening – screened out
Illaunonearaun SPA	004114	4.2 km	Considered in the AA Screening – screened out
Mid-Clare Coast SPA	004182	8.7 km	Considered in the AA Screening – screened out
Carrowmore Dunes SAC	002250	9.2 km	Considered in the AA Screening – screened out
Carrowmore Point to Spanish Point and Islands SAC	000435	12.3 km	Considered in the AA Screening – screened out

Eight designated sites were considered within the zone of influence of the project:

- Kilkee Reefs SAC 002264
- Lower River Shannon SAC 002165
- River Shannon and River Fergus Estuaries SPA 004077
- Tullaher Lough and Bog SAC 002343
- Illaunonearaun SPA 004114
- Mid-Clare Coast SPA 004182
- Carrowmore Dunes SAC 002250
- Carrowmore Point to Spanish Point and Islands SAC 000435

These sites were assessed for impacts through surface water, groundwater, air and land pathways in the AA screening. Impacts on Kilkee Reefs SAC was assessed in detail in the Natura Impact Statement (NIS)

[73] Martin, J.R., O'Neill, F.H. & Daly, O.H. (2018) The monitoring and assessment of three EU Habitats Directive Annex I grassland habitats. Irish Wildlife Manuals, No. 102. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland..

that accompanies this EIAR, due to proximity to the site and the presence of a hydrological connection. All other Natura 2000 sites were screened out.

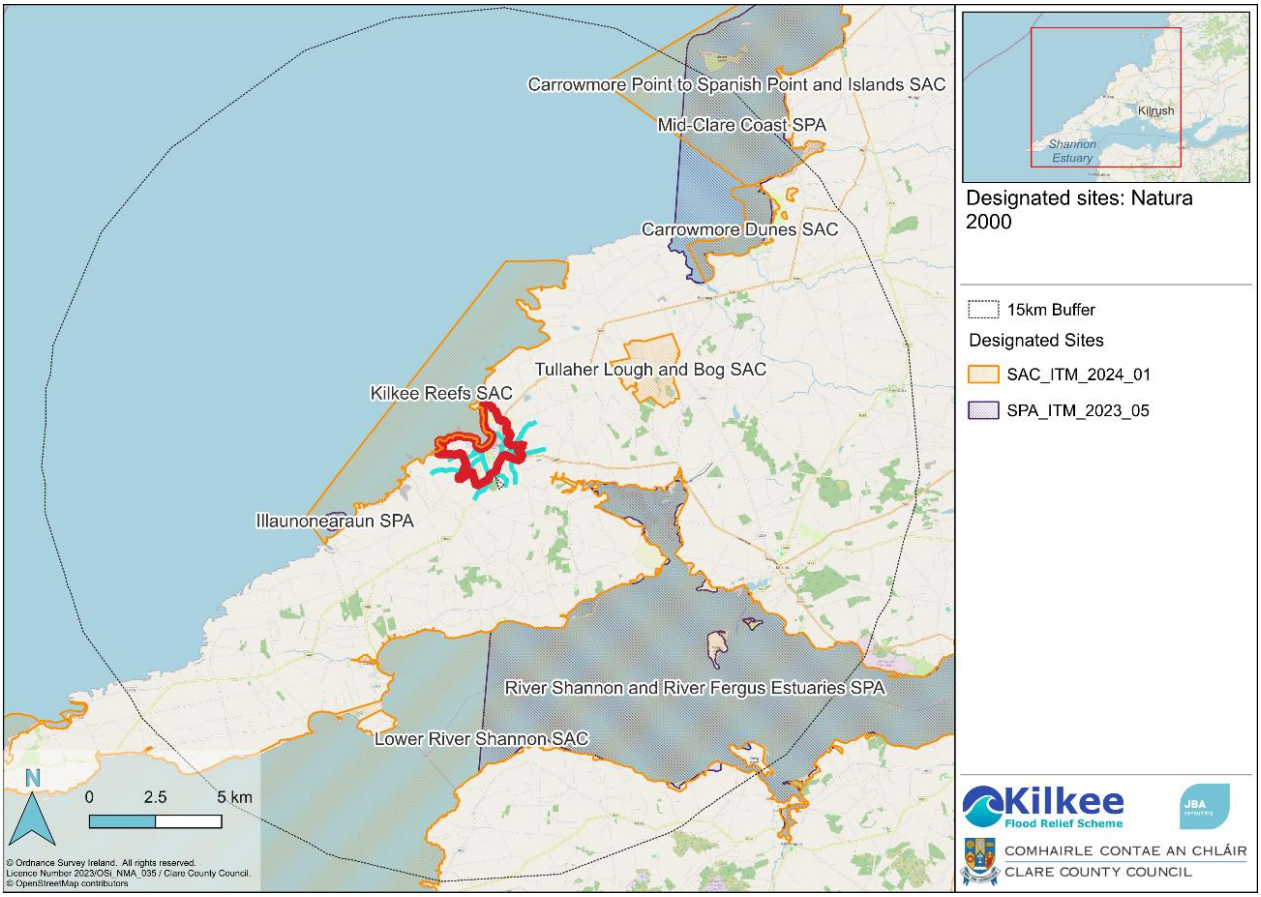


Figure 7-4: Map of European designated sites within 15km of the FRS.

Nationally Designated Sites

The basic designation for wildlife is the Natural Heritage Area (NHA). This is an area considered important for the habitats present or which holds species of plants and animals whose habitat needs protection. In addition, there are 630 proposed NHAs (pNHAs), which were published on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. Under the Wildlife Amendment Act (2000), NHAs are legally protected from damage from the date they are formally proposed for designation. An archive of the Site Synopses for pNHAs is available from the NPWS website [74]. Some of these areas overlap with SACs and SPAs, and where they do, and in the absence of any other information, synopses and conservation objectives of the Natura 2000 designated sites are assumed to be representative of the areas. This report assessed pNHAs and any other sensitive ecological receptors within the proposed development's Zone of Influence (ZoI).

Poulnasherry Bay pNHA 000065

Poulnasherry Bay is a wide stoney estuary with abundant growths of brown seaweed (*Fucus* spp.) and green algae situated near the mouth of the Shannon estuary. It is an important ornithological site, forming part of the Shannon and Fergus estuarine complex. This pNHA overlaps with the Lower River Shannon SAC (002165) and the River Shannon and River Fergus Estuaries SPA (004077). In the absence of site specific details, the Conservation Objectives of the overlapping Natura sites were considered for the assessment. The lack of viable pathways (no hydrological connections) between the site and the scheme, and the small number of birds, impacts are not expected to be significant. This site is therefore screened out.

[74] NPWS, "Site Synopsis: pNHA Portfolio," Site Synopsis (National Parks and Wildlife Service / Department of Arts, Heritage and the Gaeltacht, 1995).

Farrihy Lough pNHA 000200

Farrihy Lough is a brackish lake of ornithological importance, receiving waders and duck during winter. This site has a good range of habitats supporting a variety of floral species, including Marsh-marigold *Caltha palustris*, Thrift *Armeria maritima*, Buck's-horn Plantain *Plantago coronopus* and Common Scurvygrass *Cochlearia officinalis* (NPWS 1995).

There is no connection between the site and the proposed works in Kilkee. The site is at distance (3.3km), and no pathways for impact are identified e.g. no hydrological link, no groundwater link and species overlapping are not expected to be significant due to the low volume of birds recorded within the footprint and immediate vicinity of the scheme.

Tullaher Lough and Bog pNHA 000070

Tullaher Lough and Bog is located 4 km south-east of Doonbeg in the townlands of Carrowmore South, Carrowblough Beg and Tullaher in Co. Clare. This is a diverse site comprising of raised bog (including areas of high bog and cutover bog), wet grassland, improved grassland, scrub woodland, alkaline fen and lake [75]. No specific site details are available; it is considered to correspond to Tullagher Lough and Bog SAC 002343 and the site conservation objectives are considered to be the same as the SAC. There is no connection between the site and the proposed works in Kilkee. No pathways for impact were identified (no hydrological link), and none of the habitats of the pNHA were present in the scheme footprint. This site is therefore screened out.

Illaunonearaun NHA 001014

Illaunonearaun is a small inaccessible island located approximately 300 m off the west Co. Clare coast, about 7 km south-west of Kilkee. It is a large flat-topped sea stack surrounded by high cliffs and a rocky shore. Several rocky reefs occur off the north-west shore. The site is of importance for wintering Barnacle Goose Branta leucopsis which frequents the west Clare coastline. The site is also of note as a breeding site for seabirds, with populations of Cormorant *Phalacrocorax carbo*, Lesser Black-backed Gull *Larus fuscus* and Great Black-backed *Larus marinus* [76]. No specific site details are available; it is considered to correspond to Illaunonearaun SPA 004114. There is no connection between the site and the proposed works in Kilkee. The site is a small offshore island with no pathways for impact identified (no hydrological link) and species overlapping are not expected to be significant due to the low volume of birds recorded within the footprint and immediate vicinity of the scheme, and the abundance of habitat outside of the scheme. This site is therefore screened out.

Scattery Island pNHA 001911

Scattery Island is located near the mouth of the Shannon estuary, about 3 km from Kilrush. Much of the island is grassland, which is generally species rich. Some small areas of saltmarsh had Thrift *Armeris maritima* and a few patches of Cordgrass *Spartina* spp. This pNHA overlaps with the Lower River Shannon SAC (002165) and the River Shannon and River Fergus Estuaries SPA (004077). No specific site details are available, and its Conservation Objectives are assumed to be the same as those of the overlapping SAC and SPA [77]. There is no connection between the site and the proposed works in Kilkee. The site is at distance (9.6km), and on the opposite side of the estuary, and no pathways for impact were identified (no hydrological link) and species overlapping are not expected to be significant due to the low volume of birds recorded within the footprint and immediate vicinity of the scheme, and the abundance of habitat outside of the scheme. This site is therefore screened out.

[75] NPWS, "Site Synopsis: Tullaher Lough and Bog SAC 002343," Site Synopsis (National Parks and Wildlife Service / Department of Arts, Heritage and the Gaeltacht, 2014).

[76] NPWS, "Site Synopsis: Illaunonearaun SPA 004114," Site Synopsis (National Parks and Wildlife Service / Department of Arts, Heritage and the Gaeltacht, 2014).

[77] Clare County Council, "Clare County Development Plan 2017-2023 Volume 10 Environmental Appraisal of the Plan Volume 10a Natura Impact Report," Natura Impact Report, 2017, https://www.clarecoco.ie/planning/publications/clare-county-development-plan-2017-2023-volume-10-environmental-appraisal-of-the-plan-volume-10a-natura-impact-report-24140.pdf.

Beal Point pNHA 001335

Beal Point is a small coastal site (c. 32ha) on the southern shore of the mouth of the Shannon estuary. The site is a sand dune system, with a small area of salt marsh. Marram grass *Ammophla avenana* occurs abundantly throughout the site and there are also areas of fixed dunes with Fescue *Festuca* spp grassland. This pNHA overlaps with the Lower River Shannon SAC (002165) and the River Shannon and River Fergus Estuaries SPA (004077). No specific site details are available, and its Conservation Objectives are assumed to be the same as those of the overlapping SAC and SPA [78]. There is no connection between the site and the proposed works in Kilkee. The site is at distance (9.6km), and on the opposite side of the estuary, and no pathways for impact were identified (no hydrological link) and species overlapping are not expected to be significant due to the low volume of birds recorded within the footprint and immediate vicinity of the scheme, and the abundance of habitat outside of the scheme. This site is therefore screened out.

White Strand / Carrowmore Marsh pNHA 001007

This pNHA overlaps with Carrowmore Dunes SAC and Mid-Clare Coast SPA. Carrowmore Dunes (referred to locally as Doonbeg dunes) are situated on the south-western coast of County Clare, approximately midway between Milltown Malbay and Kilkee. They extend from Carrowmore Point in the north to Doonbeg Bay in the south. A fine sandy beach (White Strand) merges into a cobble beach on the seaward side of a sand dune system. Exposed bedrock marks the northern and southern boundaries of the site. On the seaward side, the site extends for 500m from the shore to include the reefs in the shallow marine waters within Doughmore Bay. Mid-Clare Coast SPA extends along the Co. Clare coastline in a south-south-westerly direction from Spanish Point (3 km west of Milltown Malbay) to just west of Doonbeg Bay, a distance of some 14 km. It comprises the mainland shoreline, a series of rocky reefs, Mutton Island and Mattle Island, and the open marine water of Mal Bay between the islands and the mainland. No specific site details are available, and its Conservation Objectives are assumed to be the same as those of the overlapping SAC and SPA [79]. There is no connection between the site and the proposed works in Kilkee. The site is at distance (10.9km), and no pathways for impact were identified (no hydrological link) and species overlapping are not expected to be significant due to the low volume of birds recorded within the footprint and immediate vicinity of the scheme, and the abundance of habitat outside of the scheme. This site is therefore screened out.

Carrowmore Point to Spanish Point and Islands pNHA 001021

No specific site details are available; it is considered to correspond to Carrowmore Point to Spanish Point and Islands SAC and Mid-Clare Coast SPA. The Carrowmore Point SAC extends along the Co. Clare coastline from Spanish Point (3 km west of Milltown Malbay) in a south-westerly direction to Carrowmore Point. It comprises a strip of coastline, several offshore islands and rocks (notably Mutton Island), and the open marine water of Mal Bay between the islands and the mainland. Lough Donnell is a lagoon found near Carrowmore Point at the southern end of the site [80]. There is no connection between the site and the proposed works in Kilkee. The site is at distance (12.3km), and no pathways for impact were identified (no hydrological link) and species overlapping are not expected to be significant due to the low volume of birds recorded within the footprint and immediate vicinity of the scheme, and the abundance of habitat outside of the scheme. This site is therefore screened out.

Ballylongford Bay NHA 001332

Ballylongford Bay is an inlet on the southern side of the Shannon Estuary and runs northwards from the town of Ballylongford in County Kerry. This site is of ornithological importance. This pNHA overlaps with the Lower River Shannon SAC (002165) and the River Shannon and River Fergus Estuaries SPA

[78] Clare County Council, “Draft Clare County Development Plan 2023-2029 Volume 10b(i) Strategic Environmental Assessment Environmental Report,” 2021, https://clarecdp2023-2029.clarecoco.ie/stage2-draft/display/volume-10b-i-strategic-environmental-assessment-environmental-report-45178.pdf.

[79] NPWS, “Conservation Objectives - Supporting Document: Carrowmore Dunes SAC 002250 - Coastal Habitats,” Conservation Objectives, Supporting Document (National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht., 2014).

[80] NPWS, “Site Synopsis: Carrowmore Point to Spanish Point and Islands SAC 001021” (National Parks and Wildlife Service / Department of Arts, Heritage and the Gaeltacht, 2013).

(004077). No specific site details are available, and its Conservation Objectives are assumed to be the same as those of the overlapping SAC and SPA [81]. There is no connection between the site and the proposed works in Kilkee. The site is at distance (13.3km), on the opposite side of the estuary, and no pathways for impact were identified (no hydrological link) and species overlapping are not expected to be significant due to the low volume of birds recorded within the footprint and immediate vicinity of the scheme, and the abundance of habitat outside of the scheme. This site is therefore screened out.

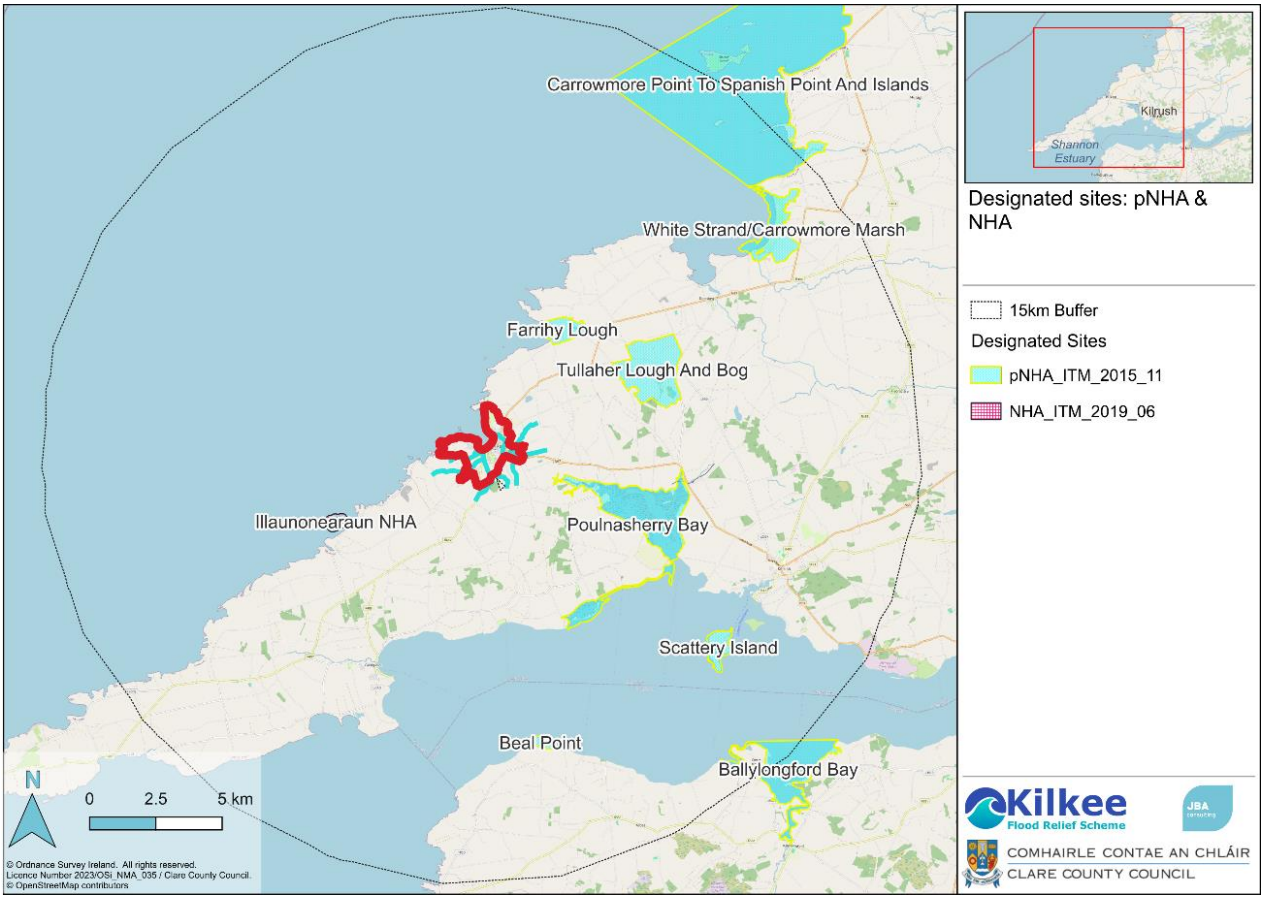


Figure 7--5: Map of Nationally designated sites within 15km of the FRS.

Table 7-6: Nationally designated sites within 15km of the proposed development

Designated Site	Site Code	Approximate distance from site	Overlap with Natura Site	Screening of Site
Poulnasherry Bay pNHA	000065	1.3 km	Yes – Lower River Shannon SAC	Considered in the AA Screening –screened out
Farrihy Lough pNHA	000200	3.3 km	No	No viable pathway – screened out
Tullaher lough and Bog pNHA	000070	4.4 km	Yes – Tullaher Lough and Bog SAC	Considered in the AA Screening – screened out
Illaunonearaun NHA	001014	4.2 km	Yes – Illaunonearaun SPA	Considered in the AA Screening – screened out
Scattery Island pNHA	001911	9.6 km	Yes - Lower River Shannon SAC and River Shannon and River Fergus	Considered in the AA Screening – screened out

[81] Clare County Council, "Draft Clare County Development Plan 2023-2029 Volume 10b(i) Strategic Environmental Assessment Environmental Report."

			Estuaries SPA	
Beal Point pNHA	001335	9.6 km	Yes – Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA	Considered in the AA Screening – screened out
White Strand/Carrowmore Marsh pNHA	001007	10.9 km	Yes - Carrowmore Dunes SAC and Mid-Clare Coast SPA	Considered in the AA Screening – screened out
Carrowmore Point to Spanish Point and Islands pNHA	001021	12.3 km	Yes - Carrowmore Point to Spanish Point and Islands SAC and Mid-Clare Coast SPA	Considered in the AA Screening – screened out
Ballylongford Bay NHA	001332	13.3 km	Yes – Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA	Considered in the AA Screening – screened out

NHAs and pNHAs that overlap with Natura sites are screened out using the same rationale as used in the AA Screening, this rationale extends to non-QI features of the designated sites i.e. the screening identified no viable pathways for impact. A source-pathway-receptor model was used.

Locally important sites

Sites of local importance that are not designated can include those which have been identified in the County Biodiversity Action Plan, in a Local Area Plan or in a local Biodiversity Action Plan.

The Clare County Biodiversity Action Plan was reviewed, and while no specific actions were identified for the Kilkee area, the features of interest were noted for Kilkee such as *Sponges, corals, sea-fans, jewel anemones, purple sea urchins, and starfish on the reefs around Kilkee.* These features would occur on many of the exposed rocks and submerged reef areas in Kilkee, including areas around the Pollock Holes. Many of these areas are designated as part of the Kilkee Reefs SAC.

Specific policies are also present in the Action Plan, which would be relevant to habitats in Kilkee including those relating to freshwater aquatic and wetland ecosystems; grassland, marine and farmland ecosystems.

Kilkee Biodiversity Plan 2019 "From Bog to Beach" highlights a number of areas of importance or features of ecological interest in Kilkee including:

- Wetlands such as Lady Isabella's Pond, the Victoria Steam, Golf Club Lakes and the Old Reservoir;
- Beach and Shoreline areas;
- Bog areas such as the Old Bog Road;
- Urban green spaces including Allender's Field, Priests Field, Hodges Green.

Features such as Lady Isabella's pond, the Reservoir, the Old Bog Road are outside the zone of potential impact of the works. Actions to protect the beach and shorelines such as beach cleaning and other local actions are unlikely to overlap with the current FRS proposals. Notable birds are highlighted within the BAP, but are mostly associated with the cliffs habitats, and have little overlap with the current FRS.

The main area of overlap between Action Areas or features identified in the Local Biodiversity Action Plans as important are Allender's Field, which is in proximity to the proposed works on the Atlantic Culvert and the Victoria Stream, which directly overlaps with the FRS footprint.

Allender's Field. Allender's Field was noted in the Local Biodiversity Action Plan as having potential for an orchard and pollinator friendly planting and some landscape and planting works have already been carried out prior to the Biodiversity Action Plan. Some remedial action on failed planting has also been identified as part of *Towards A Better Kilkee - A Town Improvement & Economic Development Strategy 2014-2024.* This is a very accessible site in close proximity to the beach, with potential for good usage by the local community, and an established network of paths.

Assessment: Higher Local Value

Victoria Stream. The Victoria Stream is recorded within the Biodiversity Action Plan as having suffered some pollution incidents and the main actions associated with the Victoria Stream were to survey, map and plan; as well as liaison between the local Biodiversity Action Group and Uisce Éireann/Clare Co. Co. to prevent future pollution incidents. The Victoria Stream is discussed and assessed more fully in Section 2.4.4 and the fisheries capacity of the stream in Section 2.4.6.

Habitats

Habitat types recorded within the study area are summarised in the following sections and mapped in (Figure 7--7-1, p.123).

Buildings and artificial surfaces – BL3

The majority of the areas surrounding the proposed FRS works consists of buildings and artificial surfaces and amenity grassland (GA2) areas. These areas are of low diversity, with only common or garden bird species such as Great Tit, Dunnock, and Goldfinch recorded.

Assessment of Value: **Less than local importance** due to the highly artificial nature of the habitat.

Reed and large sedge swamps – FS1

An area of reed and large sedge swamp c. 1ha dominated by Common Reed occurs along the east bank of the Victoria stream. This field was especially notable for supporting 40+ wintering Common Snipe *Gallinago gallinago.* Species at this site included dominant Common Reed *Phragmites australis*, with patches of dominant Meadowsweet *Filipendula ulmaria,* Bramble *Rubus fruticosus,* and Cocksfoot grass *Dactylis glomerata.* Abundant Nettle *Urtica dioica,* Meadow Foxtail *Alopecurus pratensis,* Creeping buttercup *Ranunculus repens,* frequent Creeping Thistle *Cirsium arvensis,* occasional Horsetails (*Equisetum* sp) and sedge species were present. Encroaching trees included willow *Salix sp.* Fossitt Habitat FS1 does not correspond to any Annex I habitat. The habitat is somewhat degraded due to the dumping of rubbish in the area. The value of the habitat is more associated with it's potential to provide roosting habitat for birds and habitat for amphibians. Botanical diversity is limited, and the area is in need of management of reeds and encroaching scrub, especially briars, to continue to the open nature of the shelter than the reed dominance long term.

Assessment of Value: **Local Importance (Higher)**. Provides amphibian habitat, as well as roosting habitat for winter snipe and summer habitat for sedge-warbler.

Figure 7--6: Dense Reed habitat

Depositing/lowland rivers – FW2

Several watercourses are present within the study area. These are described below.

Atlantic Stream:

The Atlantic Stream is highly channelised throughout the study area. The main outfall of the Atlantic Stream culvert flows out near Kilkee Pier, with overflows draining onto the beach upstream.

Levels of in-stream vegetation are high directly upstream of the Atlantic Stream culvert (Figures 7-7, 7-8, 7-9), where an updated debris screen is to be installed. Species include Lesser Water-parsnip *Berula erecta* and Duckweed *Lemna* spp. Bankside vegetation is beginning to encroach on the culvert where the previous debris screen has been removed, mainly Common Nettle *Urtica dioica*. The main outfall of the Atlantic Stream culvert flows out near Kilkee Pier, with overflows draining onto the beach upstream (Figures 7-10, 7-11)

Detailed notes on the river conditions upstream of this location (behind Sandpark) were taken during the fisheries assessment undertaken by Triturus Environmental in 2022 [82]: The watercourse had been extensively straightened and deepened historically, resulting in a steep trapezoidal channel with poor hydromorphology and drainage channel-like characteristics. Bank full heights were 2-4m. The site had also been excavated in the recent past with spoil evident on the banks. The stream was a homogenous 2.5m wide and 0.2-0.3m deep, comprising slow-flowing glide and occasional pool with no riffle areas. Whilst some exposed mixed gravels and cobbles were present locally, the substrata were dominated by soft silt with a high-clay fraction (further indication of recent excavation). Macrophyte coverage was very high (>75%) with abundant Fool's-water-cress, Branched Bur-reed *Sparganium erectum* and Common Duckweed *Lemna minor* with frequent Lesser Water-parsnip *Berula erecta*. Water Starwort *Callitriche* sp.,

[82] Triturus, “Fisheries Assessment for Kilkee Flood Relief Scheme, Co. Clare” (Report prepared by Triturus Environmental Ltd. for JBA Consulting, 2022).

Watercress *Nasturtium officinale* and Stonewort *Chara* sp. were occasional. Filamentous algae cover was also very high (>50%), indicating significant enrichment. The steep sloping banks supported abundant Reed Canary-grass *Phalaris arundinacea*, Water Horsetail *Equisetum fluviatile*, Meadowsweet *Filipendula ulmaria* and rank grasses with scattered Alder *Alnus glutinosa*, Sycamore *Acer pseudoplatanus* and dense Bramble *Rubus fruticosus aggregate* scrub. The site was bordered by Sandpark Kilkee holiday homes (BL3) and recolonising bare ground (ED3).

Some riparian areas had diversity, but overall, the bank structure was steep and limited development of riparian zone was present e.g. trees. Upstream towards the GAA pitch the Atlantic is bounded by wet grassland fields, with a similarly limited riparian zone dominated by rank grasses.

Figure 7--7: Atlantic Stream upstream (vicinity of GAA pitch)

Figure 7--8: Atlantic Stream - location of new debris screen

Figure 7-9: Atlantic Stream - upstream of location of new debris screen.

Figure 7-10: Atlantic Stream culvert main outfall

Figure 7--11: Atlantic Stream culvert overflow

Victoria Stream:

The Victoria Stream is highly channelised throughout the study area with existing tidal gates on the beach side of the culvert under Marine Parade Road. The lower reaches comprised tidal glide habitat that was stagnant at the time of survey given the closure of the stop log gates; these gates are closed from approximately the last week in May to the start of September. The riverbanks are steep with high cover of Willow *Salix* sp. and Bramble *Rubus fruticosus* scrub.

Detailed notes on the river conditions near the Victoria Stream culvert and a location upstream of the proposed FRS were taken during the fisheries assessment undertaken by Triturus Environmental[83]:

The lower reaches of the stream had been historically modified with high retaining walls along both banks. Upstream, along Victoria Park, the river had been extensively straightened and deepened, with a near vertical trapezoidal channel and bank full heights of up to 2m. The lower reaches comprised tidal glide habitat that was stagnant at the time of survey given the closure of tidal gates under Marine Parade Road from approximately the last week in May to the start of September. The tidal gate was installed to protect the blue flag status of the beach due to poor water quality (i.e., faecal coliforms). The substrata comprised heavily compacted and silted cobble and boulder along Victoria Park, with cobble and boulder bedded in extensive sand beds predominating further downstream. Siltation was naturally high given the tidal and depositional nature of the channel. Common reed was abundant along the steep banks, with occasional Fool's Watercress and Water Starwort Callitriche sp. along channel margins. Filamentous algae were frequent on instream structures. Extensive bacterial films were present on silt at the tidal gates, indicating a level of organic pollution. Numerous point sources and culverts adjoined the channel near the survey site and were evidently contributing to water quality declines.

The Victoria Stream upstream of the proposed FRS has been recorded as an eroding/upland river, (FW1) Eriocaulon aquaticum group *Littorella uniflora*. The watercourse had been extensively straightened and deepened historically, with a steep (near vertical) trapezoidal channel and bank full heights of up to 1.8m. The river suffered from low seasonal water levels at the time of survey, with only slight flows present. The channel averaged 1.5m wide and 0.1-0.2m deep with a profile comprising very slow-flowing glide and pool. The substrata were dominated by heavily compacted cobble and boulder with only localised interstitial gravels. These were heavily silted (exacerbated by low seasonal flows). Soft sediment accumulations were flocculent, where present. The site was heavily shaded and vegetated with abundant Fool's-water-cress *Apium nodiflorum* (>75% cover) and occasional Brooklime Veronica beccabunga. Common Reed was also abundant along the channel margins and banksides. Aquatic bryophytes were limited to very occasional Leptodictyum riparium (an enrichment indicator) and Pellia sp. liverwort on larger substrata. Filamentous algae Cladophora sp. were also present (<1% cover), further indicating enrichment. The river at this location was heavily shaded (often tunnelled) with abundant Common Reed and Bramble, herbaceous vegetation and scattered Hawthorn Crataegus monogyna. The site was bordered by a residential area (Marion Estate; BL3, buildings and artificial surfaces) and low-intensity pasture (GA1, improved agricultural grassland).

[83] Triturus.

Figure 7--12: Victoria Stream

Figure 7--13: Victoria Stream culvert

The tidal gates of the Victoria Stream are closed during the bathing season, and close from approximately the last week in May to the start of September. The water is kept from overflowing the tidal gates through pumping out to Intrinsic Bay, along with the wastewater from the Kilkee area. Flow is very slow at this time and water pools as can be seen in the above images, subsequently in times of rainfall the gates are overtopped and the stream flows onto the beach.

When the gates are open the stream passes into Kilkee Bay, see Figure 7-14.

Figure 7--14: Dry bed of Victoria Stream, leading out to Kilkee Bay, when gates are closed

Western Tributary:

A tributary of the Victoria Stream, referred to as the Western Tributary, is also highly channelised. Low light levels are present along the stream, where it flows between Cunningham's Holiday Park and the existing embankment south.

Notes on the river conditions were also taken during the fisheries assessment undertaken by Triturus Environmental [84]: The watercourse had been extensively straightened and deepened historically, with a steep (near vertical) trapezoidal channel and bank full heights of 1.5-2m. The stream suffered from low seasonal water levels at the time of survey, with only slight flows present. Frequent bank slumping and infilling caused instream flow blockages.

Upstream of the field proposed for storage, the stream averaged <1m wide and 0.1-0.2m deep with a profile comprising very slow-flowing glide and pool with highly localised riffle. The substrata were dominated by heavily compacted cobble with very localised mixed gravels and small boulder. These were heavily silted (exacerbated by low seasonal flows). Soft sediment accumulations were present locally. The site was heavily shaded (near 100% tunnelling) with Common Reed *Phragmites australis* the only macrophyte present (growing along margins and on the steep banks). Aquatic bryophytes recorded

[84] Triturus.

included the liverwort species *Conocephalum conicum* and *Pellia* sp. on muddy areas of the bank. The stream at this location was heavily tunnelled with bramble *Rubus fruticosus* agg., Meadowsweet *Filipendula ulmaria*, Horsetail *Equisetum* sp., Field Bindweed *Convolvulus arvensis*, Nettle *Urtica dioica* and rank grasses with scattered Gorse *Ulex europaeus*. The site was bordered by scrub and wet, low-intensity pasture (GA1).

Near the confluence of the Western Tributary and the Victoria Stream (Figure 7-15), the stream averaged <0.5m wide (1.5m channel) and <0.1m deep with a profile comprising slow-flowing glide and riffle over instream vegetation and debris. The substrata were dominated by heavily compacted cobble with occasional fine gravels and sands. However, these were heavily silted (exacerbated by low seasonal flows). Soft sediment accumulations were frequent. The site was heavily tunnelled with abundant Common Reed, Water Starwort (Callitriche sp.) and rare Fool's-water-cress *Apium nodiflorum*. Aquatic bryophytes were not recorded. The stream at this location was heavily tunnelled with abundant Common Reed and Bramble *Rubus fruticosus* agg. with Meadowsweet, Field Horsetail *Equisetum arvense*, Field Bindweed, Nettle and rank grasses with scattered willow *Salix* sp. and Hawthorn *Crataegus monogyna*. The site is bordered by low-intensity, often wet, improved grassland (GA1) and residential areas (Victoria Park, BL3).

Figure 7--15: Confluence of Western Tributary and Victoria Stream

Well Stream:

The Well Stream is highly channelised for the majority of its extent and becomes culverted along Crescent Place before it joins with the Victoria Stream. There are high levels of vegetation in-stream, mainly Fool's-water-cress *Apium nodiflorum* and *Lemna* spp. Riparian vegetation includes grasses such as Cocksfoot *Dactylus glomeratum*; Nettle *Urtica dioica*, Briars, Creeping buttercup *Ranunculus repens,* and ornamental species.

The examples of the stream at this site do not correspond to Annex I habitat Watercourses of plain to montane with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] due to lack of quality instream habitat and vegetation. Neither do they correspond with Annex I habitat Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation [3270] which is largely confined to the bottom of turloughs.

Figures 7-16: Well Stream & Tributary

Assessment of Value Summary

Atlantic: **Local importance (lower)** – due to highly modified nature, channelization, low water quality, culverted in many sections and very low fisheries value including passability issues.

Victoria: **Local importance (higher) -** Overall Channel itself is mostly highly modified, but still contains good fisheries value for Eel and Flounder. Some passability issues due to presence of stop-log gate during the bathing season. Poor water quality and riparian zone.

Western Tributary: **Local importance (higher) –** highly modified, but some more natural areas upstream, with riffles and a gravelly bed. Some fisheries value. No culverting. Some intact riparian margins upstream

Well Stream: **Local importance (lower) –** highly modified, adjacent to road, with poor quality riparian zone. Culverted towards the outfall. Lower fisheries value but did include the presence of eel (e-DNA results).

Improved agricultural grassland – GA1

The majority of fields surveyed within the wider study area in Kilkee were improved agricultural grasslands with low plant diversity and low usage by bird species associated with the SPAs within the project ZoI or

those using Kilkee Bay. The majority of these are not connected to the proposed FRS and will not be significantly affected.

Assessment of Value: **Less than local** due to low biodiversity value and artificial in nature.

Amenity grassland - GA2

Numerous areas of amenity grassland occur within the study area in Kilkee town. The majority of these are not connected to the proposed FRS and will not be adversely affected. An area of amenity grassland occurs in a small park behind Kilkee Waterworld. This habitat is not of value for bird species associated with the SPAs within the project ZoI or those using Kilkee Bay. The grassland has low plant diversity and a mix of native shrub and non-native/ornamental planting of shrubs throughout, used only by common garden bird species.

Assessment of Value: **Less than local** due to low biodiversity value and artificial in nature.

Marsh – GM1

Several small areas of marsh were recorded within wet grasslands within the study area. These were mapped as a different habitat type due to increased wetness in the area, dominated by growth of sedges *Carex* spp. soft rush *Juncus effusus* Yellow Iris *Iris pseudacorus* as well as Creeping Buttercup *Ranunculus repens* and Water-cress *Nasturtium officinale*. Trees included Salix spp. The surveyed areas were generally somewhat degraded, as they were heavily grazed.

Figure 7--17: Marsh in corner of wet grassland field by Southside Caravan Park, Lower Kilkee

No correspondence to Hydrophilous tall herb fringe of plains and of the montane to alpine levels [6430] was recorded due to lack of indicator species, size and nature of the areas of marsh recorded.

Assessment of Value: **Local Value (Higher)** due to high ecological potential and ecosystem function. Areas are small in size and somewhat degraded.

Dry meadows and grassy verges, wet grassland mosaic – GS2, GS4

The main area of GS2/GS4 mosaic was recorded between the Cluain na Mara housing estate and the Southside Caravan Park, in the townland of Donoughboy. A species list was taken for the orchid-rich meadow, wet grassland mosaic in an agricultural field south of Cunningham's holiday park in Kilkee. A

forb: graminoid ratio of 50:50 was noted in this grassland, increasing to 80:20 - 90:10 in some areas. This is recorded as the Long Field. This grassland has been provisionally classified as the Irish Vegetation Classification (IVC) community type Festuca rubra - Rhinanthus minor grassland (GL3E).

This habitat corresponds to the Annex I habitat Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) [6510], and is a wet example of this. It's existing flooding regime is resulting in some water logging in lower areas and some callows type features e.g. 6510 Callows type grassland as outlined in Irish Wildlife Manuals No. 144[85].

Annex II 6510 type meadows tend to be low input, traditionally managed grasslands which are typically rich in flowers. They are cut once or twice per year once plants have set seed (European Commission 2013a). Two high-quality positive indicator species and overall nine positive indicator species have been recorded at this site.

Patches of this habitat had certain species dominating, including Marsh Horsetail *Equisetum palustre*, Yellow-rattle *Rhinanthus minor*, Meadowsweet *Filipendula ulmaria* and Ribwort Plantain *Plantago lanceolata.* The herb to grass ratio was influenced by the dominating herbs in these areas.

Yorkshire-fog *Holcus lanatus,* Yellow-rattle, Ribwort Plantain and Cat's-ear *Hypochaeris radicata* were recorded as abundant. Marsh Horsetail, Meadow Buttercup *Ranunculus acris,* Creeping Buttercup *Ranunculus repens*, Jointed Rush *Juncus articulatus,* Bent-grass *Agrostis spp.,* Crested Dog's-tail *Cynosurus cristatus,* Meadowsweet, Common Sorrel *Rumex acetosa,* Greater Bird's-foot-trefoil *Lotus pedunculatus*, Red Clover *Trifolium pratense* and Silverweed *Potentilla anserina* were frequent. Lesser Stitchwort *Stellaria graminea,* Common Mouse-ear *Cerastium fontanum,* Common Knapweed *Centaurea nigra,* Sweet Vernal-grass *Anthoxanthum odoratum,* Compact Rush *Juncus conglomeratus* and Sheep's Sorrel *Rumex acetosella* were occasional. Selfheal *Prunella vulgaris* and Creeping Thistle *Cirsium arvense* were rare.

Other species recorded include Bindweed *Calystegia spp.,* Red Fescue *Festuca rubra,* Common Bird's-foot-trefoil *Lotus corniculatus*, Meadow Vetchling *Lathyrus pratensis* and Marsh Woundwort *Stachys palustris.*

Tufted Vetch *Vicia cracca,* Marsh Woundwort, Common Valerian *Valeriana officinalis,* False Oat-grass *Arrhenatherum elatius,* Common Reed *Phragmites australis,* Bramble *Rubus fruticosus agg.,* Yellow Iris *Iris pseudacorus and* Wild Angelica *Angelica sylvestris* were also recorded along the field margins.

The high-quality indicator species from Annex I habitat 6510 at the site were: *Lotus corniculatus* and *Rhinathus minor,* as well as orchid species in the overall field. Positive indicators included: *Centaurea nigra, Filipendula ulmaria, Hypochaeris radicata, Plantago lanceolata, Prunella vulgaris, Ranunculus acris, Trifolium pratense. Vicia cracca* was found in the field margins.

Although an Annex I habitat, criteria outlined [86] regarding the selection and ranking of sites were used informally to assess the value of this site. Those criteria include: Semi-natural grassland habitats; Annex I grassland habitats; Adjacent and internal semi-natural habitats; Area; Species density; Notable species; High nature value (HNV) indicator species.

This site is small and position in the surrounding landscape is low-medium (not part of a complex of grasslands or adjacent high quality semi-natural habitats), does not hold any flora protection order or red-list species and presence of HNV species are medium. Thus, if ranked within the county lists, this site would reduce it's rank to a low level.

[85] J. R. Martin, F. H. O'Neill, and O. H. Daly, "Floodplain and Callows Grasslands in Ireland. Irish Wildlife Manuals, No. 144," *National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland*, 2023.

[86] J. R. Martin et al., "Semi-Natural Grassland Survey of Counties Roscommon and Offaly," *Dublin, Ireland: National Parks and Wildlife Service*, 2007.

Figure 7--18: Species Rich Annex I quality grassland located between Cluain na Mara and Southside Caravan Park

Assessment of Value: **Regional Importance.** Annex I type, good condition and composition of species. However, smaller size, lack of red-listed or flora protection order species, and position within the wider landscape indicates Regional Importance.

Wet grassland – GS4

Several areas of wet grassland occur within the study area, with poor to moderate drainage and are generally improved. Abundant rushes *Juncus spp*. in a *Agrostis stolonifera* based grassland was the main species, with Yellow Iris *Iris pseudacorus,* Creeping Buttercup *Ranunculus repens* and White Clover *Trifolium repens* also occurring in these grasslands off the Carrigaholt Road (near Southside Caravan Park, and to the south and west of Cunninghams Caravan Park) and along the Atlantic Stream (off the Kilrush Road). Management was primarily grazing, by horses on the fields behind the Cunnigham's and the Southside Caravan Parks, and by sheep in the field on the Kilrush road.

The wet grassland along Atlantic drain 2, behind the Kilkee Bay hotel, contained similar species indicative of wet habitat conditions, including Yellow Iris, Creeping Buttercup, rushes including Soft-rush *Juncus effusus* and Compact Rush *Juncus conglomeratus,* Marsh Woundwort *Stachys palustris*, Persicaria spp., *Meadowsweet,* Creeping Thistle *Cirsium arvense*, Yorkshire-fog *Holcus lanatus,* Common Fleabane *Pulicaria dysenterica* and Nettle.

Correspondence with Annex I habitat Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410] was not recorded due to absence of positive and high-quality indicator species.

Figure 7--19: Wet grassland south of Cunningham's Holiday Park

Figure 7--20: Wet grassland along the Atlantic Stream - south of the Kilkee Bay Hotel

Assessment of Value: **Local Importance (Higher)** due to good potential and ecosystem function, but common in the surrounding landscape, low-medium diversity and naturalness.

Exposed Rocky Shores – LR1

The main outfall for the Atlantic stream culvert flows over the easternmost portion of the exposed rocky shores in Kilkee bay. A strong flow from the outfall was observed during field surveys, and it was also noted that the only growth was of green algae *Cladophora rupestris* on top of rocks over which the outfall flows. All other seaweed species recorded were deposited, not growing in this area; species deposited in the drift line south of the pier include Oar Weed *Laminaria digitata,* Furbelows *Saccorhiza polyschides*, Sugar Kelp *Laminaria saccharina,* Serrated Wrack *Fucus serratus*, Horned Wrack *Fucus ceranoides,* Bladder Wrack *Fucus vesiculosus,* Wrack Siphon Weed *Vertebrata lanosa,* Thong Weed *Himanthalia elongata,* Guiry's Bladder Wrack *Fucus guiryi,* Ulva spp. and Brown Tuning Fork Weed *Bifurcaria bifurcata.* More loose rock was observed in this area.

North of the pier and behind the sea wall, there was some seaweed growth noted, mainly of Bladder Wrack, Serrated Wrack and green algae, with some Ulva spp. and Sand Binder *Rhodothamniella floridula* also growing. Deposited seaweeds include Sugar Kelp, Landlady's Wig *Desmarestia aculeata,* Guiry's Bladder Wrack, Thongweed and Irish Moss *Chondrus crispus.* Bedrock was intact in this area, with numerous small rock pools. Limpets *Patella spp*., barnacles and Common Periwinkle *Littorina littorea* were recorded on the rocks, with Sandalled Anemone *Actinothoe sphyrodeta,* sea squirts and Common Mussel *Mytilus edulis* were recorded in the rock pools.

The exposed rocky shores recorded in Kilkee Bay correspond to the Annex I habitat 'Reefs' [1170], a QI of the Kilkee Reefs SAC. The reefs and rocky shores in the SAC are described in the site synopsis and conservation objectives supporting documents for the SAC.

Exposed Rock Shores habitat is described more fully and considered within the NIS as they are a QI of Kilkee Reefs SAC.

Assessment of Value: **International.** QI habitat within an SAC.

Sand shores - LS2

No terrestrial vegetation was recorded in the sand shores at Kilkee beach. Species recorded in the drift line included Oar Weed *Laminaria digitata,* Furbelows *Saccorhiza polyschides,* Sugar Kelp *Laminaria saccharina,* Serrated Wrack *Fucus serratus,* Horned Wrack *Fucus ceranoides*, Bladder Wrack *Fucus vesiculosus,* Wrack Siphon Weed *Vertebrata lanosa,* Thong Weed *Himanthalia elongata,* Guiry's Bladder Wrack *Fucus guiryi*, Ulva spp. and Brown Tuning Fork Weed *Bifurcaria bifurcata.*

The beach at Kilkee is described in the site synopsis and conservation objectives supporting documents for Kilkee Reefs SAC, and site surveys had similar findings and species communities (see Section 5.2.1 of the NIS REF).

Assessment of Value: **Local Importance (Higher).** No presence of drift line or association with dunes reduces the ecological value of this habitat. Connection to Kilkee Reefs SAC, as have overlapping area with - Large shallow inlets and bays [1160] Annex habitat.

Sea Inlets and Bays – MW2

The bay in Kilkee corresponds to the Annex I habitat 'Large shallow inlets and bays' [1160], a QI of the Kilkee Reefs SAC. This habitat is present where the influence of freshwater is generally limited in semi-enclosed coastal waters or indentations of the coast. Large shallow inlets and bays are generally sheltered from wave action and contain a great diversity of sediments and substrates with a well-developed zonation of benthic communities. These communities generally have high biodiversity [87].

This habitat is present where the influence of freshwater is generally limited in semi-enclosed coastal waters or indentations of the coast. Large shallow inlets and bays are generally sheltered from wave action and contain a great diversity of sediments and substrates with a well-developed zonation of benthic communities. These communities generally have high biodiversity. (European Commission 2013b)

[87] European Commission, *Interpretation Manual of European Union Habitats*, Version EUR 28 (Luxembourg: European Commission, DG-ENV, 2013).

A dedicated survey of this habitat has not been conducted. This habitat is not within the footprint of the scheme. This habitat is described more fully and considered within the NIS as it is a QI of Kilkee Reefs SAC - Large shallow inlets and bays [1160].

Assessment of Value: **International.** QI habitat within an SAC.

Hedgerows – WL1

Hedgerows occur throughout the study area, along field boundaries, watercourses and embankments, but tend to be low and wind cropped, and lack tall mature trees. Common species in these habitats include Bramble and Hawthorn *Crataegus monogyna* or are Gorse *Ulex europaeus* dominated. Hedgerows in the site tend to be wind cropped due to the exposed coastal nature of the site. Hedgerow/treeline along the well stream is largely ornamental in nature, and of lower value.

Assessment of Value: **Local Importance (Lower)** due to the ornamental nature.

Scrub – WS1 and Ornamental/non -native shrub – WS3

Some patches of scrub occur throughout the study area, along parts of the streams and expanding out from some field margins.

A small area of ornamental/non-native shrub was recorded within amenity grassland behind Kilkee Waterworld in mosaic with native shrub species. Species include Hawthorn, Bramble, Creeping Thistle, Bush Vetch *Vicia sepium*, Japanese Rose *Rosa rugosa* and Cherry Laurel *Prunus laurocerasus*.

No scrub with correspondence to any Annex I scrub type habitat was noted.

Assessment of Value: **Local Importance (Lower).** Largely outside the footprint of the site, the scrub areas are either highly ornamental or young patches of encroaching scrub of limited shelter or foraging value.

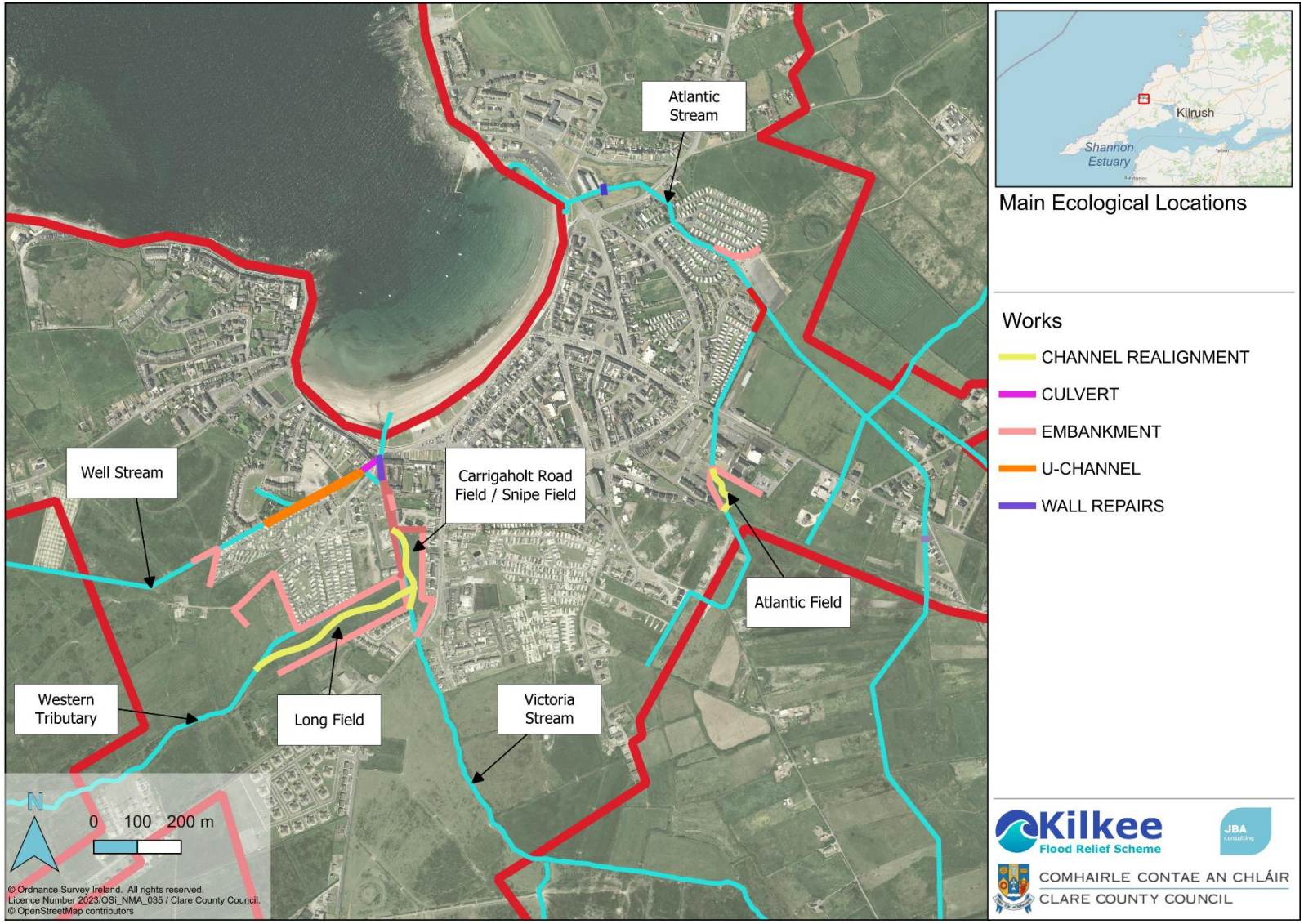


Figure 7--21: Main locations of ecological interest

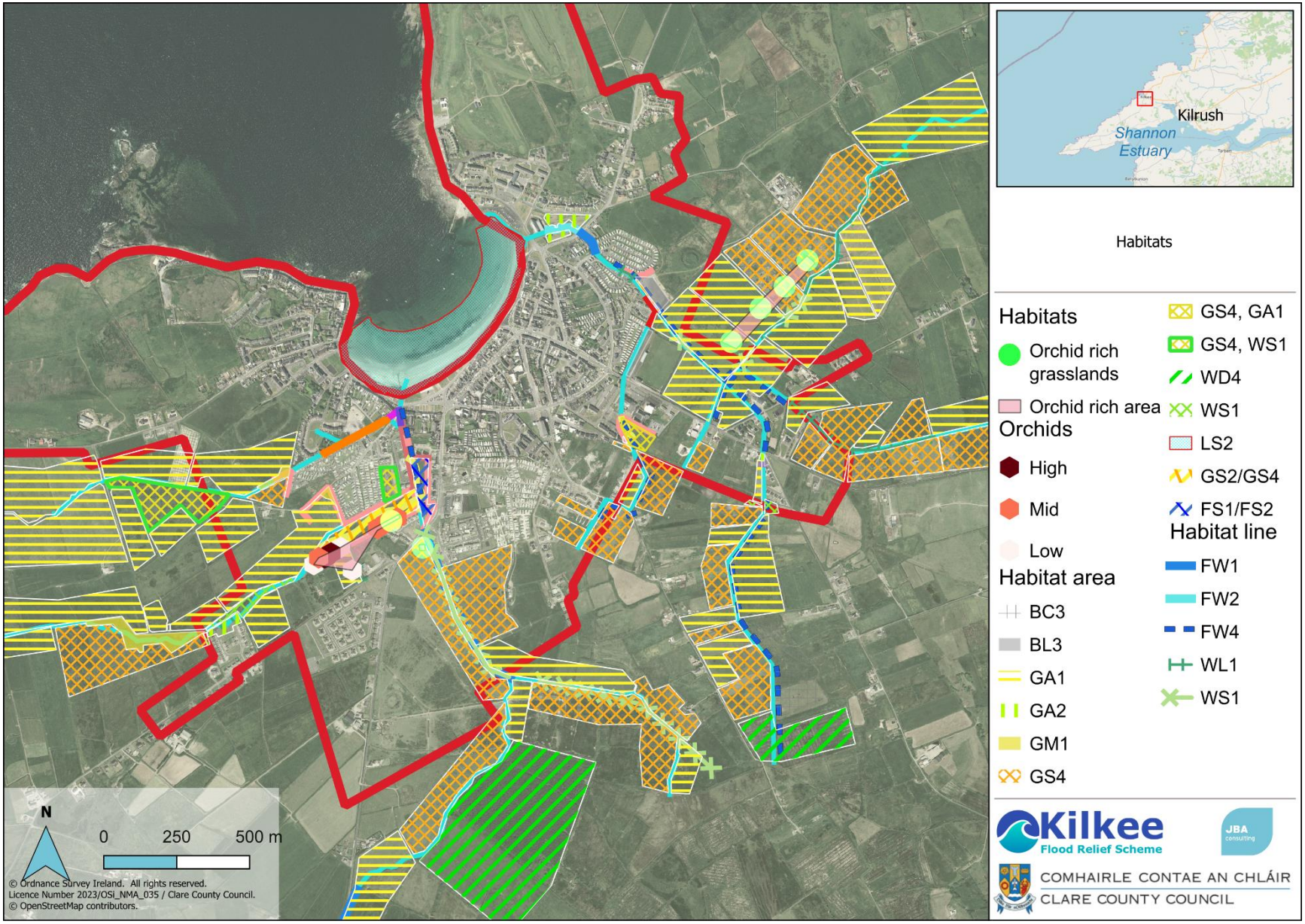


Figure 7--22: Habitats

Flora of interest

The desktop study of NBDC records for within 5km of the radius of the proposed site were gathered. Botanical society of Britain and Ireland (BSBI) records for the footprint of the site were also reviewed for 2km squares Q85Z and Q86V for protected records. No protected flora were recorded during the Desktop review.

High densities of Western Marsh-Orchid *Dactylorhiza kerryensis*, the only orchid species endemic to Ireland, were recorded in the end of the Long Field. Whilst not covered by national legislation, this species – along with other orchid species - is of high ecological value, sensitive to environmental condition and anthropogenic disturbance.This species is under recorded in Clare. This orchid generally grows in damp or quite wet pastures or meadows, which may at times be boggy. It often occurs among coarse vegetation such as rushes or yellow flag iris [88]. This orchid was recorded along the eastern boundary of the Long Field, and towards the south-west of it (Figure 7-23). Marsh orchids were also recorded during the constraints stage in the field across the road (Figure 7-24; 52.673090, -9.651569), and in fields along the tributaries of the Atlantic stream (Figure 7-25; 52.68145278, -9.63262778) and at both of which area outside the footprint or zone of influence for the scheme but indicate that the orchid is locally common.

Assessment of value: **Regional Importance**, due to being high quality indicator, and sensitivity to loss (poor reversibility) and due to incomplete baseline data with regards populations and using precautionary principle.

Figure 7--23: High density of orchids in orchid rich wet grassland.

[88] V S Summerhayes, *Wild Orchids of Britain* (London: Collins, 1976).

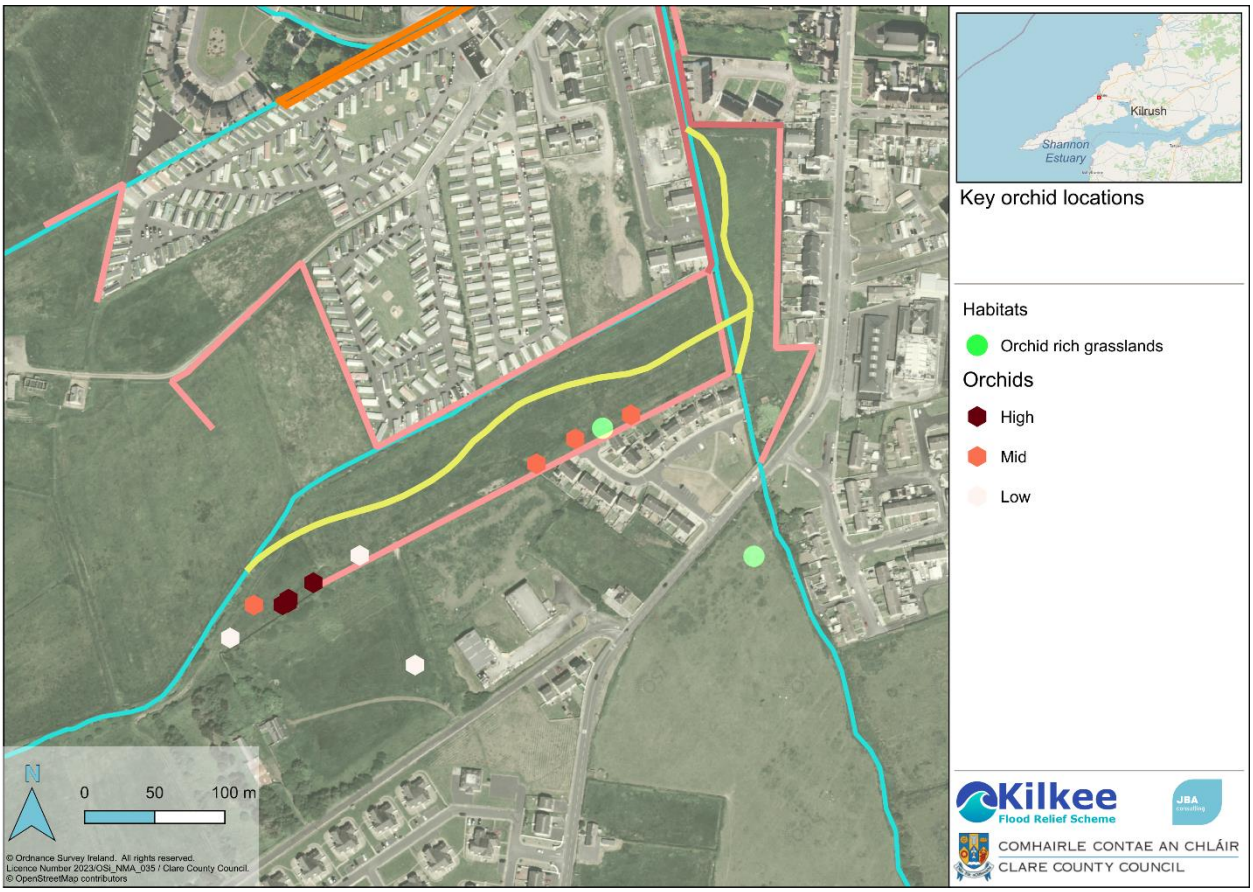


Figure 7--24: Key orchid locations along the Victoria and Western Tributary Streams

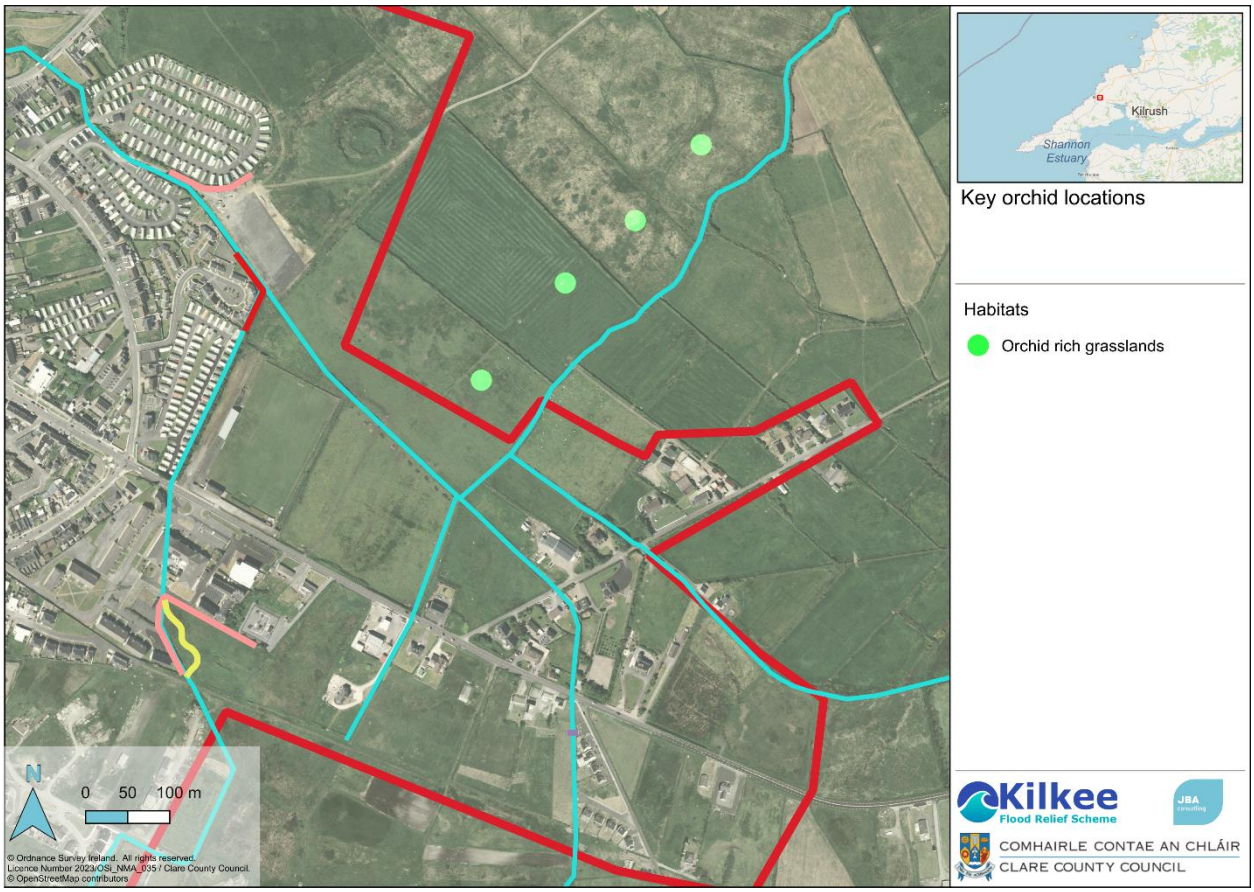


Figure 7--25: Orchid rich grassland in proximity to the Atlantic stream. Unaffected by the works.

Birds

General Records

A total of 36 species were identified across the footprint of the FRS, with some unidentified Tern and Gull species unaccounted for in the total. Six species are red listed, 10, Amber listed and the remaining 20 are green listed. A full list of species along with their status is provided in Table 7-7. The open grasslands present nesting opportunities for ground nesting birds as well as foraging opportunities for seed and insect eaters. The reed beds hosted breeding Sedge Warbler.

Some limited noise disturbance may occur but it is not expected to be sufficient to be detrimental to the bird populations. Habitat modification and removal has the potential to have a negative impact on passerines.

Table 7-7: Birds recorded within the footprint of the proposed scheme, highlighting status according to BoCCI [89] for Breeding B Wintering W or both B/W.

Common Name	Latin Name	BoCCI
Oystercatcher	*Haematopus ostralegus*	Red B/W
Black-headed Gull	*Chroicocephalus ridibundus*	Amber B/W
Gull sp.	*Laridae*	-
Tern sp.	*Laridae*	-
Herring Gull	*Larus argentatus*	Amber B/W
Lesser Black-backed Gull	*Larus fuscus*	Amber B/W
Turnstone	*Arenaria interpres*	Amber W
Snipe	*Gallinago gallinago*	Red B/W
Curlew	*Numenius arquata*	Red B/W
Greenshank	*Tringa nebularia*	Green W
Kestrel	*Falco tinnunculus*	Red B
Sedge Warbler	*Acrocephalus schoenobaenus*	Green B
Skylark	*Alauda arvensis*	Amber B
Hooded Crow	*Corvus cornix*	Green B
Rook	*Corvus frugilegus*	Green B
Jackdaw	*Corvus monedula*	Green B
Reed Bunting	*Emberiza schoeniclus*	Green B
Goldfinch	*Carduelis carduelis*	Green B
Linnet	*Linaria cannabina*	Amber B
Swallow	*Hirundo rustica*	Amber B
Grasshopper Warbler	*Locustella naevia*	Green B
Rock Pipit	*Anthus petrosus*	Green B
Meadow Pipit	*Anthus pratensis*	Red B
Robin	*Erithacus rubecula*	Green B
Stonechat	*Saxicola rubicola*	Green B
Blue Tit	*Cyanistes caeruleus*	Green B
Great Tit	*Parus major*	Green B
House Sparrow	*Passer domesticus*	Amber B
Dunnock	*Prunella modularis*	Green B
Starling	*Sturnus vulgaris*	Amber B
Blackcap	*Sylvia atricapilla*	Green B

[89] Gilbert, G., Stanbury, A., and Lewis, L. (2021) 'Birds of Conservation Concern in Ireland 4: 2020–2026', *Irish Birds*, vol. 43, 1-22

Wren	*Troglodytes troglodytes*	Green B
Redwing	*Turdus iliacus*	Red W
Blackbird	*Turdus merula*	Green B
Song Thrush	*Turdus philomelos*	Green B
Mistle Thrush	*Turdus viscivorus*	Green B
Grey Heron	*Ardea cinerea*	Green B/W
Cormorant	*Phalacrocorax carbo*	Amber B/W

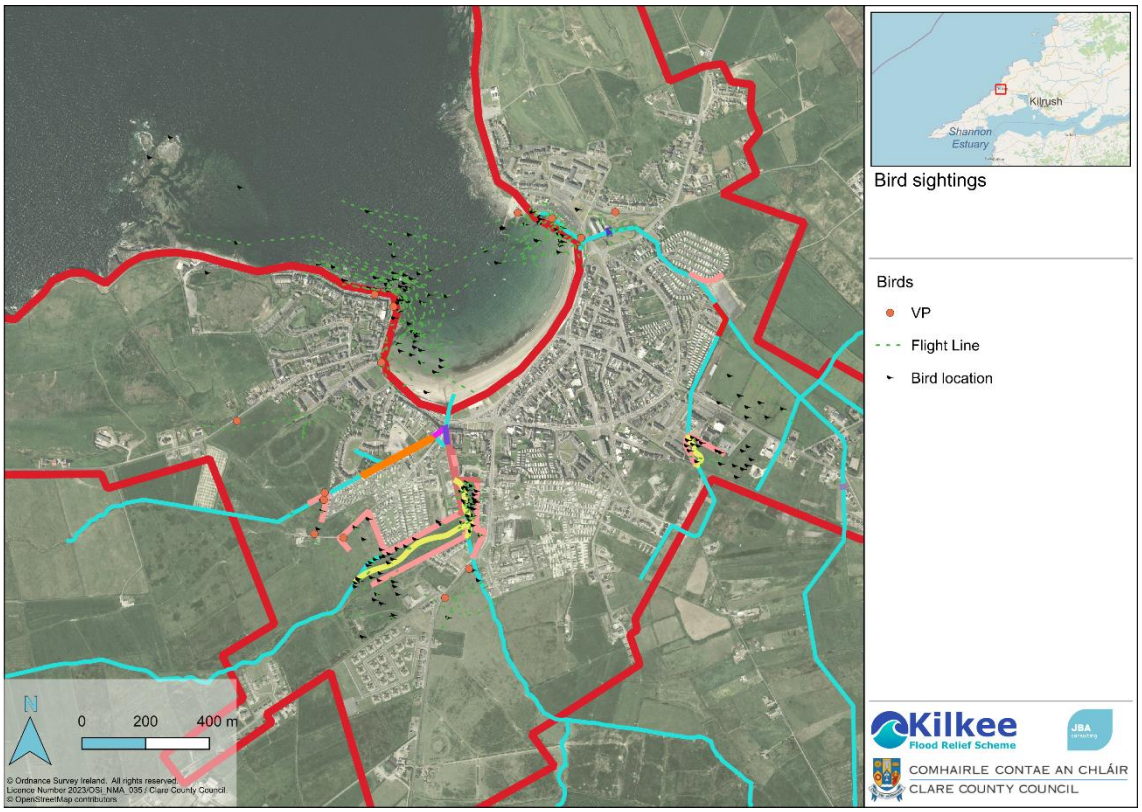


Figure 7--26: Bird sightings

Snipe

A significant amount of Common Snipe were recorded wintering in the Long Field (1), in the Carrigaholt Road Field (2), and in the Atlantic Field (3), with the highest counts of above 50 birds recorded. Snipe were recorded during each winter survey, as well as during ad hoc site visits, or nonspecific site visit during winter months. The wintering sites also presenting nesting site potential were targeted for specific breeding Snipe surveys in May /June 2022. No evidence of breeding was recorded. The site remains important for wintering Snipe, and there is potential to improve breeding wader habitat. Wintering Snipe are likely to be impacted by the works.

Figure 7--27: Snipe in flight over Carrigaholt Road Field (January 2023)

Figure 7--28: Important Snipe locations

Sedge Warbler

Sedge Warbler are a summer migrant that occur throughout the country. They are typically associated with wet habitats, particularly reedbeds, marshes and the vegetated sides of rivers, canals and lakes. Breeding Sedge Warbler were recorded in the Carrigaholt Road Field, in the vegetation along the Western Tributary, and in the patch of reed between Cunninghams' and Haugh Mobile Park.

Summary Assessment of Value:

Marine / Waterbirds**: Local Importance (Higher).** Low numbers and no especially sensitive species were recorded within the zone of influence, likely due to the disturbance already present in this urban area.

Passerines all: **Local Importance (Higher).** Suitable habitat for breeding

Sedge Warbler: **Local Importance (Higher).** Due to evidence of breeding

Snipe: **National / Regional** due to size of wintering population, and red-list status.

Fish

The fisheries survey carried out by Triturus Environmental Ltd recorded the presence of Three-spined Stickleback *Gasterosteus aculeatus*, Flounder *Platichthys flesus*, and European Eel *Anguilla anguilla* in the Victoria and Atlantic streams.

Two survey points were located along the Victoria stream and two survey points along the Western Tributary. A single survey point was located on the Atlantic stream. (Figure 7--29: Fishery survey results)

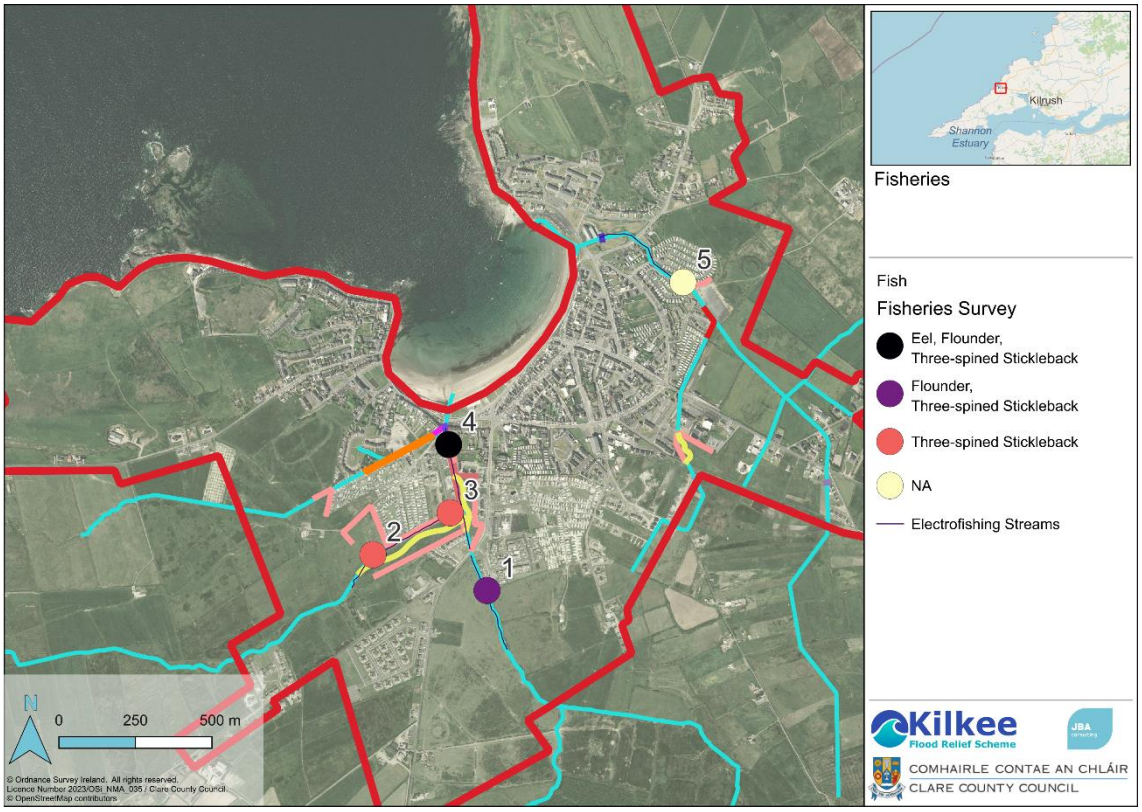


Figure 7--29: Fishery survey results

The Atlantic Stream was determined to be not of fisheries value given heavy siltation, high level of modifications, poor flows, poor hydromorphology and very poor connectivity with downstream tidal habitats, with the sea outfall being poorly passable for fish. Soft sediment accumulations were clay-dominated, which provided sub-optimal conditions for lamprey ammocoetes. However, some habitat suitability for European Eel is present. Three-spined stickleback was observed in this stream.

The Victoria Stream was not of value to salmonids given low seasonal flows, historical modifications, poor hydromorphology and poor connectivity with downstream habitats, with poor connectivity with the sea and poor-quality tidal habitat. The stretches closest to the outfall (Site 4), was of high value as a European Eel nursery supporting a high density of elvers (n=21) and as a flounder nursery, with a high density recorded (n=43). Site 4 provided excellent eel habitat given an abundance of instream refugia, namely under

existing (scoured) retaining walls and cobble/boulder substrata. Tidal mud accumulations in the lowermost reaches near the road crossing also provided evidently suitable elver habitat. A single adult eel was also recorded.

The Western Tributary was not of fisheries value given the diminutive nature of the channel, poor flows, poor hydromorphology, siltation pressures and poor connectivity with downstream habitats. Three-spined stickleback was the only species recorded in this stream.

Table 7-8: Electrofishing results

Site	Location	Results of electrofishing study
Site 1	Victoria Stream Upper	Three-spined Stickleback *n*=19 Flounder n =1
Site 2	Western Tributary Upper	Three-spined Stickleback *n*=3
Site 3	Western Tributary Lower	Three-spined Stickleback *n*=5
Site 4	Victoria Stream Lower	Three-spined stickleback n = 49 Flounder n=43 European eel n = 22 of which 21 elvers and 1 adult
Site 5	Atlantic Stream	No catch

Catadromous species such as European eel and flounder primarily rely on 'flood tide transport' to colonise catchments. In light of the tidal barrier (gate) to fish passage at the Marine Parade Road culvert, it can be surmised that the occasional coinciding of high spring tides and flood gate openings are sufficient to facilitate low-level colonisation of the Kilkee Lower Stream by such species, but not others such as salmonids which would likely require improved fluvial connectivity. The barrier is closed between the start of June to the end of August during the bathing season and may overlap with late migration of elvers into river systems which has been noted more frequently in recent years. Furthermore, juvenile European eel are able to navigate even vertical surfaces (such as a tidal gate) provided they are wet, provide traction and are of low height [90].

The poor quality of upstream riverine habitats in the vicinity of Kilkee may be encouraging residency of European eel to the lower/transitional reaches of these catchments, as is often noted in the species [91].

European Eel:

European Eel spawn in the Sargasso Sea; the eggs develop into Leptocephalus which drift back across the Atlantic. As they grow and move into coastal waters, they develop into Glass Eel (at approximately 8 cm). From there Elvers migrate to freshwater habitats where they develop over the next 5 – 20 years. Peak recruitment is thought to occur between May and June. Upon reaching maturity, Eel then migrate back to the Sargasso Sea to spawn and complete their life cycle [92]. The time spent in freshwater habitat, and Eel nurseries makes them particularly vulnerable to river works and water quality.

European Eel are *Critically Endangered* species under the IUCN Red-List and Irish Status is also *Critically Endangered* [93] protected under national and EU legislation.

[90] Triturus, "Fisheries Assessment for Kilkee Flood Relief Scheme, Co. Clare."

[91] Triturus.

[92] Alessandro Cresci, "A Comprehensive Hypothesis on the Migration of European Glass Eels (*Anguilla Anguilla*)," *Biological Reviews* 95, no. 5 (2020): 1273–86, https://doi.org/10.1111/brv.12609; Rose M. Boardman et al., "Variability in the Duration and Timing of the Estuarine to Freshwater Transition of Critically Endangered European Eel *Anguilla Anguilla*," *Aquatic Sciences* 86, no. 1 (December 26, 2023): 18, https://doi.org/10.1007/s00027-023-01033-y.

[93] JL King et al., "Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish." (National Parks and Wildlife Service, 2011).

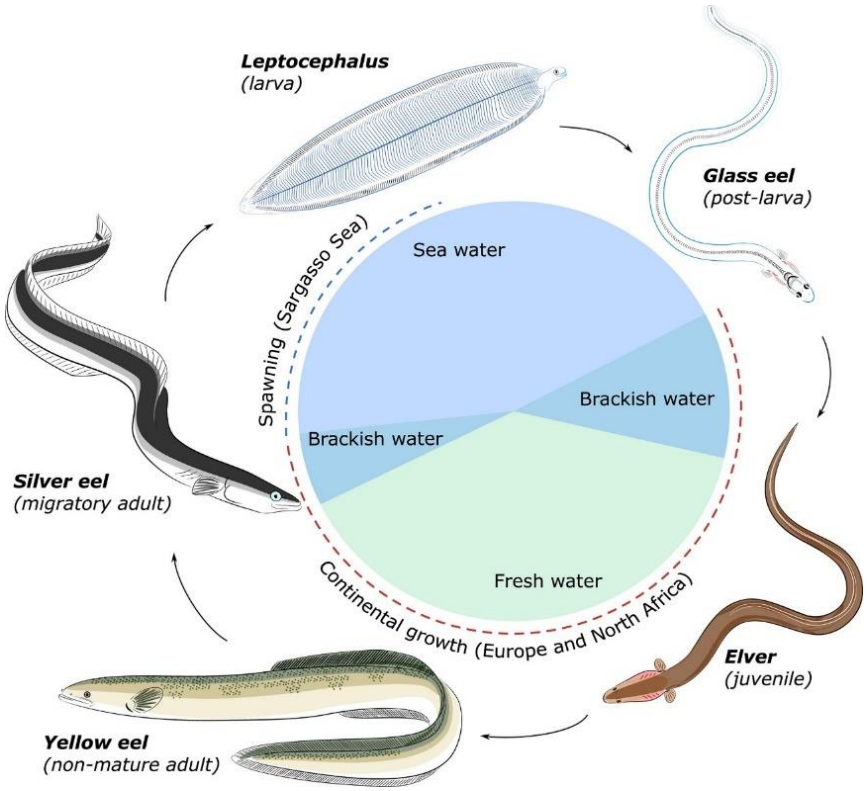


Figure 7--30: Eel life cycle [94].

As noted above, Site 4 in the Lower Victoria stream provides important eel habitat. Assessed as **Regionally to Nationally Important** given the Red-listed and Critically Endangered Nature of this species and the density of elvers recorded.

Flounder: species of Least Concern for Irish and Global Status under the IUCN RedList and under Ireland Red List [95].. They are widely distributed along the coasts of Europe. They are a shallow-water, bottom-living flatfish inhabiting muddy and sandy bottoms. They spend most of their lives in estuaries and are the only known species of flatfish that inhabit freshwater and can travel upriver [96]. Assessed as **Locally Important (Higher Value).**

Three-spined Stickleback: species of Least Concern under the IUCN RedList. They are widely distributed inhabiting a diversity of aquatic habitats due to a high salinity tolerance [97]. Assessed as **Less than Local** due to ubiquity of species.

Amphibian

Both Frog and Smooth Newt are present in the NBDC records. These species were not recorded during the surveys, but there is an abundance of suitable habitat within the footprint of the scheme, with streams and marshy areas. Some of the wetter areas of the Carrigaholt Road Field have suitability for frog but dry out too much in summer for smooth newt. The lack of ponds within the footprint of the scheme makes it unlikely for breeding Smooth Newt. Further detail is preent in Section 7.5, and preconstruction surveys will be carried out. e-DNA results did not find evidence of Smooth Newt in the Well Stream.

Assessment of Value: **Local Importance (Higher).** Frog species are likely to be present, as part of a population of local importance.

[94] Cresci, “A Comprehensive Hypothesis on the Migration of European Glass Eels (*Anguilla Anguilla*).”

[95] King et al., “Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish.”

[96] Alwyne C. Wheeler, *Key to the Fishes of Northern Europe: A Guide to the Identification of More Than 350 Species* (F. Warne, 1978).

[97] IFI, “Three-Spined Stickleback (*Gasterosteus Aculeatus*) | Inland Fisheries Ireland,” June 25, 2021.

Camera Trapping

Camera traps were placed along suspected mammals runs in five different locations; they were left to record for 38 consecutive days between 30 March 2022 and 9 May 2022, and 23 days between 26 June 2023 and 19 July 2023. A total of 7000 images were recorded, of which 92% were false triggers, leaving 64 images of wild mammals, nine insects, and 430 birds. Domestic species were excluded. Bird species recorded on the camera trap were added to the totals in section.

Mammals recorded included Greater White-toothed Shrew *Crocidura russula*, Fox *Vulpes vulpes*, Badger *Meles meles*, and Mouse *Mus* sp.

Mammals

Badger: Recorded on camera traps and suspected setts present in the area. Activity and setts were not recorded within the scheme footprint, however these are a highly mobile species and can establish in new areas rapidly. Activity records include latrines, runs and prints, visual confirmation. Potential sett locations are not presented in this document due to the sensitivity of the records. They are to be presented separately in a confidential manner. Further details are present in Section 7.5.

Otter: Not recorded in the Atlantic, Victoria or adjacent streams. Evidence of Otter present along the coast. Foraging opportunities in the Victoria stream. Activity records include latrines, runs and prints, visual confirmation. Further details are present in Section 7.5.

Hare: Suitable habitat found throughout the area, although no signs were recorded. Further assessment is required – will be covered in Section 7.5.

Fox: Measures in place for other protected species will also apply to fox. No further assessment required.

Greater White-toothed Shrew: Invasive Non-Native Species (INNS). No further assessment required.

Squirrel, Pine Martin, Stoat: Not recorded on site and no evidence of presence. Little to no suitable habitat present on site. Measures in place for other protected species will also apply. No further assessment required.

Bats

The site presents limited bat potential with a notable lack of roost features within the proposed FRS footprint. Some linear features along the boundary of Cunninghams' caravan park, and the hedges in the surrounding fields present some limited foraging opportunities. Potential suitability for roosting habitats in structures was classified as 'None', with Potential flightpaths and foraging habitats classified as 'Negligible'[98]. Potential suitability for roosting habitats in structures was classified as 'None', with Potential flightpaths and foraging habitats classified as 'Negligible'[99].

A total of 9405 potential calls were recorded on the static bat detector. Call characteristics were analysed to determine probable species present. After filtering out non bat frequencies, 55 recordings were analysed for species identification, of which 28 were false positives (bird calls), leaving 27 positive bat calls. These calls were characteristics of Common Pipistrelle *Pipistrellus pipistrellus* and Soprano Pipistrelle *Pipistrellus pygmaeus.* The limited roost potentials, marginal foraging habitats present on site, and sub optimal timing of survey, may explain the limited diversity of bats in the area.

The zone of impact relating directly to bats is considered limited in this case due to the limited roost potential of areas within the footprint of the works, the lack of hedgerows or treelines within the project. General protective measures will be applied for these protective species.

Assessment of Value:

Bats (Roosting): **Local Importance (Lower)** due to lack of roost features identified.

Bats (Foraging/Commuting): **Local Importance (Higher).** Some foraging available. Limited commuting features present.

[98] J. (ed.) Collins, Bat Surveys for Professional Ecologists: Good Practice Guidelines, 4th edn (London: The Bat Conservation Trust, 2023).Collins, *Bat Surveys for Professional Ecologists: Good Practice Guidelines*.

[99] J. (ed.) Collins, Bat Surveys for Professional Ecologists: Good Practice Guidelines, 4th edn (London: The Bat Conservation Trust, 2023).Collins.

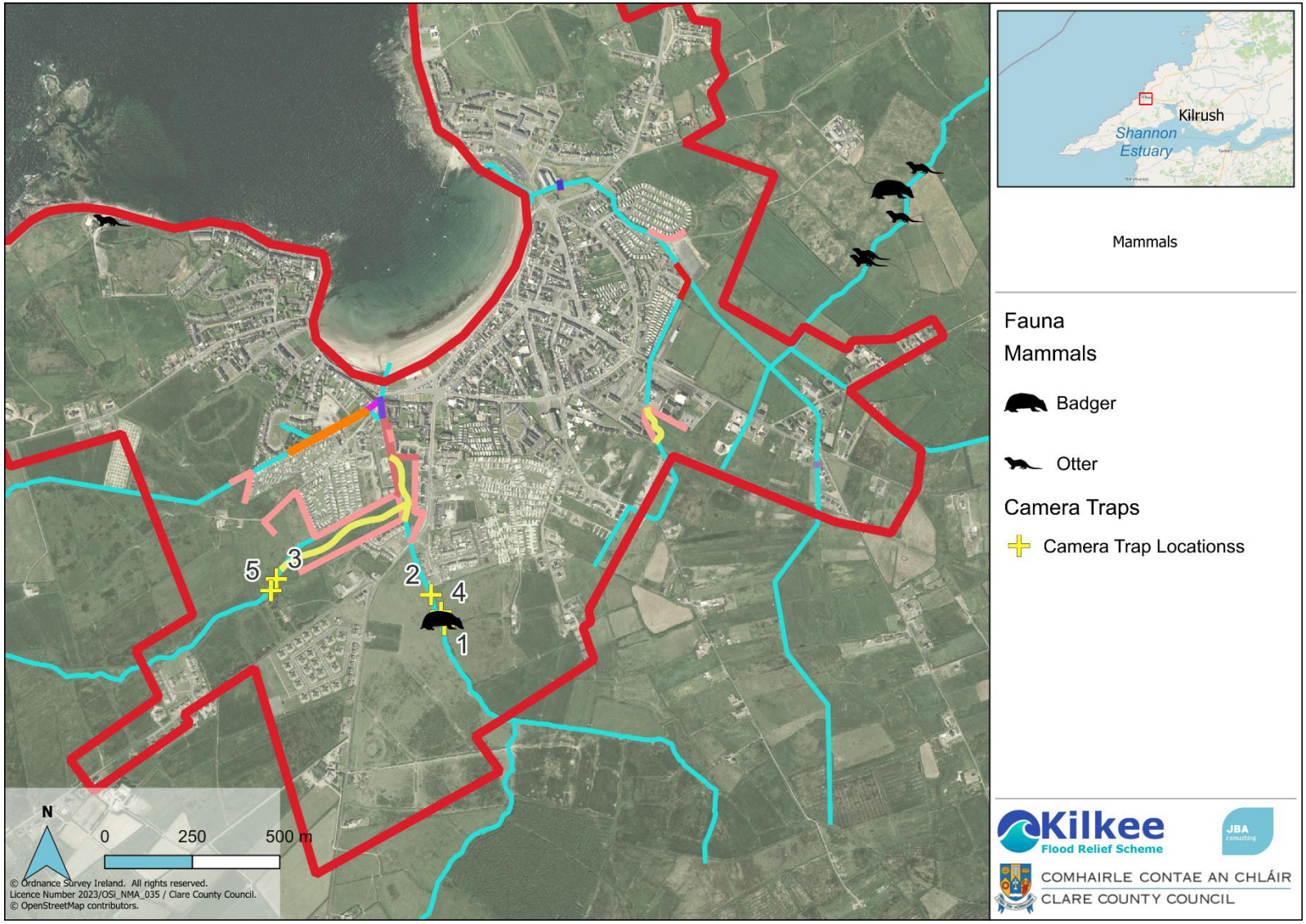


Figure 7--31: Mammal activity records, including visual confirmation, latrines, mammal runs

Invasive species

Invasive Non-Native Species (INNS) have been recorded in the area including Japanese knotweed, Three-cornered Garlic, Crocosmia sp. and Sycamore. Japanese Knotweed in Kilkee is being actively managed by Clare Co Council. Further assessment to prevent the spread of INNS is required.

Invertebrates

Annex IV and II Invertebrates

Vertigo Snails

There are eight species of Whorl snails in Ireland, of which three are protected under Annex II of the Habitats Directive, *Vertigo angustior*, *V. geyeri*, and *V. moulinsiana* [100].

Whorl snails are groundwater dependent, requiring stable conditions. They are short lived, typically just over a year, and are therefore vulnerable to the effects of negative changes in wetness conditions and have been lost from many sites both in Ireland and across the EU. These snails are mainly associated with calcareous areas and/or dunes. They are not protected outside of SACs designated with *Vertigo* as a QI species. Furthermore, the three Annex II species are unlikely to occur in the scheme footprint. A desktop study of all Vertigo species in West Clare provides an indication that little to no suitable habitat is present within the footprint of the site for *Vertigo* species.

Table 7-9: Protected Whorl snail

Species	Habitat preference	Nearest Record Location	Presence in Kilkee FRS	Designation
Vertigo angustior	Humid dune grassland	Doonbeg	Unlikely – wrong habitat	Annex II EU habitats Directive / Red list Vulnerable
Vertigo geyeri	Calcareous flushes	-	Unlikely - Not in distribution range. Unsuitable habitat.	Annex II EU habitats Directive / Red list Vulnerable
Vertigo moulinsiana	Good cover of tall sedges and grasses. Most often found in calcareous conditions.	-	Not in distribution range. Unsuitable habitat.	Annex II EU habitats Directive / Red list Endangered

Marsh Fritillary

No habitat suitable for Marsh Fritillary *Euphydryas aurinia* was identified within the footprint of the scheme. Fields such as the Long Field, the Carrigaholt Road Field and the fields bordering the Atlantic Stream (in immediate proximity) had no presence of Devil's Bit Scabious. Potential for habitat creation is limited by the need for storage areas to flood, thus precluding Marsh Fritillary, as the larval webs of Marsh Fritillary are only tolerant to short periods of inundation at best.

White Clawed Crayfish

The site is outside the range for White Clawed Crayfish.

Kerry Slug

The site is outside the range for protected populations of Kerry Slug.

Thus, no Annex II or Annex IV species invertebrate species are considered to be within the footprint of the scheme.

Marine Species

A collection of NBDC for protected species within 5km of the study area indicated the presence of a number of marine species: Basking Shark *Cetorhinus maximus*, Bottle-nosed Dolphin *Tursiops truncatus,* Common Dolphin *Delphinus delphis,* Common Porpoise *Phocoena phocoena,* Grey Seal *Halichoerus grypus,* Humpback Whale *Megaptera novaeangliae,* Killer Whale *Orcinus orca,* Long-finned Pilot Whale

[100] A. Byrne et al., "Ireland Red List No. 2 – Non Marine Molluscs" (Dublin, Ireland: National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, 2009).

Globicephala melas, Minke Whale *Balaenoptera acutorostrata*, Risso's Dolphin *Grampus griseus,* Striped Dolphin *Stenella coeruleoalba*.

The fully terrestrial nature of the footprint of the scheme, the highly utilised nature of the bay by recreational users on daily basis, as well and the low level of works (lack deep excavations involving vibrational works) within the scheme indicate that there will be no requirement for further assessment of impacts on marine species identified during the collation of NBDC records within 5km.

Screening Assessment Summary

Ecological feature	Value	Screening	Reasoning
Designated sites			
Kilkee Reefs SAC	International	Out	Assessed in NIS
Poulnasherry Bay pNHA,	National	Out	Treated in overlapping SAC / SPA - No connection to site
Lower River Shannon SAC	International	Out	Assessed in AASR - No connection to site
River Shannon and River Fergus Estuaries SPA	International	Out	Assessed in AASR - No connection to site
Farrihy Lough pNHA	National	Out	No pathways for impact identified.
Tullaher Lough and Bog SAC	International	Out	Assessed in AASR - No connection to site
Tullaher lough and Bog pNHA	International	Out	Treated in overlapping SAC / SPA - No connection to site
Illaunonearaun NHA	National	Out	Treated in overlapping SAC / SPA - No connection to site
Illaunonearaun SPA	International	Out	Assessed in AASR - No connection to site
Mid-Clare Coast SPA	International	Out	Assessed in AASR - No connection to site
Carrowmore Dunes SAC	International	Out	Assessed in AASR - No connection to site
Scattery Island pNHA	National	Out	Treated in overlapping SAC / SPA - No connection to site
Beal Point pNHA	National	Out	Treated in overlapping SAC / SPA - No connection to site
White Strand/Carrowmore Marsh pNHA	National	Out	Treated in overlapping SAC / SPA - No connection to site
Carrowmore Point to Spanish Point and Islands SAC	International	Out	Assessed in AASR - No connection to site
Carrowmore Point to Spanish Point and Islands pNHA	National	Out	Treated in overlapping SAC / SPA - No connection to site
Ballylongford Bay	International	Out	Assessed in AASR - No connection to site
Habitats			
Buildings and artificial surfaces	Less than local	Out	Low value habitat
Reed and large sedge swamp	**Local Importance (Higher Value).**	**In**	**Locally important habitat for various species including Snipe, Sedge warbler and amphibians.**
Improved agricultural grassland	Less than local	Out	Low value habitat / Not affected by the works
Amenity grassland	Less than local	Out	Not affected by the works
Marsh	**Local Importance (Higher Value)**	**In**	**High ecological potential**
Wet grassland / Dry	**Regional**	**In**	**Annex I quality habitat, presence**

Ecological feature	Value	Screening	Reasoning
Meadows and Grassy verges mosaic	**Importance**		**of good indicator species.**
Wet grassland	**Local Importance (Higher Value).**	**In**	**High ecological potential**
Exposed rocky shores	International	Out	Assessed in NIS
Sand shores	**Local Importance (Higher Value).**	**In**	**Connection to Kilkee Reefs SAC**
Sea inlets and bays	International	Out	Assessed in NIS
Hedgerow	Local Importance (Lower)	Out	Higher value hedgerows are outside the footprint of the site. Low value habitat as holding ornamental species.
Scrub and Ornamental / non-native shrubbery	Less than Local	Out	Low value habitat
Rivers			
Atlantic Stream	**Lower local importance**	**In**	**Highly modified and controlled stream, but features of local importance and ecological potential, links in local environment.**
Well Stream	**Lower local importance**	**In**	**Highly modified / piped stream but features of local importance including eel.**
Western Tributary	**Local Importance (Higher Value).**	**In**	**Highly modified but high ecological potential**
Victoria Stream	**Local Importance (Higher Value).**	**In**	**Highly modified but high ecological potential**
Flora			
Flora of interest: orchids: *Dactylorhiza* sp.	**Regional Importance**	**In**	**Endemic species**
Protected Flora	None present	Out	None present
Invasives species – Japanese Knotweed	**3rd Schedule species**	**In**	**Present along scheme.**
Mammals			
Other e.g. Pine-marten, Fox, Stoat etc.	Local Importance (Lower Value)	Out	Fox: widespread highly adaptable species. Measures covering Badger and Otter would protect Fox. Greater White Toothed Shrew: INNS
Badger	**Regional Importance.**	**In**	**Protected species**
Otter	**Regional Importance.**	**In**	**Protected species**
Bats (roosting)	**Local Importance (Lower)**	**In**	**Nationally and internationally protected species. Highly mobile with capacity to move. Preliminary roost identification identified no roosting features within the direct footprint (limited trees, no buildings).**
Bats (foraging)	**Local Importance (Lower)**	**In**	**Some foraging habitats. Protected species (nationally and internationally protected).**
Hare	**Local Importance (Higher)**	**In**	**Suitable habitat present**

Ecological feature	Value	Screening	Reasoning
Birds			
Marine / Waterbirds	Local Importance (Higher).	Out	Unlikely to be affected by the works due to lack of sensitive species. Birds recorded tolerant of disturbance in this urban environment.
Passerines all	**Local Importance (Higher Value).**	**In**	**Suitable habitat present**
Sedge Warbler	**Local Importance (Higher Value).**	**In**	**Evidence of breeding**
Snipe	**National / Regional**	**In**	**Important wintering site**
Fish & Amphibians			
Flounder	**Local Importance (Higher Value).**	**In**	**Density of numbers caught during electrofishing.**
Eel	**National**	**In**	**Protected species.**
Amphibians	**Local Importance (Higher)**	**In**	**Suitable habitat present / potential for habitat creation.**
Invertebrates			
Annex IV and Annex II Invertebrates	n/a	Out	Unlikely to occur within the footprint of the scheme
Marine Species			
Numerous	n/a	Out	Outside the zone of influence of the scheme

7.5 Predicted Impact (Pre-mitigation)

This section further examines the source > pathway > receptor chains that could potentially result in adverse impacts arising on the environment and ecological receptors as a result of the proposed works to be carried out in Kilkee.

Potential Sources of Impact via Surface Water Pathways

Release of suspended solids – this is most likely to occur as a result of sediment being released into the waterways during the works. It may come from erosion of exposed areas of embankment, poorly stored excavation material and bare ground created by vehicle movements. This has the potential to impact water quality, aquatic species including fish, and indirectly bird and mammals foraging in the water.

Release or changes in nutrient levels – this is most likely to occur as a result of the nutrients currently trapped in sediment being released in the manner described for suspended solids. Any attempt to fertilise the embankment to encourage vegetation establishment would also lead to nutrient release. It can impact on surface water dependent habitats indirectly through eutrophication and reducing water quality.

Release of pollutants – this would be a construction impact due to vehicles and site compound locations creating a local release of polluting material.

Changes in water levels/channel morphology – this would be as a result of the in-stream works, including placing of the U channel, realignment of the streams, water pumping and channelling. It can impact on surface water dependent organisms through changes in aquatic invertebrates and plant communities, and the loss of suitable habitat.

Potential Sources of Impact via Land Pathways

Direct habitat loss – There will be some loss of marsh habitat, reed bed, wet grassland, ornamental hedgerow and scrub habitat. There will be loss of stream habitat when realigning two watercourses.

Physical disturbance – The works are likely to cause disturbance to birds, mammals, fish species, and some important plant communities. This will likely be due to removal of habitat, and obstruction to normal behaviour. Disturbance of habitats can include tracking of machinery, soil compaction, removal of vegetation.

Noise and visual disturbance – this would occur during the construction phase and would impact specifically on birds and mammals where noise and visual disturbance could displace animals from the habitats.

The impacts of noise and visual disturbance on species is a complex impact to quantify, but Otters are mostly active at night, and unlikely to be directly disturbed unless works are very close to resting places. The use of lights overnight can be disruptive to Otter activity, and even if there are no night works, security lights may be used to help protect equipment that can't be removed from the site.

Potential Sources of Impact via Groundwater Pathways

Potential Impacts to groundwater are obstruction of flows; or largely similar to those of contamination of surface waters. The nature of the works, with shallow excavations, and reconstruction of existing walls make it unlikely for there to be any obstruction to groundwater flows. No features of the scheme are present that would obstruct groundwater flows. No groundwater dependent habitats such as turloughs or fens are present within the footprint of the site. Some wetter marsh or reed areas may be dependent on high water tables.

The proximity of water and the coastline mean that groundwater if encountered will likely have a direct connection to surface waters. i.e. a groundwater to surface-water pathway. Limited excavations and mitigation measures for surface waters will also protect groundwater.

Do Nothing Impact

The do-nothing impact is always subject to a significant amount of uncertainty. In the absence of other interventions, the do-nothing option is likely to involve flooding events in Kilkee, including road infrastructure, dwellings and businesses, resulting in reoccurring and long-term socio-economic pressures on the local community. This could result in the requirement for emergency works or ad-hoc remedial measures which may negatively impact the environment if done inappropriately. Impacts are likely to be modified by human responses to changes and no attempt is made here to predict these. Current flooding regime and do nothing impacts are unlikely to impact on habitats. Flooding events also have the potential to mobilise pollutants and physical material into the watercourses, but records of mobilisation of pollutants as a result of flooding in Kilkee are incomplete. Some past flooding events at the Atlantic Stream culvert have result in large amounts of sediment being mobilised. This will continue to occur.

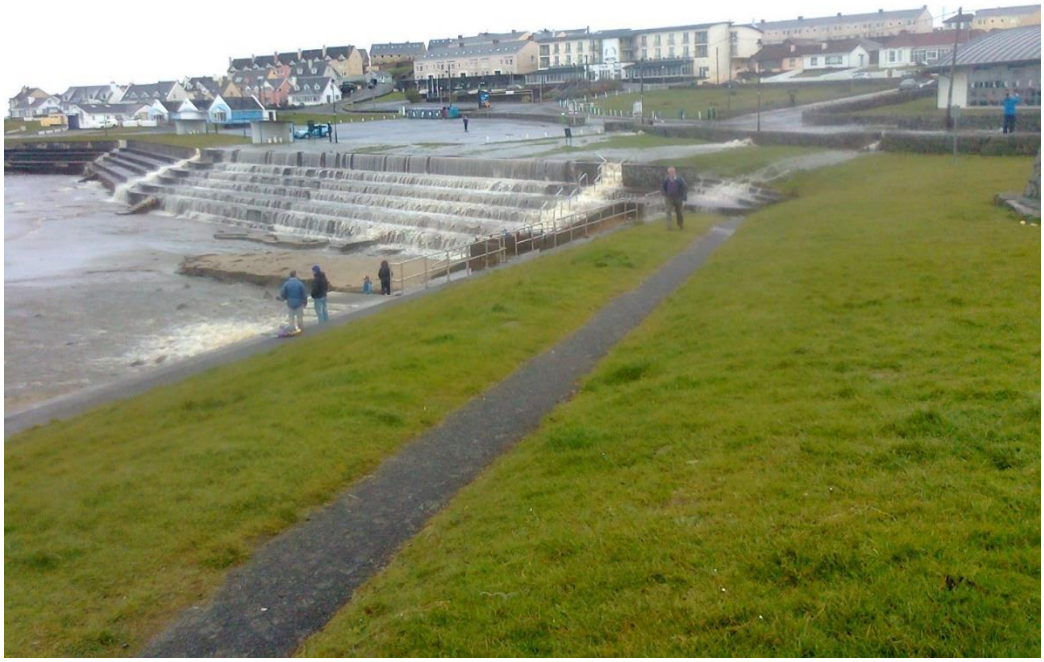


Figure 7--32: Overflow at Waterworld

Construction Phase Impacts

The main construction phase impacts assessed are:

- Habitat loss/disturbance.
- Habitat degradation
- Disturbance to faunal species.
- Reduction in water quality.
- Release of dust (impacting habitats and water quality).
- Spread of invasive species.

Potential direct and indirect impacts are discussed in detail below. Where potentially significant adverse impacts are identified, avoidance and mitigation measures are proposed to offset these impacts.

This section will identify all impacts common to the entire scheme (e.g. dust, disturbance) and further analysed by specific location of each section of the proposed Scheme. The impacts to each ecological receptor will be assessed by location of each element of the proposed Scheme as follows:

- Impacts not location specific e.g. disturbance impacts, emissions, invasive species etc.
- Impacts at Atlantic Stream – Kilkee Bay Hotel
- Impacts at Atlantic Stream Outfall
- Impacts at Victoria Stream

Impacts Over Entire Scheme

Noise and Vibration Impacts

A noise assessment was carried out and is presented in the Construction Impacts chapter of this EIAR. There will be no operational noise and/or vibration impact from the operation of the proposed development. As no sheet piling is proposed, it is expected that there will be no significant vibration impact during the construction. Construction noise is not anticipated to be significant in volume or duration. It is expected that breaking of road surface and concrete will lead to noise of 95dB for hand-held pneumatic work and 80dB for backhoe hydraulic breaker. These sound levels are not exceptionally high and will be temporary in nature. Different Fauna will react differently to noise and they are assessed separately in their individual sections below.

Dust and Emissions

A separate Air Quality report has been carried out for the EIAR (Construction Impacts Chapter 6). The volume of deposition due to demolition, earthworks, construction and trackout has the potential to affect sensitive habitats as well as plant communities. Dust could smother habitats adjacent to the works. There is also a potential impact that any dust settling in the river or watercourses could introduce pollutants which could impact aquatic species. Dust mitigation measures are set out in the Construction Impacts Chapter 6.

Embankment Construction

The embankment footprint will cause the permanent loss of the underlying habitat. Furthermore, there is potential for accidental release of suspended solids, nutrients and pollutants into the streams and associated habitats over the 12 to 18 month construction period. Release of suspended solids, dust, hydrocarbons from construction activities associated with the embankment construction could impact through changes in water quality, turbidity, smothering etc. Polluting materials from accidental spills could enter the streams and have a deleterious effect on water quality which can affect surface water dependent habitats. Mitigation measures will be required to protect habitats from release of any sediment and impact water quality.

Wall Construction

Walls will be mainly built to replace existing infrastructure, and therefore habitat removals will be unexpected / limited. However, during site preparation, removal of existing infrastructure, excavations, there is potential for release of dust, sediments and trapped nutrients. During the pouring of foundations, and construction of new walls there is potential for uncured concrete and cement dust to enter the waterways.

Stormwater Drains

The installation of new stormwater drains has the potential to result in the release of contaminanted surface/stormwater release at the tie of tying in the new stormwater drain to the network e.g. new pipes will be contaminated with soil, or where concrete pipes are used, cement dust. Upgrading of stormwater drains could also result in similar release of materials.

Culvert Construction

Removal of existing culvert has the potential to impact organisms living within them; installation of the new u-channel, and new culverts will require excavation of existing stream bed which will impact the stream channel, as well as all the organisms living within it. There is potential from water pollution, habitat and species loss, as well as loss of spawning sites / fish nurseries.

Impacts on Mammals

Bats

Common and Soprano Pipistrelle were recorded in the area. These species have different ecological niches and may use the environment in slightly different ways. However, they tend to use linear features such as hedges, woodland edges as foraging sites. Soprano Pipistrelle are also associated with wetland / riparian habitats, whilst Common Pipistrelle also use open grassland areas to forage. Broadly Soprano Pipistrelle prefer to forage in riparian habitats, whereas Common Pipistrelle is more generalist foraging in riparian, meadow and small woodland habitats [101].

There will be no loss of roosts associated with the project. There will be a loss of some scrub and a limited amount hedgerow habitat, which could be of value as a foraging and commuting corridor. However, this is of sub-optimal quality for the bats. There will be no permanent loss of foraging habitat due to the inherent design level mitigation of the project and the increased wetland area may provide higher quality habitat for invertebrates, and further opportunities for bats.

The effects on Bats are anticipated to be **neutral** and **temporary** in nature.

Badger

Evidence of badger using the land around Kilkee was recorded; potential sett locations were also noted and monitored. No active sett was recorded within the footprint of the scheme works. No setts are likely to be disturbed by the works, due to distance. Potential disturbance effects on Badger are anticipated to be temporary in nature and confined to the construction period but are highly unlikely to be at a level that would impact breeding success. No loss of overall foraging habitat is anticipated, due to the inherent design of the project. Some slight fragmentation of habitat is anticipated, walls are in the footprint of the existing walls/embankments. However, some standard precautionary measures must be taken and considered to avoid any risk. Any potential disturbance is offset by design level improvements in overall functioning of the habitats through dechannelisation and removal of steep double embankments enclosing streams, which are provide some existing fragmentation.

The effects on Badger are anticipated to be **neutral** and **temporary** in nature.

Otter

Otter were recorded using the area around Kilkee; no evidence of Otter activity was recorded on the Atlantic, Victoria, Western Tributary or Well streams. These waterways host Otter prey species and therefore there is potential for interactions between the scheme and Otter. Precautionary mitigation measures will be undertaken to avoid and minimise any risk.

No loss of overall foraging habitat is anticipated, due to the inherent design of the project. Potential disturbance effects on Otter are anticipated to be temporary in nature and confined to the construction period, but are highly unlikely to be at a level that would impact breeding success. There is potential for indirect slight negative impact through water pollution. The slight negative impacts are offset by overall

[101] Alek Rachwald et al., “Habitat Preferences of Soprano Pipistrelle *Pipistrellus Pygmaeus* (Leach, 1825) and Common Pipistrelle *Pipistrellus Pipistrellus* (Schreber, 1774) in Two Different Woodlands in North East Scotland,” *Zoological Studies* 55 (May 31, 2016): e22, https://doi.org/10.6620/ZS.2016.55-22.

improvements in ecosystem functioning at design level, and realignment of the stream, presence of pools which will be used by amphibians, a food source for Otter.

The effects on Otter are anticipated to be **neutral** and **temporary** in nature.

Other

Other mammal species using the area may be impacted by the works; this includes both legally protected species (e.g. Irish Hare) and those that are not afforded legal protection (e.g. Fox). For Hare: Suitable habitat is found throughout the area, but no signs were recorded. Pre-conconstrcution survey may detail location of breeding sites which are likely to changeable. Standard precautionary measures used for Otter and Badger should provide the necessary cover for all other mammal species ensuring that risk to wildlife is minimised.

The effect on other mammals is expected to be **temporary slight negative**.

Impacts on Birds

Birds will be affected at different distances from the noise source. Conservatively a 600m buffer is applied as Greenland White Fronted Goose is the most sensitive. Kilkee Bay doesn't receive Greenland White Fronted Goose, nor any significant numbers of other Goose species, and none were recorded during winter surveys. Gulls, and waders that are in the area have varying degrees of sensitivity ranging from 50m to 100m [102]. These buffer distances apply to wintering birds. No records of nesting Gulls, or wetland and waterbirds was recorded within the scheme footprint nor its surrounding areas. As a precautionary measure, a 100m buffer is assumed to be the limit of disturbance to large flocks of birds.

Marine birds: The vast majority of works in the scheme will not have a significant effect on the bird populations as a whole. The marine birds are mainly found along the coastal exposed rocks (reefs) and the beach area. These will be most likely affected by works along the waterfront i.e. works on the Atlantic culvert and debris screen replacement. Noise disturbance may occur if there is exposure to loud noise. This may cause temporary disturbance and displacement. However, the marine birds associated with the beach and reefs in this area are tolerant of disturbance and the works will be at a similar or lesser disturbance level to the daily noise of the busy town, recreational users of the beach and marine steps, as well as boat users.

The Scheme will have an **imperceptible temporary** impact on marine birds.

Wetland and Waterbirds: this includes all waders that are susceptible to be in the area. Few waders were recorded on the reefs area to the NE of the beach area (i.e. near the lifeboats station). Wetland and waterbirds in this area will be most likely affected by works along the waterfront including work on the Atlantic culvert and debris screen replacement. Noise disturbance may occur if there is exposure to loud noise. This may cause temporary disturbance and displacement. However, the birds associated with the beach and this reefs area are tolerant of disturbance due to frequent presence of beachgoers and people along the promenade, and the works will be at a similar or lesser disturbance level to the daily noise of the busy town, recreational users of the beach and marine steps, as well as boat users. Noise levels and presence of work force are unlikely to have a significant effect on the bird populations.

Habitat, and noise and visual disturbance is likely to occur in areas of work where stream realignment occurs, especially on the Victoria stream in the Carrigaholt Road Field. This work has the potential to cause physical disturbance for wintering Snipe (Flushing if approached to within 20m), and result in changes in habitat function.

There is potential for **significant negative** effect on wintering Snipe.

Passerines: These will most likely be affected by removal of vegetation, leading to a loss of breeding, roosting and foraging habitat.

There is potential for **significant negative** effect on breeding Sedge Warbler.

[102] N. M. Goodship and R. W. Furness, "Disturbance Distances Review: An Updated Literature Review of Disturbance Distances of Selected Bird Species," Research Report (NatureScot, 2022).

Positive Impacts on Birds

Inherent mitigation within the project provides for constructed wetland areas i.e. stream realignment, a series of ponds and scrapes. The project will enhance conditions for wetland and waterbirds by providing increased wintering habitat, and improving conditions for breeding waders. Birdwatch Ireland data suggests that Snipe are possibly nesting in very localised areas in west Clare. By providing better habitat conditions for breeding Snipe, there is a potential to encourage this species to nest in the area. This could provide some valuable habitat for them and expand nesting areas. Grassy embankments can also provide habitat for ground nesting birds.

Furthermore, the works are expected to improve water quality, and reduce the potential for pollutants to enter the waterways and Moore Bay. This has an indirect impact on fish species and other aquatic organisms which are a food source to waders, waterbirds, herons and marine species.

Impact on Fish and Aquatic Species

Without mitigation, works along the streams and in-stream has the potential to impact fish through habitat destruction, water pollution, noise and physical disturbance to fish. Eel occur in the Victoria stream along with an Eel nursery. Flounder have also been recorded instream, although they are not affected by noise. Levels of noise are not expected to have any significant effect on fish.

Atlantic Stream: Works in and adjacent to the stream have the potential to alter hydraulic characteristics, change stream profile, and impact on connectivity. The Atlantic Hotel realignment has the potential to lead to the loss of fish and aquatic species. Installation of the culvert headwall and debris screen has the potential to introduce uncured concrete, cement and particles into the water ways.

Victoria Stream, Western Tributary: Works in and adjacent to the stream have the potential to alter hydraulic characteristics, change stream profile, and impact on connectivity. The realignment has the potential to lead to the loss of fish and aquatic species, loss of habitat and loss of connectivity by the introduction of culvert sections. Installation of the culvert headwall and debris screen has the potential to introduce uncured concrete, cement and particles into the water ways.

There is a potential for the loss of the eel nursery in the Victoria stream during the works on the Victoria Stream Wall, as suitable habitat for elvers was noted to be present within the cracks/crumbling areas of the walls along the Victoria stream.

The culvert in the embankment between the Snipe and Long Fields has the potential to reduce potential passability for Eel and other fish into the Western Tributary, although it should be noted that present conditions indicated fisheries potential of the Western Tributary was low. This has the potential to be a permanent negative impact.

Well Stream: Over pumping and water storage in an underground retention tank has the potential to trap fish during the construction phases. Utilisation of underground storage tanks during flood events also has the potential to divert fish into attenuation features. The removal of the culvert has the potential to trap and destroy fish. Changing of the nature of the habitat i.e. instalment of the U channel has the potential to result in loss of habitat for Eel (presence confirmed in Well stream by e-DNA).

There is potential for long term significant negative effect on fish and aquatic species.

Impact on Amphibians

Work in or adjacent to waterways and wetlands has the potential to impact amphibian species by disturbing or destroying breeding and foraging habitat. Without mitigation, work measures have the potential to impact on breeding success of amphibians i.e. frog for a single season at each location.

There will be a creation of wetland habitat through the realignment of the streams, creation of scrapes and areas of standing water in Long Field, Carrigaholt Road Field and Atlantic Field with the realignment of the streams. This will increase the breeding opportunities and suitable habitat for amphibians. Furthermore, limited vegetation management and the lack of pesticides or fertilisers will prevent excessive nutrients and pollutants in the waterways that would be detrimental to amphibians. The improved water quality following the scheme works can also provide benefits to amphibians.

Overall, additional suitable habitat created within the scheme will benefit amphibians, with habitat suitable for smooth newt being created (not recorded at present).

There is potential for temporary significant negative effect on amphibians during the construction phase, but long term habitat creation.

INNS

Japanese Knotweed is recorded in Kilkee. There are currently active eradication measures in place by Clare County Council. The works have the potential to spread Japanese Knotweed through the movement of vehicles, the excavation and removal of materials and the introduction of inert materials.

Three-cornered Leek is recorded along the boundary of the Long Field. The works have the potential to spread Three-cornered Leek through the movement of vehicles, the excavation and removal of materials and the introduction of inert materials.

Japanese Rose *Rosa rugosa* and Cherry Laurel *Prunus laurocerasus* were also recorded within the footprint of the scheme.

Japanese Knotweed and Three-cornered Leek are Third Schedule species under Regulations 49 & 50 in the European Communities (Birds and Natural Habitats) Regulations 2011. These regulations restrict the dispersal, spread and transportation of this invasive species and due diligence must be given to work methods in the vicinity of this invasive non-native species.

Mitigation measures are required to control the spread of these invasive species during the construction of the scheme. Monitoring measures to ensure the effectiveness of the control is also required.

Lighting

The works are not anticipated to introduce any new lighting to the area. Temporary lighting may be necessary to facilitate the works in some locations, especially during shorter winter days. Lighting has the potential to disturb wildlife depending on orientation, light spills, and wavelength used.

Without mitigation, lighting could have a temporary impact on wildlife during construction works.

The limited timing of the works, and temporary nature of the **lighting is unlikely to have a significant effect.**

Maintenance

The scheme maintenance may have an impact through physical disturbance of habitats, release of suspended solids, hydrocarbon and other spillage, release of nutrient, change in water levels, noise and visual disturbance, through the mowing regime of the embankments, infrastructure repair and maintenance, riverbed and aquatic vegetation maintenance. Management procedures are expected to follow standard OPW Environmental Guidance: Drainage Maintenance & Construction [103].

A maintenance program will be completed which is anticipated to include at minimum the following elements:

- Grass cutting maintenance program.
- Inspection of entire scheme following a flood event.

Provided standard best practices are followed, and suitably trained personnel carry out the works, maintenance is not expected to significantly impact any ecological receptors.

Detailed design of ponds will be done in conjunction with a wetlands specialist and should allow for a self-cleaning regime i.e. the majority of the deposition of suspended material should be in the flood plain, and not fill in the pond, but occasional clearing out of the ponds may be required on an as-needed basis.

Therefore, no specific mitigation is discussed, and the standard best practice is considered relevant to all schemes. Any maintenance required as the failure or damage to infrastructure may require full ecological assessment. This would be assessed during inspections, and monitoring programme.

Maintenance of compensatory habitats will be undertaken. The Long Field will continue to be maintained as a meadow, with a late annual hay/silage cut and optional after-graze to keep an open structure i.e. continuation of the existing regime, with a modification for a later cut to facilitate breeding waders.

[103] T Brew and N Gilligan, “Environmental Guidance: Drainage Maintenance & Construction,” Series of Ecological Assessments on Arterial Drainage Maintenance (Trim, Co. Meath, Ireland: Environment Section, Office of Public Works, 2019).

Habitats

As a result of the scheme there will be some loss of vegetated habitats, (summary in Table). However, there will be an improvement on the stream habitats, by giving them back a more natural shape and function, away from the current drainage ditch aspect, as well as creation of wetland areas.

Removal of some marsh and sedge habitat in the footprint of the embankment will be compensated by the creation and maintenance of wetland areas of better overall quality and layout. This will provide a more complete setting with better ecological connectivity and function.

Embankments will become established grassland with limited intervention and management; these will provide habitat for ground-dwelling birds and has the potential to address Pollinator Plan guidelines.

The use of grazing and selective mowing will ensure that noise disturbance will be limited in time and space, flowering plants will be able to establish and fulfil normal lifecycles. No / Low nutrient input will prevent the grassland from turning into a species poor high nitrogen system.

Compaction of soils may occur through use of heavy machinery.

Reed and large sedge swamp FS1

Approximately 220m^2 of habitat along the eastern margin will be removed for the construction of the access road for the construction of the Victoria Stream Walls. This access road will then be covered and become an embankment. A further ~280 m^2 will be lost for the construction of a 1 m wide maintenance access path.

Approximately 370 m^2 will be lost for the realignment of the Victoria stream. In total ~870 m^2 will be lost out of the overall ~10,000 m^2.

Permanent loss of small areas of locally important (higher) habitat.

Dry meadows and grassy verges, wet grassland mosaic – GS2, GS4

There will be a loss of approximately 600m^2 of wet grassland with the stream realignment and creation of scrapes in the Long Field. This corresponds to approximately 3% of the habitat in that field. Embankments in this field will be on the footprint of the existing stream or embankment features, so no loss of meadow-type habitat is anticipated. Some degradation of habitat through compaction of soils, tracking of machinery may be anticipated in the absence of mitigation measures. Some reprofiling will be required to achieve greater storage. This is anticipated to affect approximately 10% of the field, mostly in the NE corner.

Increased flooding has the potential to make the habitat wetter on a more frequent basis, with a change in composition of species. However, in current conditions the field floods, and following the works this is not expected to be at a frequency or duration expected to impact on the composition of species negatively. Stands of damper species such as Meadow-sweet are present, and Common Valerian and Angelica were both recorded in the field margins, indicating a wetter herb component that may be enhanced by increased flooding, and as the field represents a wetter example of 6510, with some Callows type features, retention of Annex I quality is anticipated.

Permanent loss of small areas of habitat of Regional Importance, through conversion to storage ponds, and general reprofiling/regrading. Some degradation through working with machines in the vicinity of the Annex I areas e.g. tracking and compaction of soils, reprofiling of small areas.

Depositing/lowland rivers FW2; Eroding/upland rivers FW1

The Western Tributary and Victoria Stream will be realigned. The Western Tributary will see 375m of stream diverted, and extended by about 25m, adding some meanders, and increasing the potential for flood plain type habitat. The stream will have additional scrapes, and leaky dams. The original stream path will be lost, as this will be filled in and an embankment will be constructed over it.

The realignment of the Victoria Stream will see 165m of stream diverted and filled in. The new stream will be increased in length by approximately 15m by adding in some meanders which will also help slow the flow down and giving it a more natural setting.

There will be a loss of the original streams, with potential loss of aquatic habitats, removal and loss of bed material and associated fauna and flora. Overall, there will be no net loss of river length, but habitat may be affected without mitigation measures.

Marsh GM1

Approximately 200m^2 of marsh area will be lost to the creation of the embankment across the Well Stream, and approximately 330m^2 of marsh area along Cunningham's caravan park. This corresponds to approximately 8.7% and 23% of each area respectively.

Sand shores LS2

There is no expected loss of habitat; there may be some scouring in the event of extreme flooding.

Table 7--10: Summary of key habitat areas that will be lost.

Ecological feature	Value	Extent affected	Notes
Reed and large sedge swamp FS1	**Local Importance (Higher Value).**	~870 m^2	Approximately 9% of available habitat
Dry meadows and grassy verges, wet grassland mosaic – GS2, GS4	**Regional Importance**	~600 m^2 wet grassland	Approximately 3% of wet grassland Approximately 10% of the field will be affected by scrape creations, stream realignment
Depositing/lowland rivers FW2; Eroding/upland rivers FW1	**Local Importance (Higher Value).**	Victoria Stream: 165m linear Western Tributary: 375m linear	No net loss of area length; new stream line, extends stream length by approximately 15-25m.
Marsh GM1	**Local Importance (Higher Value).**	~530m^2	Approximately 14% of Marsh habitat
Sand shores (LS2)	**Local Importance (Higher Value).**	0	No loss anticipated

Flora of Interest: Orchids

Loss of Habitat

Orchids *Dactylorhiza* spp were recorded in the Long Field. This field will be modified to accommodate scrapes and realignment of the Western Tributary. There is likely to be some loss of habitat and some loss of plants as part of the field will become the new stream section.

The highest concentration of the plants was noted to the southwestern end of the field, which is not going to be affected by the construction of the scheme, or within the proposed re-aligned stream. The proposed access road to the construction site has been realigned to take the sensitivity of the site into account.

Loss of Plants

The highest concentration of orchids is recorded in close proximity to where the new access road for the site construction is to be installed; there is a risk of plants being permanently destroyed with the construction of the access road, and if vehicles do not stay on the defined path.

Change in Flooding Regime

Dactylorhiza spp (Marsh orchid) are tolerant of wet, waterlogged and flooded areas and recorded growing with other water dependent plants such as Iris. The change in setting of the field, with increased water storage means that there may be increased flooding events. However, in current conditions the field floods, and following the works this is not expected to be at a frequency or duration expected to impact on the orchids. Furthermore, the patch with the highest concentration will be at the upstream end of the flood retention area, that will be the least impacted, and little impact on flood regime is anticipated here.

There is potential for permanent significant effect on the orchids through habitat loss and destruction of plants.

Atlantic Stream Kilkee Bay Hotel

The construction of the embankment has the potential to lead to increased runoff, sedimentation, release of nutrients, noise, visual and physical disturbance of wildlife and destruction of habitats.

The diversion of the stream has the potential to damage the aquatic ecosystems, disrupt fish and aquatic species, lead to the loss of spawning habitat, release nutrient and sediment into the waterways.

The new culvert under the embankment is not expected to cause significant impact as this connects into an existing system that is suboptimal for aquatic species with poor existing fisheries capacity.

Dún an Óir estate:

There is potential for water contamination through uncured concrete and cement dust entering the waterways.

Sandpark mobile park:

The construction of the embankment and work directly in the vicinity of the waterway to achieve the tiered embankment has the potential to lead to increased runoff, sedimentation, release of nutrients, physical disturbance of wildlife and destruction of habitats.

Waterworld:

There is a potential for water contamination through uncured concrete and cement dust; there is the potential for wildlife to become trapped, and some loss of habitat in the works to facilitate the installation.

Meadowview court:

There is a potential for water contamination through uncured concrete, cement dust and sediment release; there is the potential for some loss of habitat and a slight change in the field flooding regime.

Atlantic Stream Outfall

The works on the stream outfall have the potential to release dust during the dismantling of the existing maintenance access, with potential contamination of water through dust release. Pneumatic drills to remove the existing cover is likely to cause disturbance to bird species roosting on the beach and exposed reefs. The construction and installation of the new maintenance access cover has the potential to release uncured concrete and cement particles into the aquatic and marine environment.

Victoria Stream

Well Stream:

The construction of the embankment has the potential to lead to increased runoff, sedimentation, release of nutrients, noise, visual and physical disturbance of wildlife and destruction of habitats. Approximately 200m^2 of marsh habitat will be lost.

The installation of the precast channel, decommissioning of the culvert, installation of the new box culvert, has the potential to impact on the aquatic environment, including invertebrates and fish that live in the stream as well as aquatic vegetation. Temporary loss of aquatic habitat is expected during the construction period.

The disconnection of the existing drain has the potential to release sediment and trapped nutrients.

The resurfacing of the road has the potential to release hydrocarbons, dust and sediment into the waterways.

Victoria Court:

The construction of the embankment has the potential to lead to increased runoff, sedimentation, release of nutrients, noise, visual and physical disturbance of wildlife and destruction of habitats.

Victoria Stream:

The diversion of the channel has the potential to impact on the aquatic environment by destroying habitat, communities and disrupting fish. There is a potential for reduced fish passage.

The construction of the embankment has the potential to lead to increased runoff, sedimentation, release of nutrients, noise, visual and physical disturbance of wildlife and destruction of habitats.

The repair of the wall on the left bank has the potential to impact on groundwater and surface water with the excavations for the foundations, and the construction of / repairing of the wall. Pouring of concrete for the foundations, and construction of block wall has the potential to release uncured elements into the water which would have a detrimental effect on aquatic species and the Eel nursery downstream.

Disturbance of the Eel Nursery during the works on the Victoria Stream Wall may be anticipated and some temporary loss of habitat will occur during works. No permanent changes to the bed of the stream will

occur. Some of the Eel nursery is within the walls itself, within cracks and crumbling areas, so direct mortality of eel may be anticipated in the absence of mitigation.

Western Tributary:

The diversion of the channel has the potential to impact on the aquatic environment by destroying habitat, communities and disrupting fish. There is a potential for reduced fish passage.

Regrading of the fields and stream diversion has the potential to release sediment and suspended solids into the waterways, and release of dust.

The construction of the embankment has the potential to lead to increased runoff, sedimentation, release of nutrients, noise, visual and physical disturbance of wildlife and destruction of habitats. The new culvert under the embankment is not expected to cause significant impact as this connects into an existing system that is suboptimal for aquatic species.

There is potential from water pollution, habitat and species loss.

Public Health

Once operational, the FRS will reduce the flood area within Kilkee, reducing the likelihood of pollutants being mobilised and entering the watercourse during flood events. This also has the potential to reduce wasterwater overflow into the waterways and the bathing waters.

Predicted impacts

Table 7--11: Summary of Predicted Impacts on Habitats

Ecological feature	Value	Construction Impact	Operational Impacts	Effect without mitigation
Habitats				
Reed and large sedge swamp	Local Importance (Lower Value).	Loss of habitat		Permanent loss of habitat and ecological features
Wet grassland	Local Importance (Higher Value).	Loss of habitat		Permanent loss of habitat and ecological features
Marsh	Local Importance (Higher Value).	Loss of habitat		Permanent loss of habitat and ecological features
Sand shores	Local Importance (Higher Value).	Sedimentation	Storm runoff	Water pollution
Hedgerow	Less than Local	Loss of habitat		
Scrub	Less than Local	Loss of habitat		
Rivers				
Atlantic Stream	Lower local importance	Water quality – release of sediments and pollution during construction.	Improved water quality; Annual vegetation cutting on banks is not expected to have any negative impact	Sedimentation, nutrient loading, loss of habitat, loss of aquatic species
Well Stream	Lower local importance	Water quality – release of sediments and pollution during construction.	Vegetation maintenance impacts	
Western Tributary	Local Importance (Higher Value).	Water quality – release of sediments and pollution during construction. Loss of habitat	Vegetation / Scrape maintenance impacts	Sedimentation, nutrient loading, loss of habitat, loss of species
Victoria Stream	Local Importance (Higher Value).	Water quality – release of sediments and pollution during construction. Loss of habitat	Vegetation / Scrape maintenance impacts	Sedimentation, nutrient loading, loss of habitat, loss of species
Flora				
Dactylorhiza kerryensis	Regional	Loss of habitat, loss of plants	Permanent loss of habitat	Loss of habitat, loss of plants

Invasives species – Japanese Knotweed	None	Spread of invasive species	Spread of invasive species	Spread of INNS
Mammals				
Badger	Regional Importance.	Loss of foraging habitat; trapping; disturbance	No impact anticipated	Trapping of individuals; disturbance
Otter	Regional Importance.	Loss of foraging opportunities; trapping; disturbance	Improved water quality; increased foraging opportunities	Trapping of individuals; reduced foraging; disturbance
Bats	Regional Importance	Loss of linear features	Increased foraging habitat	None
Birds				
Marine birds / Waders & Waterbirds	Local Importance (Higher Value).	Temporary disturbance	None anticipated	Temporary displacement
Passerines all	Local Importance (Higher Value).	Temporary disturbance	None anticipated	Temporary displacement
Sedge Warbler	Local Importance (Higher Value).	Loss of habitat; temporary disturbance		Temporary displacement; reduced breeding potential
Snipe	Regional	Loss of habitat; temporary disturbance		Temporary / permanent displacement;
Fish & Amphibians				
Flounder	Local Importance (Higher Value).	Temporary loss of habitat	Increased water quality; increased connectivity	Loss of habitat; loss of individuals
Eel	Regional to National	Temporary loss of habitat	Increased water quality; increased connectivity	Loss of habitat; loss of individuals; loss of nursery
Amphibians	Regional Importance	Temporary loss of habitat		Loss of habitat

7.6 Mitigation Measures

Standard construction practices are outline in the associated NIS, they are reiterated here, and developed for the aspects not covered in the NIS. Best practice must be applied at all times, along with use of precautionary principles to avoid detrimental effects to the environment. The mitigation for the Well and Victoria Stream incorporates measures for both the pluvial and fluvial works.

Standard Environmental Best Practice

The activities required for the proposed development's construction phase will remain within the boundary of the proposed site, bar select compound areas, which will be located in adjacent lands for mitigation control reasons. The Construction Environmental Management Plan (CEMP) will also strictly adhere to best practice environmental guidance including but not limited to the following:

- CIRIA (C512): Environmental Handbook for Building and Civil Engineering Projects[104].
- CIRIA (C532): Control of water pollution from construction sites. Guidance for consultants and contractors[105].
- CIRIA (C648): Control of water pollution from linear construction projects: Technical guidance[106].

[104] CIRIA, "C512: Environmental Handbook for Building and Civil Engineering Projects," CIRIA Guidance, 2000.

[105] CIRIA, "C532: Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors.," CIRIA Guidance, 2019.

[106] CIRIA, "C648 Control of Water Pollution from Linear Construction Projects: Technical Guidance," CIRIA Guidance, 2006.

- CIRIA (C649): Control of water pollution from linear construction projects: Site guide[107].
- CIRIA (C741): Environmental good practice on site guide [108].
- CIRIA (C750D): Groundwater control: design and practice [109].
- CIRIA (C753): The SUDS Manual[110] .
- Inland Fisheries Ireland: Guidance on Protection of Fisheries During Construction Works In and Adjacent to Waters[111].
- Inland Fisheries Ireland: A Guide to the Protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning[112].
- Brew & Gilligan (2019) Environmental Guidance: Drainage Maintenance[113].

Environmental Management of Site Compounds

The principal contractor will be required to ensure good environmental management within the site compounds. The below list of measures will be incorporated into site compound environmental management:

- Site compounds will use existing hard-standing areas as a priority to reduce the level of ground disturbance. If within a flood zone, assessment of the risk of flooding will be untaken for the main site compound and spoil storage locations, which will include likelihood of flooding, predicted depths and velocities of flood waters to ensure mobilisation of sediment does not occur. An emergency response plan will be drawn for implementation in the event of a predicted storm or weather event with the potential to cause flooding.
- Site compounds, spoil heaps and welfare facilities will not be within Flood Zones A or B, where possible.
- Storage of hazardous materials will be outside of Flood Zone A or B lands in accordance with OPW guidelines[114].
- Only plant and materials necessary for the construction of the works will be permitted to be stored at the compound location.
- All sub-contractors will be given induction toolbox talk so that they are aware of material storage arrangements.
- Construction materials within the compound will be stored in a designated area in an organised manner so as to protect them from accidental damage and deterioration as a result of exposure.
- Bunded storage of fuels and refuelling area. Bunds shall be 110% capacity of the largest vessel contained within the bunded area.
- A chemical storage plan will be in place as required, including spill kits.
- A separate container will be located in the Contractors compound to store absorbents used to contain spillages of hazardous materials. The container will be clearly labelled, and the contents of the container will be disposed of by a licenced waste contractor at a licenced site. Records will be maintained of material taken off site for disposal.
- A maintenance programme for the bunded areas will be managed by the site environmental manager. The removal of rainwater from the bunded areas will be their responsibility. Records will be maintained of materials taken off site for disposal.

[107] CIRIA, “C649: Control of Water Pollution from Linear Construction Projects. Site Guide,” CIRIA Guidance, 2006.

[108] Philip Charles and Philip Edwards, eds., *Environmental Good Practice on Site Guide*, version Fourth edition, CIRIA C 741 (London: CIRIA, 2015).

[109] M. Preene, T. O. L. Roberts, and W. Powrie, “Groundwater Control: Design and Practise, Second Edition,” Guidance document (London: CIRIA, 2016).

[110] CIRIA, “C753 The SuDS Manual,” CIRIA Guidance, 2015.

[111] IFI, “Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters,” 2016.

[112] IFI, “Planning for Watercourses in the Urban Environment. A Guide to the Protection of Watercourses through the Use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning.”

[113] Brew and Gilligan, “Environmental Guidance: Drainage Maintenance & Construction.”

[114] OPW, “The Planning System and Flood Risk Management,” Guidelines for Planning Authorities (Environment, Heritage and Local Government, 2009). OPW.

- The site environmental manager will be responsible for maintaining all training records and weekly environmental inspections.
- Drainage collection system for washing area to prevent run-off into surface water system.
- Stockpiling of spoil and spoil-like materials will be appropriately located within the compounds to minimise exposure to prevailing winds and risk of runoff.
- All refuelling of vehicles will be carried out at the fuel stores within the site compounds and only Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) trained personnel will be permitted to operate fuel bowsers.

Monitoring

To determine the effectiveness of proposed measures, the site will be monitored prior to, during and for at least 5 years post construction. This is to determine how measures are performing and if management strategies are effective at maintaining the function of the area, and its ecological benefits. Suggested monitoring procedures are presented in the following sub sections, targeted toward different habitats and organisms. Monitoring methods must be approved by the relevant competent authority, have clearly defined objectives, and reports submitted to the competent authority and refined following their guidance. Data collection will be carried out in a systematic and standardised manner to allow for inter survey comparison and following established procedures to feed into national databases (e.g. EPA for water quality, I-WeBS, BBS for bird monitoring). A copy of all data on species will be uploaded to the NBDC within 4 weeks of a survey being carried out, and all data will be made available in a public repository, in line with the Open Data Directive [115]. Data on sensitive species will have a restricted availability (e.g. Badger setts). Monitoring procedures should be carried out for a sufficient length of time (minimum 1 year) in order to assess effectiveness of the measures. At the end of the monitoring period, a review of the findings will be carried out, and if necessary, monitoring will be prolonged.

Monitoring will include the following methodologies/guidance:

- Annex I monitoring of the Long Field to ensure Annex I status is maintained following procedures outlined in [116], with commentary on suitability of management, or similar established condition assessment.
- Monitoring of other disturbed habitats to determine condition using indicators of disturbance and assessment of vulnerabilities, including invasive species.
- Monitoring of overall biodiversity of the ponds at the site, including macro-invertebrates and diatoms (suggested methodology of: A guide to monitoring the ecological quality of ponds and canals using PSYM) but other methods may be utilised by a wetlands specialist.
- Bird monitoring using I-WeBS methodology for winter birds, and countryside bird survey methodology for breeding birds, with a walk through of suitable habitat to determine presence/absence of breeding ground-nesting or non-calling birds.
- Monitoring should be carried out until it is established that the ecosystems are functional, and of good condition – this will allow for tweaking of management until such conditions are achieved.
- With Annual post construction monitoring for a minimum of 1 to 5 years depending on ecological receptor, and to be reviewed at the end of each term until adequate outcomes are achieved.
- Water quality monitoring in conjunction with Clare Co. Co. standard water quality monitoring standards.
- Data to be submitted to NBDC 4 weeks post survey.
- 5 year reviews of management plans to ensure long term effectiveness of the site.

Further details for monitoring are given under each relevant habitat/species.

Water Quality

Relevant legislation and best practice guidance that have been considered includes but not limited to the following:

[115] EU, "Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on Open Data and the Re-Use of Public Sector Information (Recast)," L 172/56 § (2019).

[116] O'Neill et al., "The Irish Semi-Natural Grasslands Survey 2007-2012."

- Water Framework Directive (2000/60/EC). The WFD requires that member states protect inland surface waters and, where necessary, restore water bodies in order to reach good status, and to prevent deterioration.
- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. No. 272 of 2009).
- Local Government (Water Pollution) Acts 1977 (Updated 2021).
- CIRIA (C532) *Control of water pollution from construction sites*. Guidance for consultants and contractors[117].
- CIRIA (C741): *Environmental good practice on site guide* [118].
- CIRIA (C750): *Groundwater control: design and practice*[119].
- Inland Fisheries Ireland (2016) *Guidance on Protection of Fisheries During Construction Works In and Adjacent to Waters*[120].
- Inland Fisheries Ireland (2020) *A Guide to the Protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning*[121].

To prevent watercourse pollution:

- Adoption of a surface water plan including appropriate barrier controls to prevent any polluted surface water from the site reaching the aquatic habitats.
- Minimise area of exposed ground by maintaining existing vegetation in vicinity of site compound.
- Oil booms and oil soakage pads should be maintained on-site to enable a rapid and effective response to any accidental spillage or discharge. These shall be disposed of correctly and records will be maintained by the environmental manager of the used booms and pads taken off site for disposal.
- Fail-safe site drainage and bunding through drip trays on plant and machinery will be provided to prevent discharge of chemical spillage from the sites to surface water.
- Any accidental discharge will be controlled by use of oil booms in the water prior to construction starting.
- Phased installation of silt fences along the lengths of the site's stream.
- Works within the aquatic habitats will need to take place during a dry period so that the waterbodies have minimal water volumes present, which will reduce the risk of water contamination.
- Tying in of new stormwater drains and upgrades of existing drains will be overseen and monitored by the ECoW. Mitigation measures will include washing out of new pipes prior to tying in to avoid sudden influx of contaminated material to watercourses.

Monitoring and assessment

Water quality monitoring must be carried out prior, during and post construction in order to establish baseline water quality metrics, evaluate the impacts of the construction whilst it's going on, and how the works impact water quality once the site has been restored. Monitoring and assessment should follow EPA guidance. The protocol should be implemented so that data are collected in a standardised manner and can be integrated into EPA databases. Typical metrics that should be recorded to determine the assessment are:

- Flow (continuous monitoring using on-line flow meter with recorder).
- pH.
- Temperature
- Conductivity
- Biochemical Oxygen Demand.
- Chemical Oxygen Demand.

[117] CIRIA, "C532: Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors."

[118] Charles and Edwards, *Environmental Good Practice on Site Guide*.

[119] Preene, Roberts, and Powrie, "Groundwater Control: Design and Practise, Second Edition."

[120] IFI, "Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters."

[121] IFI, "Planning for Watercourses in the Urban Environment. A Guide to the Protection of Watercourses through the Use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning."

- Dissolved Oxygen.
- Suspended Solids.
- Ammonium (as N).
- Nitrate (as N).
- Total Phosphorus (as P).
- Orthophosphate (as P).
- Turbidity (very regular or in-line recording recommended)
- Hydrocarbons.
- Biological Quality (Q Rating).

These metrics will be collected on all streams within the construction area. Monitoring locations should be determined when implementing the monitoring protocol; suggested locations are presented in Figure 33. This will include points located upstream of any works, and then points within the works area and at the outfall locations. At connection points between streams (e.g. Western Tributary to Victoria stream), sampling should occur prior to the confluence of the streams, and at the junction point.

Monitoring during construction will be within the remit of the appointedEcological Clerk of Works (ECoW), who will have a stop-works power to halt activity as needed. In-field/live analysis of results such as:

- pH.
- Dissolved Oxygen.
- Conductivity.
- Turbidity/Suspended Solids.

will be undertaken by the ECoW to allow for immediate reactive management, especially during instream works, and where releasing water after working in the dry, or other high impact situations. Discharge standards should aim to meet Surface Water Regulation Standards for all relevant parameters, or comparable to water quality standards achieved upstream, as determined by baseline. Further detail for water quality protection measures are provided within the NIS, the CEMP and the Water Quality Chapter of this EIAR. Specific measures for control of siltation are provided within the following sections regarding control of sediment during realignment, run-off for embankments etc.

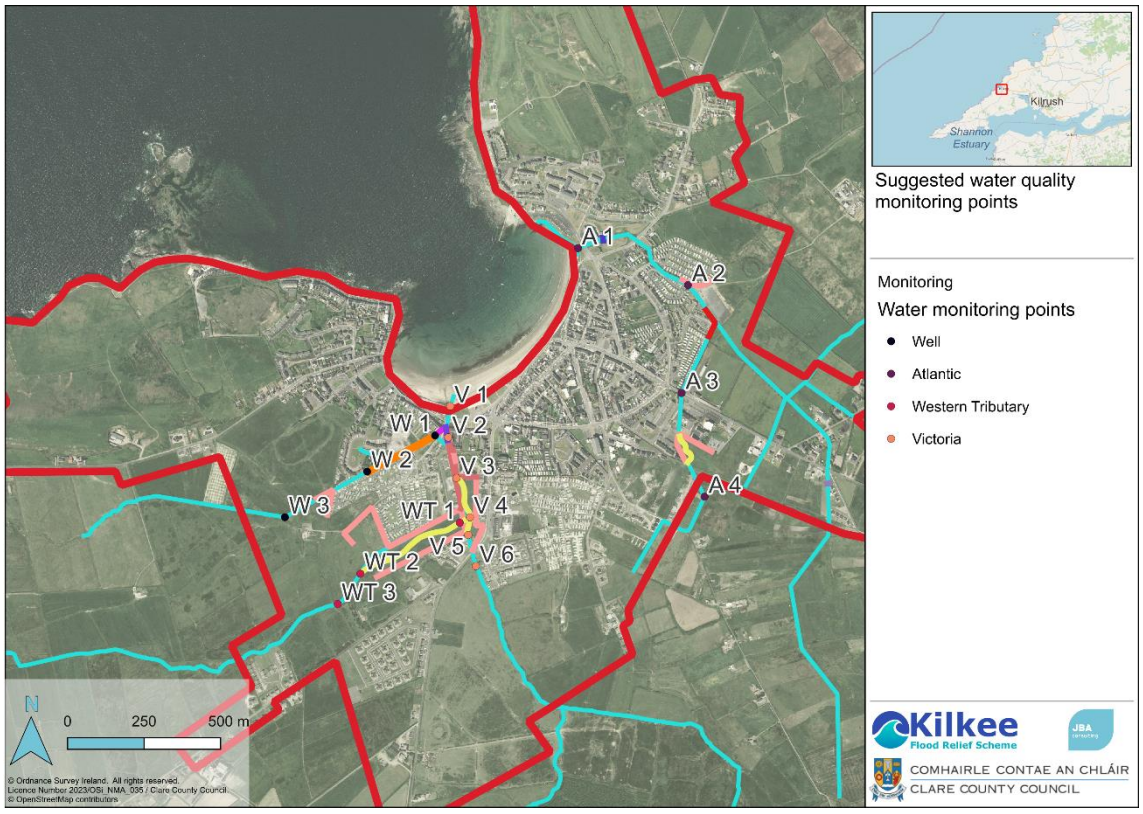


Figure 7--33: Suggested water quality monitoring locations.

Culverts

Guidance for treatment of Crossing Watercourses prior to construction is set out in the National Roads Authority Guidance: [122]: Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes, and the following will be applied:

- Where possible open-bottomed type culverts should be adopted, leaving the stream-bed undisturbed and maintaining some natural bank on both sides to allow for the passage of mammals.
- Where natural banks cannot be accommodated, ledges may be required to facilitate mammal passage. Ledges shall be at least 500mm wide, constructed at least 150mm above the 1 in 5 year flood event. There should be a minimum of 600mm of headroom and the ledge must be accessible at both ends from the bank and the water (for example, by ramps).
- The diameter of any culvert providing for the passage of fish should not be less than 900mm. The culvert should be installed so that it has a constant slope through its length, except for an appropriate camber allowance where settlement is anticipated.
- Culverts should retain the natural gradient of the existing channel – this will maintain the current deposition rates. A naturalised bottom will be facilitated by the gradient of the culvert and will allow for natural deposition.
- All culverts should be installed so that the bottom (invert) is at least 500mm below the grade line of the natural stream bed.
- The length of the proposed culvert at the Western Tributary is <9m long. This is consistent with passability for both Eel and Lamprey. Any increase in length should be in consultation with the IFI.
- Culverts should be equipped with baffles and / or have a naturalised base to improve fish passability. Baffles should be such that in the event of high flow or washout, the stream substrate is reteained.
- To facilitate passability through the culvert between the two storage areas, an outlet pool of adequate dimensions with tail-water control should be installed at the culvert entrance and exit.
- Minimum water levels to be maintained to allow passability and future proof of design (requirements: Eel 1cm, Lamprey 15cm, Trout 24cm, Salmon 42cm).

In situations where closed culverts are used, the following criteria should be applied:

- All culverts should be over-sized so that they can be set a minimum of 500 mm below bed-level. This requirement should be assessed on a case-by-case basis where a crossing is on bedrock.
- The culvert should be of similar width to that of the natural low-flow channel. The use of multiple units of lesser width is unacceptable.
- In all cases, the culvert should be laid at a level and grade which allows the upstream invert to remain drowned (by back-watering) under low-flow conditions, to a depth suitable for the easy passage of the largest species frequenting the stream. This requirement can be readily met where the natural bed gradient is shallow.
- Pools should be formed at each end of the culvert to provide for transition from the shape of the pool to the shape of the river downstream. Pools should, ideally, be built in natural rock and be designed to provide take-off conditions for upstream migrants entering and leaving the culvert. The downstream pool should be designed to act as a stilling-chamber that will prevent erosion of the banks below and provide quiescent take-off conditions for fish, and to serve the purposes above.

The effective slope of the culvert should generally not exceed:

- 0.5% for a culvert greater than 24m in length, unless baffles are added.
- 1.0% for a culvert less than 24m in length, unless baffles are added.
- 5.0% at any time, even with the addition of baffles.
- >5.0%, site specific design will be required.

Where stormwater drains are being tied in:

- The installation of new stormwater drains has the potential to result in the release of contaminated surface/stormwater release at the tie of tying in the new stormwater drain to the network e.g. new pipes will be contaminated with soil, or where concrete pipes are used, cement dust. Upgrading of stormwater drains could also result in similar release of materials.

[122] NRA, “Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes,” Environmental Series on Construction Impacts (National Roads Authority, 2005).

Realignment

The measures for the stream re alignment apply to the Atlantic Stream, Western Tributary, and Victoria Stream. Stream realignment needs to be carried out in a manner that does not interrupt the flow of the stream.

The following measures will be implemented during the realignment:

- So that the water flow is not interrupted the new stream bed, and associated scrapes need to be prepared and put in place prior to alignment.
- Vegetation from the banks of the current stream needs to be translocated to the edge of the new site to allow for the rapid re-establishment of the herbaceous riparian community.
- Banks to be vegetated using turves from a nearby location (e.g. from where the haul roads are due to be, or from the excavated bed of the new alignment).
- Any clean gravel substrate will be translocated from the current stream and placed in the new channel. If no such substrate is available, imported material may be used. This should be of local provenance/similar rock type. Consultation with IFI to determine the appropriate materials necessary will need to be carried out.
- The upstream end of the realigned portion needs to be connected to the current stream and let the water flow down the new riverbed gradually with both steams flowing at once for a period of time. Movement of invertebrates can then take place.
- Electrofishing can be carried out and fish moved into the new stream.
- Once water is flowing in the new alignment the upstream end of the old watercourse can be obstructed and left to drain. The riverbed can be searched for remaining invertebrates and small fish/eel, and material moved over.
- The realigned stream will maintain the same gradient that is currently in place, with a similar width to the upstream portion of the stream so as not to reduce the flow below natural conditions.
- Create glide, riffle, pool sequence.
- All instream works need to be done in accordance with IFI guidelines, and subject to IFI approval. Stream re alignment works will be overseen by an IFI officer and scheme ECoW.
- Timing of the instream works will be carried out during the period July-September. The streams in Kilkee are not of suitable quality to host Salmonids and therefore subject to IFI permission and ECoW supervision, some tolerance on the timing of the works may be required.
- Water quality (suspended solids) will be measured during the wetting of the realigned channel.
- Silt fencing, coir logs or other biodegradable materials Will be utilised to limit potential for run-off from the surrounding area.
- Monitoring of the newly aligned streams for erosion during the bedding in period and will include stability of banks, revegetation as well as water quality.

These measures will ameliorate the release of sediment during the realignment process, as the new bed will be in place and wetted in a graduation process. The sinuosity and ponds will also allow for the deposition of material. Placement of scrapes may add some sediment, but the receiving environment on the Victoria Stream is not considered sensitive to sediment release. The translocation of riparian material will also prevent large volumes of sediment release. The shallower sloping banks and scrapes will also limit the potential for sediment release through erosional run-off.

Habitat enhancement and creation:

- Create natural features – Change the profile of a river to provide shallows and riffles and reinstate bends, loops.
- Encourage the growth of aquatic plants and design gently sloping grassy margins.
- Banksides can be improved by providing a range of vegetation.

Pond creation

- Large shallow ponds or a series of smaller ones will be most effective.

Design in as many natural features as possible, including varied depths, diverse aquatic and bankside vegetation.

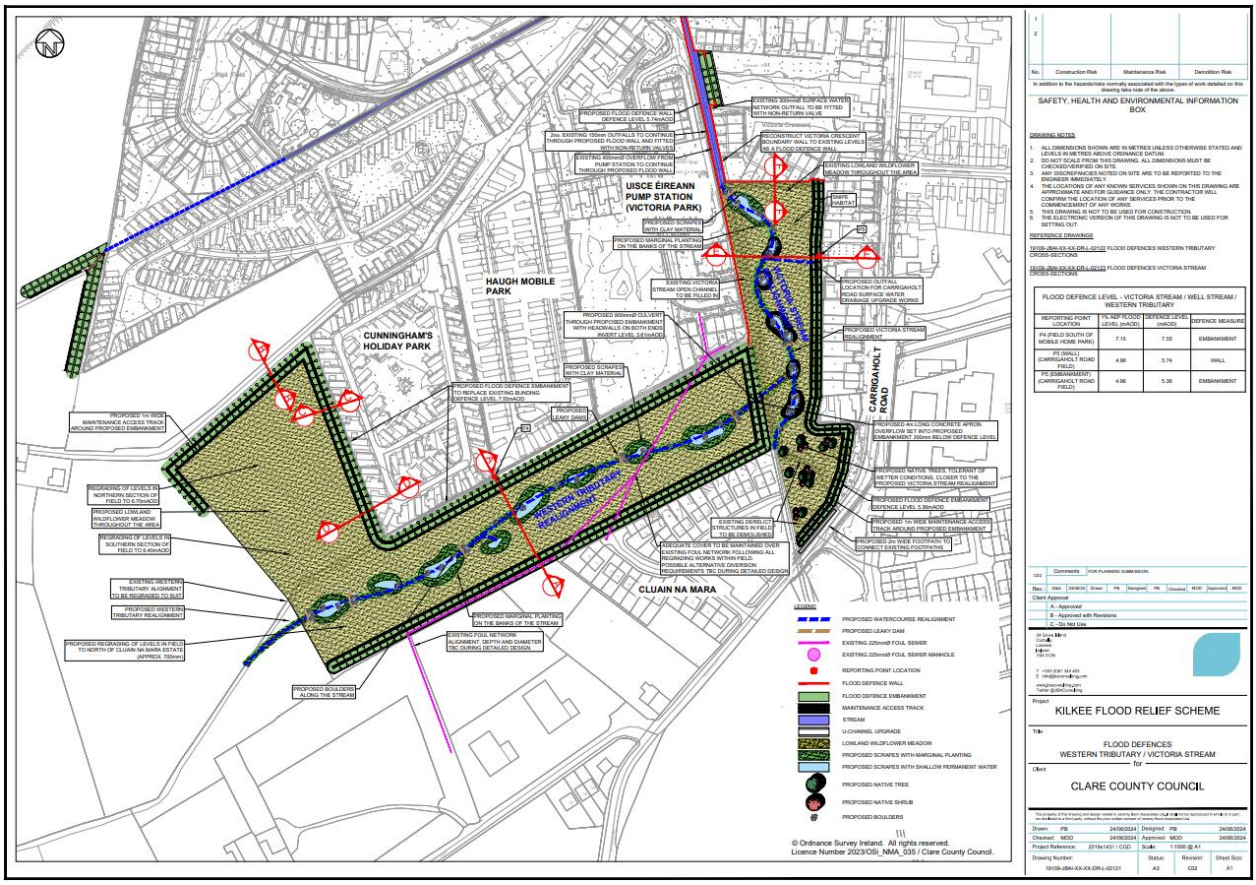


Figure 7--34: Illustration of potential aspect of the realigned streams and ponds.

Embankments

The following measures will be applied to work on establishment of new embankments. All works will be overseen and managed by a suitably qualified ecologist or ECoW:

- Turf from excavation works will be saved and strips will be used to cover parts of the embankment.
- Establishment of turves from the existing banks will be prioritised and utilised where possible.
- Areas vulnerable to silt/soil run-off will be prioritised e.g. areas in proximity to watercourses; slopes rather than the top of the bank; areas of heavier usage by people or animals; areas in the drip lines of trees or where other run-off is predicted. This will allow for the maintenance of the local seedbank and provide some buffer to prevent the risk of erosion.
- Suitably sourced native species seed, with a suitable mix of herbs and forbs of local provenance will be used to revegetate the embankment, if enough turves are not preserved. The seed mix must have a similar species composition to what is currently on site. This can be achieved by harvesting hay in the summer prior to the works being carried out to be used as a seedbank. Seed from Hay from the Long Meadow can be used as a seed source of local provenance.
- Biodegradable matting (e.g. coir fibre) to prevent soil erosion/silt run-off maybe used in some locations, and reseeding of locally appropriate native species will be used in conjunction with this, as above.
- Silt barriers will be placed along the bottom to hold back materials in the event of heavy rainfall prior to revegetation of the area. Once the vegetation has reestablished silt barriers may be removed, taking care not to dislodge any trapped sediment.
- Fertiliser must not be used on the embankment as runoff could lead to nutrient loading of the water and eutrophication. This will ameliorate negative impacts on water quality from sediment and nutrient run-off.

Material used for the embankments must be free of contamination, from hydrocarbons and / or Invasive Species, and care must be taken not to spread INNS when moving materials.

Debris Screen

Relevant guidance for debris screens is set out in

- *CIRIA (C786): Culvert, screen and outfall manual*[123].

The debris screen will be such that it doesn't impede on fish or mammal passage. Maintenance of the screen will be carried out by Clare County Council.

Habitat Creation

The realignment of the streams (Long Field and Kilkee Bay Hotel Field) will introduce meanders into the waterways, giving a more naturalised aspect to them in enhancing their ecological functions. Creation of scrapes and additional pools in the field around the stream will also enhance habitat for plant, invertebrates, and bird species. The scrapes and pools of shallow water fill up during rain events, and dry slowly over the spring and summer months. Some permanent year-round larger and deeper pools will also be present.

At minimum a 10m buffer either side of the streams, ponds, scrapes will be maintained as riparian habitat[91]. In any areas where those 10m cannot be achieved because of existing built infrastructure, a buffer zone as wide as possible, and constrained by existing infrastructure, shall be maintained.As the water recedes the margins and wet mud provide conditions for plants to seed and for invertebrates to bask and feed. These conditions can attract wetland and wading birds by providing foraging habitat but also providing nesting conditions. Snipe require these soft muds for foraging. During the winter months the scrape can host wading birds such as Snipe and may also attract waterbirds such as ducks.

By associating the scrapes with other ponds and the meandering stream and using the field as water storage during flood events, the area should remain near permanently damp providing the benefits of wetlands and wet grasslands throughout the year. Scrapes should maintain water throughout the year, even during the driest months. Guidance on managing wet grassland, protecting streams and scrapes creation is provided in three Technical Notes by Natural England: [124]: *Illustrated guide to ponds and scrapes;* [125]*: Illustrated guide to managing lowland wet grassland for Snipe;* [126]*: Illustrated guide to protecting rivers, streams and ditches*. Guidance is summarised below:

- The creation of scrapes should follow so key designs to allow for ecological benefits:
- Scrapes should be at least 20 m^2. Aiming for 1 ha of combined area of overall habitat.
- Create multiple smaller areas rather than one large one.
- Vary shape and size of scrapes, avoiding straight edges. Favour irregular shapes.
- Edges and bottom should be left rough (bucket teeth marks provide varied micro topography and rough surfaces).
- Variety of depths across the scrape with a maximum depth of 45 cm. Keep at least 10cm of height variation from the base of the scrape.
- Create gently sloping edges to increase the area of muddy edge.
- Use excavated top spoil and turves to reseed the embankments.
- Leave scrapes unfenced, allow some grazing at the edge of the scrape, to avoid vegetation becoming too dense.
- Where possible create a complex of smaller ponds with wetland between them. Some pools should be permanent, some temporary.
- Create a variety of water depths, in particular very gently sloping margins.
- Leave excavated surfaces rough and hummocks and hollows on the bottom of the pond and around the edge.
- Avoid trees, shrubs and permanent fencing as these deter open-country birds and can harbour predators.
- Monitor scrapes for build-up of vegetation and increased silt deposition and manage accordingly.

Atlantic Field:

[123] CIRIA, "C786: Culvert, Screen and Outfall Manual," CIRIA Guidance, 2019. CIRIA.

[124] Natural England, "Illustrated Guide to Ponds and Scrapes," Technical Information Note (Natural England, 2010).

[125] Natural England, "Illustrated Guide to Managing Lowland Wet Grassland for Snipe," Technical Information Note (Natural England, 2011). Natural England.

[126] Natural England, "Illustrated Guide to Protecting Rivers, Streams and Ditches," Technical Information Note (Natural England, 2014).

The Atlantic Field realignment has the potential to establish *Iris pseudacorus* beds. The area already contains suitable habitat for these Iris, and the realignment of the stream away from its current boundary will provide more space for the Iris beds to spread. This area could also develop into a Hydrophilous tall herb community and provide habitat for invertebrates, birds, and amphibians.

Figure 7--35: Potential aspect of Iris bed, as present in nearby fields

Carrigaholt Road Field:

This field is dominated by *Phragmites australis* with potential to improve and diversify the habitat by opening up the river channel through the centre of the field. This will have as effect to maintain the Sedge Warbler breeding habitat, whilst also providing more open water and wetland areas that are beneficial to waders, invertebrates and amphibians.

Long Field:

The Long Field is currently managed similarly to a traditional hay meadow. The current setting of the Western tributary limits the amount of wetland species present and their distribution. The realignment of the stream has the potential to increase species diversity, and distribution. Current management as a hay meadow will be retained.

Monitoring and assessment

The effectiveness of the created habitats will be monitored by assessing how the different organisms that use it perform. Suggested monitoring procedures are presented in the different relevant sections, to assess water quality, fish and aquatic environment development, plant communities, bird and mammal use of the area.

Mowing

Vegetation maintenance needs to be carried out to prevent scrub and bush encroachment into the wetland habitats, and to maintain the embankments in a safe and suitable state to maintain their function.

Embankments: No woody vegetation is to be planted or maintained on top of the embankments. A grass cutting or grazing regime will be implemented to maintain vegetation in the desired state, with an annual or

biannual cut. The embankments will have been covered with turves preserved from the surrounding areas. Seed from Hay from the Long Meadow can be used as a seed source of local provenance. Any additional seed required should contain a suitable species mix with seeds of local provenance of species common or endemic to the area.

Long Field Hay Meadow: The hay meadow in the Long Field will be managed for biodiversity. The current management regime will be replicated, to allow for continuation of the current good condition of the field. No fertiliser will be applied. A late season cut will be completed annually, from August onwards to allow for plants to seed, including the existing population of yellow rattle. This can be followed by grazing, as part of an adaptive or reactive management, and/or rush management, dependent of weather and growth over the previous year. Provided the habitats are maintained for the benefit of biodiversity, the management method has little importance and the most practical and efficient method should be used. Areas around scrapes will be topped in late February to provide a short sward around potential foraging areas for birds and to provide structural diversity, and cover will continue to be provided by the longer vegetation in the meadow during the breeding season. Hay cutting will be:

- Delayed till the end of the bird nesting season.
- Cut in an inside out pattern to allow birds and mammals to escape.
- Use traditional hay meadow management methods i.e. cut, with drying and hay turning, before lifting. No fertiliser application.
- Use hay from this field to reseed embankments, or seed-vacuum and brush harvesting

Carrigaholt Road Field: Intermittent cutting is required to prevent succession to scrub. The Carrigaholt Road Field will be cut on a 3-4 year rotational basis, to allow for the retention of the reed beds, with an annual cut in the areas around the scrapes, to provide for diversity of structure. Management will be adaptive to local conditions, weather and the results of the monitoring.

Guidance on management for Snipe is provided in Illustrated Guide to Managing Lowland Wet Grassland for Snipe [127]. The structure is good for snipe w.here:

- Tussocks 50-80 cm tall cover between 60-70% of the area.
- A short sward between 5-15 cm tall covers between 30-40% of the area.
- Bare ground is less than 10%.
- Standing water covers less than 60% of the area.
- Trees, hedges and fence posts should not be established in the area to prevent them being used by predatory birds.
- Scrub to be removed to prevent establishment of mesocarnivores.

Other wader species will have different requirements, management plans to include other species or species that are known to nest in the area should also be considered during detailed design. Heterogeneity in structure can be achieved by grazing or cutting.

Monitoring and assessment

- Monitoring of vegetation growth to determine effectiveness of management regime to provide suitable habitat for breeding birds (Snipe).
- Monitoring of species composition i.e. Annex I monitoring of the Long Field to ensure Annex I status is maintained following procedures outlined in O'Neil et al (2013)[128], or similar established condition assessment. Commentary on suitability of management should be provided.

Mammals

Bats

Guidance for treatment of Bats prior to construction is set out in:

[127] Natural England, "Illustrated Guide to Managing Lowland Wet Grassland for Snipe." Natural England.

[128] O'Neill et al., "The Irish Semi-Natural Grasslands Survey 2007-2012."

- NRA 2006[129]: Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes.
- ILP 2023[130]: Guidance Note 8 Bats and Artificial Lighting.

As a precautionary measure any trees that need to be felled will be assessed for bat roost potential prior to the works being carried out. At present only one mature tree is identified as needing felling, on the Well Stream, and this was not considered suitable for bat roosts. If tree-based bat roosting features are identified during the pre-construction site enabling works phase, soft felling measures will be put in place where trees will be cut and left over night to allow any bats to get out, and such felling will take place outside the main maternity season. This will take place under the supervision of the ECoW. No same day mulching or cutting up will take place.

There will be no operational lighting as a result of these works. Construction will be confined to daylight hours, but in areas around the site compound where some safety or security lighting may be required this must meet bat criteria:

- Light sources should feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats, and 2700 Kelvin in the warmer part of the spectrum.
- Lighting should not spill on to ecologically sensitive habitats (must be limited to built areas).

Badger

No badger setts have been recorded within the footprint of the scheme. Prior to any work being commenced, further badger surveys will be carried out to establish whether badger have moved into the area, and whether any active setts are likely to be impacted by the works. These are a mobile species that can establish rapidly. These surveys will determine whether the baseline data are still valid.

Guidance for treatment of Badgers prior to construction is set out in [131]: Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes. The following mitigation will apply:

- Trenching works shall not create confined areas where Badger or any other mammal may get trapped. If trenching works create such features, the area will be fitted with an escape ramp at an angle of no more than 45º, to allow trapped animals to escape. These areas must be made safe before leaving site each day. OPW EP23.
- Badger sett tunnel systems can extend up to c. 20m from sett entrances. No heavy machinery should be used within 30m of badger setts; lighter wheeled machinery should not be used within 20m of a sett entrance; light work, such as digging by hand or scrub clearance should not take place within 10m of sett entrances.
- If the pre works surveys establish the presence of badger in the area, and that mitigation measures need to be put in place regarding sett closure or translocation, then post work surveys need to be carried out. A full methodology should be established with a suitably qualified ecologist / NPWS ranger.
- Surveys/monitoring to be carried out at minimum quarterly for 12 months post construction.

Otter

Guidance for treatment of Otter prior to construction is set out in: NRA[132]: Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes

A pre-construction survey for Otter will be carried out within 10 months prior to construction. This should be supplemented by inspection of the development area immediately prior to site clearance to ensure no holts or couches have been created in the intervening period. This should particularly be undertaken around the Victoria Stream. If any holts are found appropriate steps will be taken and a derogation licence will be applied for from NPWS.

[129] NRA, “Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes,” Environmental Series on Construction Impacts (National Roads Authority, 2006).

[130] ILP, “Guidance Note 8 Bats and Artificial Lighting,” Guidance Note (Institution of Lighting Professionals / Bat Conservation Trust, 2023).

[131] NRA, “Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes.”

[132] NRA, “Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes.”

- No works to be carried out within 150m of a holt until ecological guidance has been sought.
- Trenching works shall not create confined areas where Otter or any other mammal may get trapped. If trenching works create such features, the area will be fitted with an escape ramp at an angle of no more than 45º, to allow trapped animals to escape. These areas must be made safe before leaving site each day ; OPW EP 20
- Lighting will be minimised during hours of darkness and will not illuminate the streams and newly created wetland areas to ensure no effect on wildlife.
- Box culverts to be used in preference.
- Obstacles to mammal passage, should allow for ledges or steps by which mammals may avoid them.
- Where practicable, cover using suitable native species, should be restored as soon as possible after construction to limit short and long term impacts on the use of watercourses by faunal species. Riparian habitats can often be improved by additional planting along the affected watercourse. The aim of landscaping should be to ensure, in so far as is possible, maintenance of a vegetated wildlife corridor along all watercourses affected by any scheme.
- Any holts or couches found in the pre-work survey will require guidance from a suitably qualified ecologist / NPWS to ensure no Otter are disturbed. Derogation licence required.
- Artificial holts to be provided if any disturbance to holts is anticipated.
- The U-Shaped culvert will have a naturalised bottom, with provisions for herbaceous aquatic vegetation to grow. A mammal ledge will be provided to allow for any Otter to travel along the stream in the dry dry at all times.

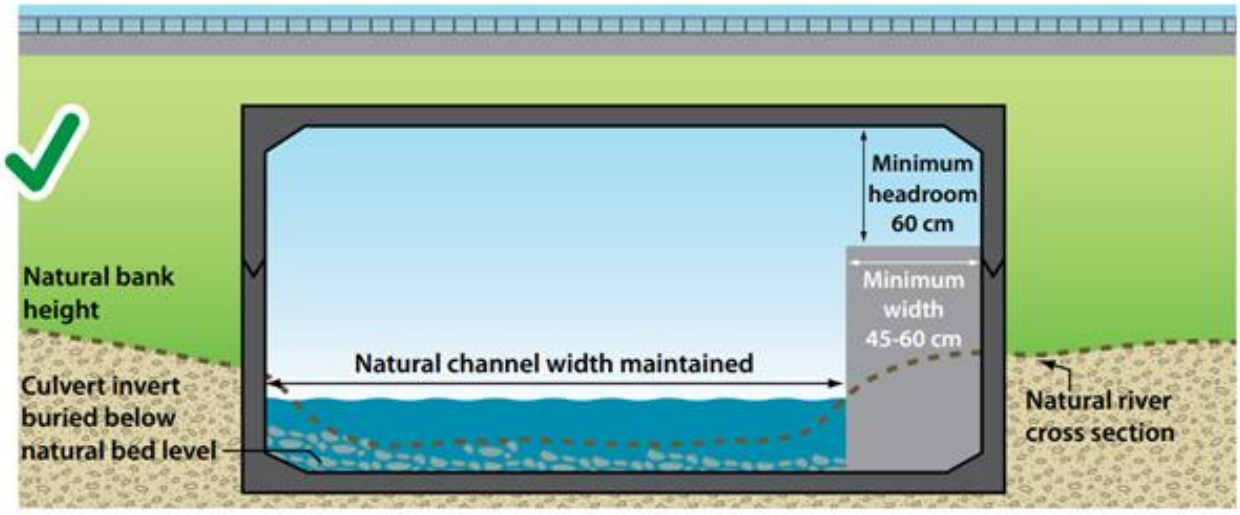


Figure 7--36: Mammal ledge specifications guidance[133]

[133] SEPA 2010

Figures 7-37: Example of mammal ledge (left) and aspect of installed ledge (right)[134].

Other

The measures set out for Badger and Otter are applicable to other mammal species and will ensure that no mammals are harmed during the construction works. This includes not leaving unprotected trenching or excavations, not disturbing any dens during breeding season. Inspecting vegetation for hibernating small mammal such as Hedgehog before clearance in the winter and relocating individuals to suitable habitat or temporary housing. This needs to be carried out by a suitably qualified ecologist and guidance from NPWS.

Monitoring and assessment

If the pre works surveys establish the presence of Badger in the area, and that mitigation measures need to be put in place regarding sett closure or translocation, then post work surveys must be carried out. A full methodology should be established with a suitably qualified ecologist / NPWS ranger to ensure no lasting negative impact on Badger.

- Surveys to be carried out at minimum quarterly for 12 months post construction.

If the pre works surveys establish the presence of Otter in the area, and that mitigation measures need to be put in place regarding holts, dens or couches, then post works surveys need to be carried out to assess effectiveness of the measures. A full methodology should be established with a suitably qualified ecologist / NPWS ranger to ensure no lasting negative impact on Otter.

- Surveys to be carried out at minimum quarterly for 12 months post construction.

Birds – General Measures

General construction mitigation measures will minimise risk of disturbance to breeding and non-breeding birds. Limit displacement and habitat degradation by controlling vehicle movement and working from non-vegetated areas as much as possible. This will be managed by the ECoW via toolbox talks to provide constraints for workers, and monitoring during of the scheme.

- Vehicles will not encroach on to habitats beyond the proposed development footprint.
- Tree felling and vegetation clearance will take place outside the statutory breeding season (March to August, inclusive), unless permission is obtained from NPWS outside of these times. Any clearance outside this timeframe will require a suitably qualified ecologist or ECoW to be present and to check the area for nesting birds prior to any vegetation removal.
- A suitably qualified ecologist or ECoW will be present and carry out pre work checks to ensure that no nesting birds are disturbed. If nesting birds are present, works in the area will be postponed until the birds have fledged; advice may be sought from a suitably qualified NPWS ecologist / ranger.
- Works in the Carrigaholt Road field will be timed to avoid bird nesting season. If this is not feasible, Reeds will be mown prior to the bird nesting season and prior to the arrival of Sedge Warbler and maintained short for the duration of the works to prevent the establishment of nests. Once the works are complete vegetation will be left to grow back to offer nest sites for the following years.

[134] Althon.co.uk, n.d.

- Areas to remain intact will be fenced off from machinery using wildlife friendly fencing.
- All plant and equipment will conform with the Construction Plant and Equipment Permissible Noise Levels Regulations 1996 (SI 359/1996) and other relevant legislation.
- Plant and equipment will be turned off when not in use, with no unnecessary revving.
- Lighting will not shine directly onto surrounding areas and will be switched off at night.
- Overhead cables that go over wetland areas, and open greenspace susceptible to be used by birds are to be equipped with flight deflectors.

Marine Birds

Avoid loud noise if large flocks (>50 individuals) are roosting within 100m of site of works. Normal vehicular traffic noise, and presence of workers is not anticipated to cause disturbance.

Snipe

Clear any necessary vegetation at the end of the breeding seasons of the year preceding the first winter of works. Snipe are likely to still use the habitat when no work is being carried out. Snipe will flush and displace to nearby fields.

Stagger the works so all fields are not under construction at the same time e.g. Carry out works and embankment on Long Field, once complete carry out works in Carrigaholt Road Field. Once work in Long Field is finished, remove all machinery and let the areas settle so that birds can return to it whilst work is being carried out in the Carrigaholt Road Field. Retain and fence off areas (wildlife friendly fencing) that will remain intact.

Sedge Warbler

Clear vegetation at the end of the breeding seasons in the year prior to the works being carried out and maintain low vegetation in work areas. Leave pockets of reeds to grow to offer nesting habitat.

Monitoring and Assessment

Following the end of the realignment works, seasonally appropriate surveys need to be implemented to assess the effectiveness of the works. Surveys must cover full and complete seasons, with Winter Bird Surveys covering the period between September and March inclusive, with a minimum of one visit per month, and Breeding Bird Surveys should cover March till August, with targeted wader surveys following specific guidelines.

- Wintering bird surveys to be carried out as priority in the Long Field following I-WeBS methodology to determine wintering bird use. These should be carried out in mid to long term duration – 3 to 5 years - to evaluate how the site develops post construction, and procedures adapted when necessary.
- Wintering bird surveys to be carried out in the Carrigaholt Road Field and in the Atlantic Field.
- Breeding bird surveys should be carried out the Carrigaholt Road Field to ensure that breeding conditions for passerines have recovered. These should be carried out for a minimum of 3 to 5 years to account for natural variation in population numbers and give sufficient time for species to return to the area.
- Breeding wader surveys to be carried out in Long Field and Atlantic Field to determine if the establishment and management of the new wetland areas provides adequate habitat. Note that it may take years before waders breed in the area due to numerous factors. Therefore, lack of evidence of breeding would not necessarily be seen as a failure in the site restoration. To allow for this, monitoring should be carried out for at least 5 years post construction.
- Snipe surveys to use established methodology.

Aquatic environment

Fish

Mitigation measures for fish will relate to all stream works being carried out. Therefore, all instream works need to be done in accordance with IFI guidelines, and subject to IFI approval. Stream re-alignment works will be overseen by an IFI officer.

- Guidelines on protection of fisheries during construction works in and adjacent to waters [135]:
- Planning for Watercourses in the Urban Environment[136].
- River Restoration Works[137].
- Design Guidance for Fish Passage on Small Barriers[138].

The works should also take into account future connectivity and improvements of the waterways in accordance with the WFD. Therefore, long term connectivity measures will be built into the mitigation in a way that future improvements will not be impeded by the current work. At the time of the survey, water depths of approximately 20 cm were recorded. These depths are too shallow for salmonid passage, but sufficient for Eel and Lamprey species[139].

Measures implemented for fish will involve the rehabilitation and improvement of the streams, providing better connectivity, improved habitat and future stream potential with a long term ambition to reconnect the streams to the sea.

- Reinstatement of riparian buffer (e.g. Habitat creation section).
- Reconnect stream to floodplain within the Long Field.
- In stream works to be carried out between July and September.
- Minimum water levels to be maintained to allow passability and future proof of design (requirements: Eel 1cm, Lamprey 15cm, Trout 24cm, Salmon 42cm).
- Maintain light access, avoid dark corridors.
- Stop log gates to be opened in November and April and May (at a minimum) under ECoW supervision to allow downstream migration of Eel.

Atlantic Stream:

The Atlantic stream has poor connectivity to the sea due to a long culvert that is cut off from the sea through tidal flaps. Works to the outfall will include a tidal flap to prevent inflow. The length of the culvert means that fish passability is not currently feasible, and due to catchment wide water quality issues removing the tidal flap is not a feasible option. There is potential for some Eel to traverse a long culvert but this is unlikely, and the lack of Eel recorded during the surveys tends to show that this is not likely. The work along the stream at the Atlantic field, and along the back of the Sandpark has the potential to improve water quality by filtering runoff and nutrients.

Victoria Stream:

The Victoria stream outfall is equipped with side hung gates allowing for overtopping. This existing feature is not within the remit of the scheme. IFI recommend addressing passability issues for fish. A number of measures are possible but these are not part of the project and therefore not discussed in detail here. The electrofishing report and IFI consultation have both identified that passability could be improved whilst not amending the current regime in terms of Victoria Stream discharge significantly. It is proposed to pursue this improvement of passability outside of this scheme. No change to current baseline passability at the point of discharge of the Victoria Stream (i.e. at the stop-logs) will occur.

Eel nursery:

The construction of the left hand bank wall will use in-situ poured concrete and therefore measures must be put in place to prevent uncured concrete and cement to enter waterways.

Any full diversion of the stream will require the displacement of the Eel nursery, followed by its reinstatement upon completion of the works.

[135] IFI, “Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.”

[136] IFI, “Planning for Watercourses in the Urban Environment. A Guide to the Protection of Watercourses through the Use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning.”

[137] IFI, “River Restoration Works - Science Based Guidance Centred on Hydromorphological Principles in an Era of Climate Change.”

[138] OPW, “Design Guidance for Fish Passage on Small Barriers” (Jonathan Swift Street, Trim, Meath, C15 NX36: Office of Public Works, 2022). OPW.

[139] OPW, “Design Guidance for Fish Passage on Small Barriers.” OPW.

At the site of the nursery, work will be carried out in the dry. First the stream will be electrofished to collect all fish in stream. Then, a dam will be put in place around the zone of works; further electrofishing for any Eel within the exclusion area will be carried out. The area can then be drained of water, sediment and gravels removed and stored. The wall will be dismantled manually, taking care to remove all Eels that are within the wall structure. The Eel will be translocated upstream to the newly created ponds within the Carrigaholt Road Field. This will be part of the Victoria Stream watercourse and continue to allow movement up and downstream. Post work monitoring will be carried out to ensure that the Eel are established in the newly created pools. Upon completion of the works, the stored gravels can be reinstated.

Western Tributary:

The culvert will be such that it allows for fish passage (see Section 7.6.5 on Culverts).

The culvert will be designed and installed such that a permanent pool of water is present at all times on either end of it. In the event that a bottomless culvert is not possible to install at this location, a naturalised bottom to the culvert will be put in place. A naturalised bottom will be facilitated by the gradient of the culvert and will allow for natural deposition. The length of the proposed culvert is <9m long. This is consistent with passability for both Eel and Lamprey.

Dry working

All construction works that require working in the dry will require the temporary partial or full closure of the stream, with overpumping.

Highly mobile species can be encouraged to leave an area using disturbance methods. Following this, electrofishing and translocation will be carried out to ensure no fish are trapped. The proposed area for dry working will be fenced off using mesh fencing. A pulse and draw methodology will be used for up to one minute per square meter along the area of works. Fish will then be collected using a hand net and placed into a bucket of water pending translocation. Captured fish should be translocated to suitable habitat away from the zone of works. Once translocation efforts are completed the zone of works should remain isolated, preventing fish from returning to the area in advance of works. The electrofishing must be carried out by a suitably trained ecologist following an IFI approved protocol.

Where overpumping is required, pumps will be equipped with suitable intake screens (e.g. Passive Wedge-wire Cylinder (PWWC)) to prevent any juvenile fish or Eel being taken in. Bio-fouling of screens can be reduced through the use of a copper nickel alloy screens. The sizing and configuration of the intake and protective screens will need to limit water velocities through the intake screens to no more than 0.15m/s to avoid fish entrapment[140].

Damming to obtain dry working conditions will require electrofishing.

Amphibians

A preconstruction survey to check streams and any standing water for the presence of amphibians will be carried out. If any spawn is found, or evidence of breeding is recorded works will be rescheduled until the young amphibians are mobile enough to disperse. Alternatively, a derogation licence will be obtained from the NPWS to carry out licenced translocation of spawn and amphibians. This will be carried out under guidance from a suitably qualified ecologist or NPWS ranger, following approval by the NPWS. Spawn will be relocated to nearby water features with similar characteristics, that are unlikely to be disturbed by the construction activity, or any other anthropogenic activities nearby. In stream works should be carried out in the summer months, between July and September; pre works checks will be carried out and any amphibian found will be captured and translocated to nearby suitable and safe habitat. Exclusion fencing (e.g. silt fences) may be required to keep mobile individuals out of the zone of works. This should be determined during pre-construction site surveys. Suitable habitat for amphibians will be created during the habitat creation works.

[140] A. W. H. Turnpenny and N. O'Keefe, "Screening for Intake and Outfalls: A Best Practice Guide," Science Report (Environment Agency, 2005), https://assets.publishing.service.gov.uk/media/5a7c9293ed915d6969f45d2d/scho0205bioc-e-e.pdf.

Monitoring and assessment for fish and amphibians

In order to accurately assess the biological effectiveness of the works, monitoring data may need to be collected for more than 3 to 5 years before one can conclusively determine what impacts, if any, the works may have had. Surveys should be carried out by suitably qualified ecologists in each of the different fields to be studied. Monitoring procedures will be determined by the ecologist following expert opinion and best practices guidance.

- An overall biodiversity check on the success of the ponds and realigned streams, including macro-invertebrates and/or diatoms (suggested methodology of: A guide to monitoring the ecological quality of ponds and canals using Predictive System for Multimetrics PSYM[141]) but other methods may be utilised by a wetlands specialist.
- Monitoring on the presence and success of the Eel nursery habitat, and presence/ absence of amphibians.
- Fishery survey in repeat location from pre works study.
- Monitoring of fish passage through culverts following most up to date IFI guidelines.

Flora of interest/6510 Hay meadow habitat.

Measures

The construction of the access road to the Field south of Cunninghams' caravan park will be aligned such that it avoids the high-density patch of orchids at the western end of the field, and the route will be agreed with the ECOW. Vehicles will be restricted to the road and designated work area. The patch with the highest density of plants will be fenced off using wildlife fencing to prevent the area being damaged. The duration of the works, and fencing off of the area will be temporary/limited in time to avoid excessive disturbance in the is Annex I habitat.

- Vehicles will not be permitted to drive off road and outside of the designated storage areas and zones of work.
- Turves to be excavated from vicinity of the river alignment area and preserved.
- Turves to be excavated from embankment footprint and preserved.
- In species rich grassland areas machines will work from protective mats to preserve vegetation not within the footprint of the works and prevent soil compaction.
- Work during dry ground periods to minimise soil disturbance and compaction.
- Access roads will avoid orchid rich areas. Bog mats to be placed over sensitive ground.
- If the section of orchids within the vicinity of the embankment / roads cannot be avoided, an orchid specialist/ suitably qualified botanist will be employed to oversee translocation within the zone of works. Excavated orchids to be replanted in suitable habitat once the construction works are over.
- Excavated turves to be replaced on to the embankments once construction is complete.
- Waste material will not be discarded into the adjacent field area.
- Access road will be removed once the construction is complete, and the access will be reinstated to pre-construction state. Suitable turves from excavation areas can be used to help speed up reinstatement of the area.
- No fertilising of any green space to be carried out.
- Where any areas of soil compaction are noted via machine tracking, a tine harrow will be utilised to break up compacted areas and aerate the soil.

Monitoring and assessment

Habitat management needs to be carried out to ensure that the ecological features designed serve their purpose and meet ecological standards. Along with the aquatic and bird surveys, areas that were worked for habitat creation and establishment of new planting need to be monitored for a minimum of 3 years post construction.

- Survey embankment to monitor establishment of vegetation, ensure that a suitable mix of species is present, and that turves have taken.
- Survey of riparian vegetation to assess if it has reestablished.

[141] Shelley Howard, "A Guide to Monitoring the Ecological Quality of Ponds and Canals Using PSYM," 2002.

- Survey for orchids pre-works and monitor recovery post work and spread of the plants over time. Enumeration of number of plants affected by the works, and translocated must be used as baseline conditions to determine effectiveness of measures over time.

Invertebrates

Embankments provide the opportunity to create habitat for solitary bees where bare earth sections occur. Ponds will create habitat for an array of invertebrates including Dragonflies and Damselflies. Many invertebrates and some pollinators require an aquatic component to their lifecycle e.g. Hoverfly larvae, and ponds in proximity to flower rich habitats will provide ideal conditions to complete a full lifecycle.

Embankments re seeded with mixed species seed can provided a rich habitat for pollinators, including Hymenoptera (Bees, Wasps, Flies) and Lepidoptera (Butterflies, Moths), improving biodiversity of the area and providing a source of food for insectivorous birds, and bats. Seed from Hay from the Long Meadow can be used as a seed source of local provenance. Any additional seed required should contain a suitable species mix with seeds of local provenance of species common or endemic to the area.

Construction

General mitigation during construction for control of sediment/silt and pollution control will include those laid out in the accompanying NIS in Section 8.1.3 and 8.1.3.1 for the protection of surface water and for concrete management, and in Section 8.1.3.2 for Pollution Control. These are the key features for protecting the SAC, and the local aquatic environment.

INNS

A preconstruction invasive species survey will be carried out to re-map stands of invasive species, to determine effectiveness of current management plans, detect any new contaminated areas, to inform management and construction strategies.

Data collected as part of this survey will include species, approximate area covered, a detailed description of each patch (e.g. approximate total number of stems, growth and information on other vegetation present). This information will inform calculations of volumes of infested soils to be excavated, as part of the measures outlined below.

For specific measures in relation to these species, reference should be made to the UK Environment Agency document The Knotweed Code of Practice: Managing Japanese knotweed on development sites (UK Environment Agency, 2006) and to the Best Practice Management Guidelines for Japanese Knotweed (Invasive Species Ireland, 2008).

Biosecurity Mitigations

Biosecurity measures must be implemented to stop the spread of INNS. Following the INNS survey that immediately precedes the works a set of measures will be implemented:

- Fencing off/demarcating invasive species
- A minimum 3m buffer zone will be applied (as per guidelines on specific management plans within the Knotweed Code of Practice).
- Communicating the location, risk and hazards associated with invasive species to construction personnel.
- Identifying dedicated access points into and out of fenced-off areas, the installation of designated decontamination facilities (where appropriate).
- Protocols around the storage of infested soils, and the checking of boots, tyres and tracks before they enter the works site.
- Contaminated soils to be disposed of in appropriately licenced facility with measures in place to prevent spread along roadways during transport.
- Continuation of the Japanese Knotweed work eradication work should carry on until it is fully removed from the area. Three-cornered leek should be destroyed prior to work being carried out.
- Japanese Knotweed eradication to follow Clare County Council procedures as established and currently implemented.
- Three-cornered Leek to be dug up during vegetative period ensuring all bulbs are removed. The area should be cut in subsequent years to prevent reestablishment through seedbank. Monitor the area for establishment over subsequent years and destroy appropriately.

All instream works, and works around the water must comply with best practice biosecurity protocols for aquatic work – set out in [142]: IFI Biosecurity Protocol for Field Survey Work, including:

- Tanks that are used to stock or transfer live fish should be thoroughly washed with a 1% solution of Virkon Aquatic or another proprietary disinfection product. Alternatively, a 5% solution (100 ml / 20 litre solution) of chlorine bleach should be used. All disinfected equipment must be thoroughly rinsed with clean water.
- All nets must be cleaned of all vegetation and debris before returning to base. Clean nets must then be placed in a freezer for a period of four days and then soaked in a 1% solution of Virkon Aquatic or a proprietary disinfectant for a period of not less than 15 minutes and thoroughly rinsed thereafter.
- Footwear should be dipped in or scrubbed with a disinfectant solution (e.g. 1% solution of Virkon Aquatic or another proprietary disinfection product) and thoroughly dried afterwards.

Operational Mitigation

Natural flood alleviation zones should be allowed to act as a riparian buffer, providing ecologically important habitat, filtering nutrients and sediment before it enters the waterways.

Operational Attenuation Area

The rerouting of the Western Tributary will include scrapes and capacity for the surrounding fields to flood and hold water, with a connection to the Victoria stream through a culvert. This will provide environmental benefits and mimic natural drainage and encourage its infiltration attenuation and passive treatment.

Controlled Release of Water into Moore Bay

Upstream water storage will provide wetland areas for wildlife, filter sediment, excessive nutrients and any other pollutant that may be in the water, and limit the amount released into the bay. By limiting the sediment load into the bay, the risk to the beach and reef communities are minimised.

Ecological Clerk of Works (ECoW)

A or a team of suitably qualified ecologist / ECoW will be present on site for key stages of the works and will liaise with the site foreman to ensure mitigation measures are implemented. The ECoW will be responsible for, but not limited to:

- Pre works ecology checks.
- Orchid translocation.
- Oversight of electrofishing.
- Oversight of vegetation clearance.
- Oversight of silt barriers and monitor sedimentation.
- Oversight during tying in of new/upgraded stormwater drains.
- Oversight of U channel works, including the mammal ledge.
- Reporting ecological sensitive receptors on site.
- Notifying relevant authorities in case of water pollution.

This oversight will allow for the implementation of the mitigation outlined in this document, as well as taking preventative action. The ECoW will have the power to stop works if/ when required.

7.7 Residual Impacts

A summary of the project impacts on the different ecological features, with reference to a summary of mitigation measures is provided in the table below.

[142] IFI, "IFI Biosecurity Protocol for Field Survey Work," 2010.

Table 7--12: Summary of scheme impacts on screened in ecological receptors.

Ecological feature	Value	Construction Impact	Operational Impacts	Effect without mitigation	Mitigation	Residual effect significance
Habitats						
Reed and large sedge swamp	Local Importance (Lower Higher).	Loss of habitat, habitat degradation (soil compaction, tracking and disturbance by machinery).	-	Loss of habitat	Preserve excavated turves and reinstate, fence areas to remain intact. Enhanced post construction management of reeds.	Slight negative effect. Loss of habitat to the footprint of the embankment and stream re-alignment will be offset by enhanced management and wetland creation.
Wet grassland	Local Importance (Higher Value).	Loss of habitat, habitat degradation (soil compaction, tracking and disturbance by machinery).	-	Loss of habitat. Temporary disturbance of habitat from machinery working.	Preserve excavated turves and reinstate. Work in dry ground conditions. Use mats to protect sensitive areas. Only small areas of local important habitat to be lost in footprint of embankment, or to stream re-alignment.	Long term loss of small area of locally important wet grassland.
6510 Annex I habitat	Regional Importance	Loss of habitat, habitat degradation (soil compaction, tracking and disturbance by machinery).	Change in hydrological regime causing changes in species composition	Habitat degradation, change in species composition, loss of habitat	Mowing/ grazing regime. Avoid machinery working in species rich areas. Position ponds and regrading in areas of low diversity. Where machinery must work from within species rich areas use of mats to avoid soil compaction and to protect vegetation. Work in dry ground conditions only to minimise cutting up/disturbance.	Slight negative. Enhanced management (e.g. formalised hay meadow management with no fertiliser input) will secure management of field in long term for biodiversity.
Marsh	Local Importance (Higher Value).	Loss of habitat	-	Loss of habitat to embankment behind Cunninghams caravan park.	Habitat creation of similar type habitat.	Neutral effect
Sand shores	Local Importance (Higher Value).	Sedimentation	Storm runoff causing erosion of sand shores (normally replaced within incoming tides over time).	Sedimentation	Dry working. Operation of the FRS will mean less storm runoff events	Neutral effect
Rivers						
Atlantic Stream	Lower local importance	Water quality – release of sediments and pollution during construction.	Improved water quality; Annual vegetation cutting on banks is not expected to have	Sedimentation, nutrient loading, loss of habitat, loss of aquatic species	Water quality protection measures	Temporary slight negative impact in localised areas of stream. Operational: neutral.

			any negative impact			
Well Stream	Lower local importance	Water quality – release of sediments and pollution during construction. Temporary loss of habitat during overpumping / diversion.	Loss of naturalness (replacement of natural bed with U channel). .	Loss of instream habitat. Dry bed during overpumping / diversion	Water quality protection measures. Naturalised features to be re-instated. Similar connectivity (culvert replacement). Translocation of bed material to new U channel. Translocation of any eel to suitable habitat. ECoW monitoring.	Long-term slight negative in a localised extent approximately 100m of locally important stream. Reversible. Offset by overall gain in higher quality stream habitat at a scheme level.
Western Tributary	Local Importance (Higher Value).	Water quality – release of sediments and pollution during construction. Loss of habitat	-	Sedimentation, nutrient loading, loss of habitat, loss of aquatic species	Water quality protection measures during construction. Stream realignment to include natural features. Habitat, fauna and flora translocation. ECoW monitoring. Water quality improvements from ponds and flooding.	Slight positive residual impact. Improved water quality and aquatic/fish habitat
Victoria Stream	Local Importance (Higher Value).	Water quality – release of sediments and pollution during construction. Loss of habitat	-	Sedimentation, nutrient loading, loss of habitat, loss of aquatic species	Water quality protection measures during construction. Stream realignment to include natural features. Habitat, fauna and flora translocation. ECoW monitoring. Water quality improvements from ponds and flooding.	Slight positive residual impact. Improved water quality and aquatic/fish habitat
Flora						
Dactylorhiza sp.	Regional	Loss of habitat, loss of plants	Permanent loss of habitat	Loss of habitat, loss of plants	Avoidance of orchid areas. Use of protective mats to protect vegetation. Work during dry periods in prevent compaction. Translocation of plants if needed by specialist.	Small loss of habitat to embankment. Slight negative.
Invasives species – Japanese Knotweed	None	Spread of invasive species	Spread of invasive species	Spread of INNS	Biosecurity measures in Section 0	No residual effects anticipated
Mammals						
Badger	Regional Importance.	Loss of foraging habitat; trapping in trenches	No impact anticipated	Trapping of individuals	Excavation protection measures.	No residual effects anticipated
Otter	Regional Importance.	Loss of foraging opportunities; trapping	Improved water quality; increased foraging	Trapping of individuals; reduced foraging	Excavation protection measures; Water quality protection measures Otter passability ledges	No residual effects anticipated / slight positive

			opportunities			
Bats	Local Importance (Higher)	Loss of linear features	Increased foraging habitat	Temporary displacement	Lighting control during construction. Retention of linear features.	No residual effects anticipated
Birds						
Marine birds / Waders & Waterbirds	Local Importance (Higher Value).	Temporary disturbance	None anticipated	Temporary displacement	Noise avoidance measures	Potentially improved habitat for waders and waterbirds
Passerines all	Local Importance (Higher Value).	Temporary disturbance	None anticipated	Temporary displacement	Vegetation management outside of bird nesting season	No residual effects anticipated
Sedge Warbler	Local Importance (Higher Value).	Loss of habitat; temporary disturbance	None anticipated	Temporary displacement	Vegetation management outside of bird nesting season	No residual effects anticipated
Snipe	National / Regional	Loss of wintering habitat; temporary disturbance	None anticipated	Short-term displacement	Vegetation management outside of bird nesting season and prior to arrival of winter migrants. Preservation of intact areas of reed habitat.	Potentially improved habitat for Snipe
Fish & Amphibians						
Flounder	Local Importance (Higher Value).	Temporary loss of habitat	Increased water quality; increased connectivity	Loss of habitat; loss of individuals	Water quality protection measures; fish translocation measures during construction.	Potentially improved water quality; improved habitat
Eel	National	Temporary loss of instream habitat	Increased water quality; increased connectivity	Loss of habitat; loss of individuals; loss of nursery	Water quality protection measures; fish translocation measures; Nursery protection measures; increased nursery habitat Eel passability measures	Potentially improved water quality; improved habitat; improved connectivity
Amphibians	Local Importance (Higher)	Temporary loss of habitat	Increased water quality; increased habitat potential	Loss of habitat; loss of individuals	Water quality protection measures; translocation as required.	Temporary Slight negative during construction. Long term Slight positive during operation. Potentially improved water quality; improved quality and quantity of habitat, improved connectivity.
Features of local interest identified in the Local Area Plan	Allender's Field	n/a outside area of works	Enhancement of biodiversity wider area	n/a	n/a	Slight positive.

7.8 Interactions and Predicted Cumulative Impacts

Since 2020, 16 new planning application were approved in Kilkee. These applications exclude change of use, retention or modification to existing dwellings. The application includes new constructions and/or new waste treatment facilities for existing constructions. Only developments that may overlap in time with the scheme were considered.

Two main projects were identified with the potential for cumulative impact.

Watersports

The new water sports facility in Kilkee is near the works on the Atlantic Stream. The facility will link into the existing water drainage network. There may be an overlap in disturbance between the construction phases of both projects. However, the new water sports facility has screened out impact on birds within the NIS, as has this project, given the distance to the SPAs and lack of bird activity in the works area. Locally important non-QI populations are similarly unlikely to be impacted, even if both projects occur simultaneously, as both projects are occurring in a similar footprint within a busy urban town, where birds within the zone of disturbance impact are already tolerant of disturbance from recreational walkers on the beach, dogs, boats and noise from the town itself. As such, no cumulative impact is anticipated from the two projects.

Waste Water Treatment Plant – Uisce Éireann

The WWTP and new pumping station is likely to have positive impact on the local water quality within Kilkee, and a reduction in nutrient output to Kilkee Reefs SAC. Operationally, there is little potential for cumulative impact.

An overlap in the construction works between the new pumping station and the works on the Victoria Stream may result in additional pressure on the Victoria Stream, including where it is pumped out to Intrinsic Bay. Moreover, the existing plant in Victoria Park will maintain a storm overflow into the Victoria stream. The redevelopment of the site will upgrade the outfall pipe. This work and discharge point may have a cumulative impact.

With this in consideration and the fact that that the proposed development will potentially impact the QIs or conservation objectives of Kilkee Reefs SAC, it can be stated that in the absence of mitigation for this proposed development, there is some potential for cumulative impacts to occur with other local projects.

The new WWTP planning documents were presented to Clare County Council in January 2024; the development will involve two sites, one out of town upstream of the Well stream works. The second site will consist of the construction of a new Foul Pumping Station at the existing plant in Victoria Park, with the construction of an emergency storage tank; surge kiosk; washwater kiosk; odour control building; control panel kiosk; standby generator; foul pumping station; petrol interceptor; potable water / break tank kiosk; gantry's for pump and cleaning system removal; installation of underground internal site pipework including surface water drainage and petrol interceptor; ESB building and Panel Room; 2.4m high wire mesh security boundary fence; replacement of existing chain-link fence; safety bollards; new signage; an access gate; temporary construction access including the demolition and reinstatement of a boundary wall at the existing Victoria PS site; temporary works area; permanent access off Victoria Park; and all hard and soft landscaping including screen planting.

The new WWTP will use the same existing outfall pipe into Intrinsic Bay. Disturbance impacts on the stream and associated habitats during the construction works are not considered to be significant, even if both projects happen simultaneously, as no habitats or species highly sensitive to disturbance are present, and provided comprehensive mitigation measures will be in place. Detailed water quality protection measures will be in place during the construction of this project. The water quality being discharged should be improved as it will have been treated prior to discharge, and improved water quality in the Victoria Stream will be result from this scheme once operational. As such, The WWTP works and management are independent from the FRS and therefore are not considered in detail here.

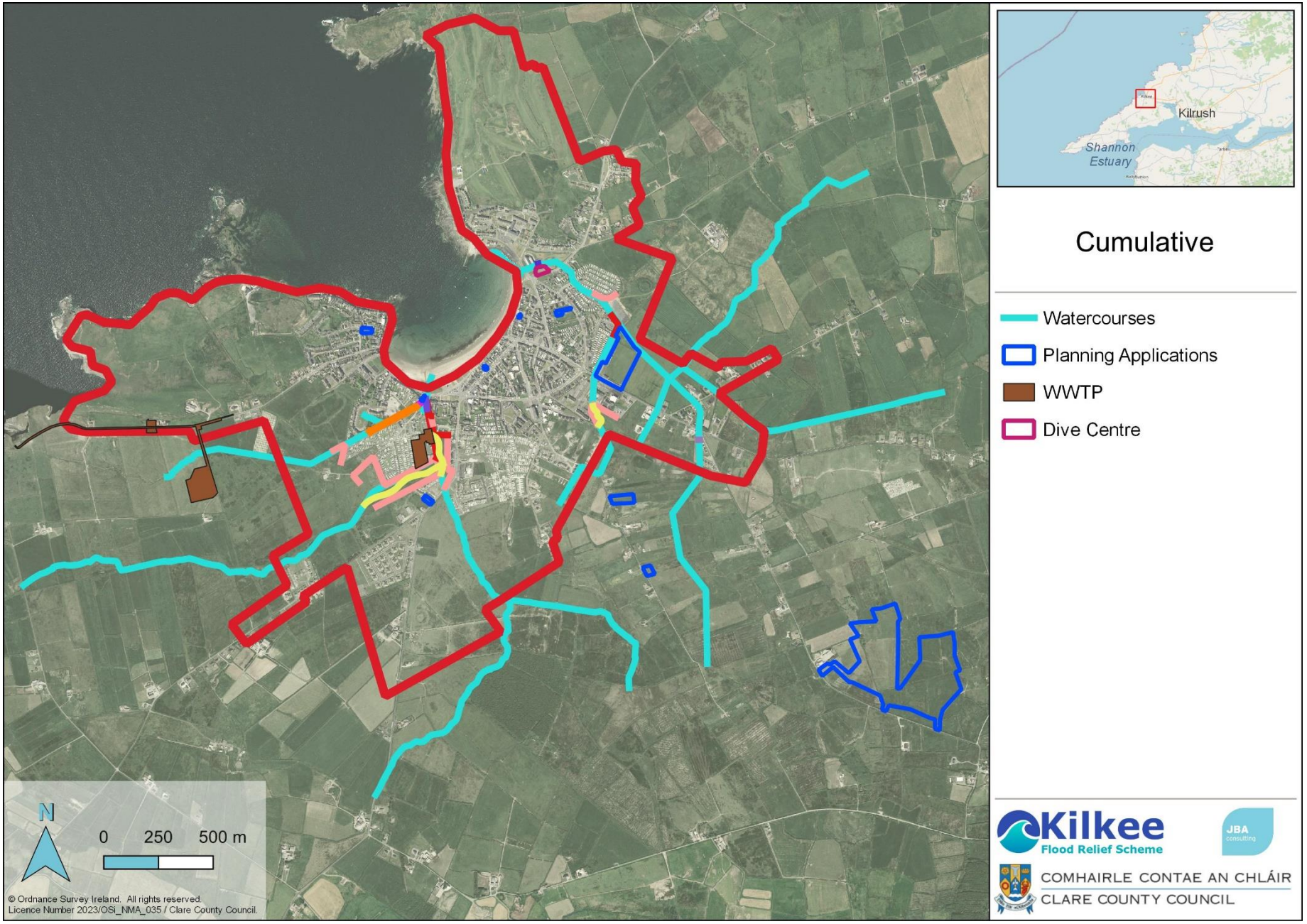


Figure 7--39 Development with potential for cumulative impacts

Table 7--13: Planning applications within the vicinity of the works

Application	Development Description	Address	Received	Expiry date
16708	for the development of a solar photovoltaic panel array consisting of up to 37,800 m2 of solar panels on ground mounted steel frames, 2 No. electricity control cabins, inverter units, underground cable and ducts, hardstanding area, boundary security fencing	Dough Lisdeen, Termon west, Kilkee	12/09/2016	29/03/2027
21605	to construct two no. new dwelling houses, storage shed and all associated site works and ancillary services	Carrigaholt Road, Kilkee, Co Clare	10/06/2021	02/09/2026
21804	to construct a new dwelling house, site entrance and access road along with all associated site works and ancillary services	Circular Road, Kilkee, Co Clare	29/07/2021	27/10/2026
21884	for the following development: 1. PERMISSION to demolish existing Dive Centre Building and close up existing entrance; 2 PERMISION to construct new Dive Centre Building consisting of 2 No. Rib Storage areas, changing area, toilets office and briefing room	Kilkee Sub Aqua Club, Pound Street, Kilkee Co Clare	23/08/2021	18/11/2026
22288	to construct agricultural storage shed, entrance and all ancillary site works	Dough, Kilkee, Co Clare	31/03/2022	23/01/2028
22311	for the development which will consist of a dwelling house and proprietary wastewater treatment system & percolation area together with ancillary site works	Dough, Kilkee, Co Clare	07/04/2022	26/10/2027
22395	for the following development at St Joseph's, Strand Line, Kilkee, Co Clare 1) Demolition of existing single storey dwelling 2) Construction of new 3 storey private residence and 3) all associated site works including connection to public services	Strand Line , Kilkee , Co Clare	29/04/2022	18/05/2028
22825	to construct a new dwelling house with connection to public services and all other associated site works	West End , Kilkee , Co. Clare	15/09/2022	12/12/2027
23145	to construct new raised domestic yard with storage underneath to side of existing dwelling plus all ancillary site works	Strand Line , Kilkee , Co. Clare V15 R974	09/03/2023	06/06/2028
2460002	to apply for a 10-year permission for development at these sites (c.4.56ha combined total) in the townlands of Kilkee Lower and Foohagh, Kilkee, Co. Clare (no Eircode available); comprising two areas of land principally bound: Subject Site (A) to the north	sites in the townlands of Kilkee Lower and Foohagh , Kilkee , Co. Clare	03/01/2024	-

8 Land and Soil

8.1 Introduction

This chapter of the EIAR comprises an assessment of the likely significant effects of the proposed development with respect to land, geology, and soil. This chapter should be read in conjunction with Chapter 9 (Water) due to overlapping impacts and mitigation measures.

The following legislation was consulted during the preparation of this chapter:

- Water Framework Directive (2000/60/EC);
- Groundwater Directive (2006/118/EC);
- European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010);
- European Union Environmental Objectives (Groundwater) (Amendment) Regulations, 2016 (S.I. No. 366 of 2016);
- Waste Management Act 1996, as amended;
- Habitats Directive (92/43/EEC).
- Classification of waste material that may be taken off-site for disposal is based on the Commission Decision of 18th December 2014, amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European parliament and Council (2014/955/EEC) [the List of Waste (LoW)]. These enable waste to be classified as either hazardous, non-hazardous or minor (either hazardous or non-hazardous).

8.2 Assessment Methodology

Methodology

The methodology for assessment of the impacts on soil and geology has been undertaken in accordance with the following guidance documents and recommendations:

- Environmental Protection Agency (EPA) (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.
- Institute of Geologists of Ireland (IGI) (2013) Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements.
- Department of Housing, Planning and Local Government (DHPLG) (2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment.
- National Roads Authority (NRA) (2008) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.

Sources of Information

Several sources of information were used to establish baseline environment conditions, through desktop surveys and site work.

- EPAMaps – gis.epa.ie
- GSI maps – gsi.ie
- SEPM Strata – sepmstrata.org
- Teagasc soil and subsoil database and mapping keys
- Clare County Council County Development Plan (2023-2029)
- Aerial photography
- Google Earth
- Google Maps
- Site investigation report - OCB Geotechnical conducted a site investigation between 17th November 2021 and 3rd June 2022. A draft report was issued on the 15th of July 2022.
- Site walkover
- Malcolm J. Brandt, K. Michael Johnson, Andrew J. Elphinston, Don D. Ratnayaka, Chapter 3 - Hydrology and Surface Supplies, Twort's Water Supply (Seventh Edition), (2017),

Assessment Criteria

The significance or sensitivity of receptors and assessment of effects have been described following criteria outlined in the EPA Guidelines[143].

In accordance with the IGI guidance[144], the study area has been set as a 2km radius from the site boundary. This is the recommended minimum distance in the IGI guidelines and takes into account the lack of karstic or other sensitive subsurface features at the site, and the scale and nature of the development.

Table 8-1: Criteria for Rating Site Attributes: Estimation of Importance of Soil and Geological Attributes[145]

Importance	Criteria	Typical Examples
Very High	Attribute has a high quality, significance or value on a regional or national scale Degree or extent of soil contamination is significant on a national or regional scale Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale	Geological feature rare on a regional or national scale (NHA) Large existing quarry or pit Proven economically extractable mineral resource
High	Attribute has a high quality, significance or value on a local scale Degree or extent of soil contamination is significant on a local scale Volume of peat and/or soft organic soil underlying route is significant on a local scale	Contaminated soil on site with previous heavy industrial usage Large recent landfill site for mixed wastes Geological feature of high value on a local scale (County Geological Site) Well drained and/or highly fertility soils Moderately sized existing quarry or pit Marginally economic extractable mineral resource
Medium	Attribute has a medium quality, significance or value on a local scale Degree or extent of soil contamination is moderate on a local scale Volume of peat and/or soft organic soil underlying route is moderate on a local scale	Contaminated soil on site with previous light industrial usage Small recent landfill site for mixed wastes Moderately drained and/or moderate fertility soils Small existing quarry or pit Sub-economic extractable mineral resource
Low	Attribute has a low quality, significance or value on a local scale Degree or extent of soil contamination is minor on a local scale Volume of peat and/or soft organic soil underlying route is small on a local scale	Large historical and/or recent site for construction and demolition wastes Small historical and/or recent landfill site for construction and demolition wastes Poorly drained and/or low fertility soils Uneconomically extractable mineral resource

A number of walkover surveys, and the installation of trial pits and boreholes as part of site investigations have furnished relevant information regarding the geological and pedological environments at the site.

A Conceptual Site Model will be developed based on the site investigations undertaken, the information on groundwater levels in the boreholes and the proposed development. The impacts of the scheme on soil, geology, and dependant habitats and species will be assessed and any significant impacts will be mitigated.

The interaction between geology/soils and hydrology/hydrogeology on water-dependant ecology will be discussed in Chapter 13 Interactions.

[143] Environmental Protection Agency (EPA) (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports

[144] Institute of Geologists of Ireland (IGI) (2013) Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements

[145] National Roads Authority (NRA) (2009) 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the National Roads Authority'

8.3 Receiving Environment

Table 8-2 below shows a summary of the land, geology, and soils features identified, and their importance rankings. These are further discussed in the following sections.

Table 8-2: Site feature importance ranking

Feature		Ranking	Comment
Land/land take	Residential/urban areas	Medium	Areas designated for excavation are in residential or urban areas. There will be some temporary and permanent land take to complete the works.
	SAC	High	Kilkee Reefs SAC. There will be no works directly in or bordering the SAC, however, proposed flood measures could result in downstream effects.
Soil and subsoil	Made ground	Low	A monitoring program will be implemented during construction in order to detect the presence of any contaminants.
	Topsoil	Medium	Predominantly peaty and gley soils. High clay content and seasonal waterlogging through inadequate drainage of rainfall and water table fluctuation.
	Till	Low	Low value cut blanket peat and mudstone, sandstone, and shale till.
Geological Heritage sites	Foohagh Point	High	Occupies the western coastline from the town and covers a number of small rock formations separated from the coastline. Designated national importance, with particular significance for tourism and educational. Forms a substantial feature of the Wild Atlantic Way.

Land use

Kilkee has been a seaside town and fishing village since the 18th Century. It began to see an influx of tourists in the late 19th Century which can be afforded to the South Clare and West Clare railways which connected Kilkee to Ennis, as well as a rise in personal transport means such as the car, and bus. It has maintained its significance as an important domestic and foreign tourist destination to the present day, with its future potential recognised by the Clare County Council.

Kilkee is a Level 4 Small Town in the settlement hierarchy of the Co. Clare County Development Plan (CDP) and is identified for small scale growth across the commercial, enterprise, and tourism sectors. It has a wide range of facilities and recreational options for residents and tourists alike. The town forms part of the Wild Atlantic Way, Ireland's first long-distance touring route. Foohagh Point is a spectacular geological formation forming much of the coastline southwest of Kilkee and part of the Wild Atlantic Way. Walking, cycling, water sports, sailing, and fishing are among some of the nature-based activities Kilkee currently offers. Potential also exists to expand Clare's educational tourism based on the geology of the Kilkee/Loop Head areas.

Kilkee experiences extreme fluctuations in residential vacancy due to the seasonality of tourism and is generally vulnerable to changes in tourism, which was evident during the Covid-19 pandemic. The 2016 Census recorded just over 72% vacancy during the off season. This intense seasonal change places considerable strain on the town's infrastructure. In April 2014 Kilkee experienced damaging flash floods after intense rainfall fell within the small, steeply graded catchment, which dampened the tourism season for that year.

Holiday home villages and mobile homes make up a large footprint of Kilkee. Flood relief measures of the proposed development are situated along the border of areas zoned for future and existing tourism, residential developments, and enterprise developments. Land take from areas zoned for open space or as buffer space will be required for the construction of the flood storage areas as part of measures proposed for the Victoria Stream. The Atlantic Stream outfall, upon which upgrades are proposed, is situated at the bay in an area reserved for the future development of the pier, land-based facilities associated with the development of water-based commercial activities and for tourism and leisure uses.

Bedrock Geology

Bedrock geology of the site is composed of Upper Carboniferous (Namurian) sandstone, siltstone, and mudstone, with grey siltstone and sandstone present in sections along the coastline and inland towards

the east. The Carboniferous bedrock transitionally overlies the progradation slope system (Gull Island Formation) which forms part of the Clare Basin. All flood defences will be constructed in areas underlain by the sandstone, siltstone, and mudstone of the Central Clare Group.

Quaternary Sediments

Quaternary sediments within the study area are dominated by Namurian sandstone and shale till, blanket peat and made ground.

Marine sediments underlie Kilkee Beach and tidal marsh silts and clays are present around parts of the Shannon Estuary southeast of Kilkee. There is significant surface bedrock along the northern and western coastline. In general, subsoil permeability is low across the site and study area.

Flood defences proposed for the Atlantic Stream, the Well Stream, and the Victoria Stream systems are located in areas of made ground or blanket peat.

Topsoil

Soils across the study area belong to the Surface water Gleys, Groundwater Gleys, Brown Earths, Brown Podzolics, or Luvisols Great Group listed in decreasing frequency.

Flood defence measures are located in areas of urban ground or peat.

Table 8-3: Summary of topsoil in Kilkee

Soil Association	Great Groups	Description
0700b	Surface water Gley, Groundwater Gley, Brown Earth, Brown Podzolic	Fine loamy, occasionally silty, drift with siliceous stones or over shale and slate bedrock
1130a	Brown Earth, Surface Water Gley, Luvisol	Fine loamy drift with siliceous stones or over sandstone bedrock
1xx	Peat	Peat
Tidal Marsh	Tidal Marsh	Silty and clayey soils.
Urban	Urban	Made ground

Karst

No karst features were identified within the 2km study area during the desktop study.

Geohazards

No geohazards were recorded during the desktop study. Kilkee is an area of relatively low radon risk and the majority of the works will take place in areas of low radon risk (1 in 20 homes is likely to have radon) with some areas of medium risk (1 in 10 homes is likely to have radon).

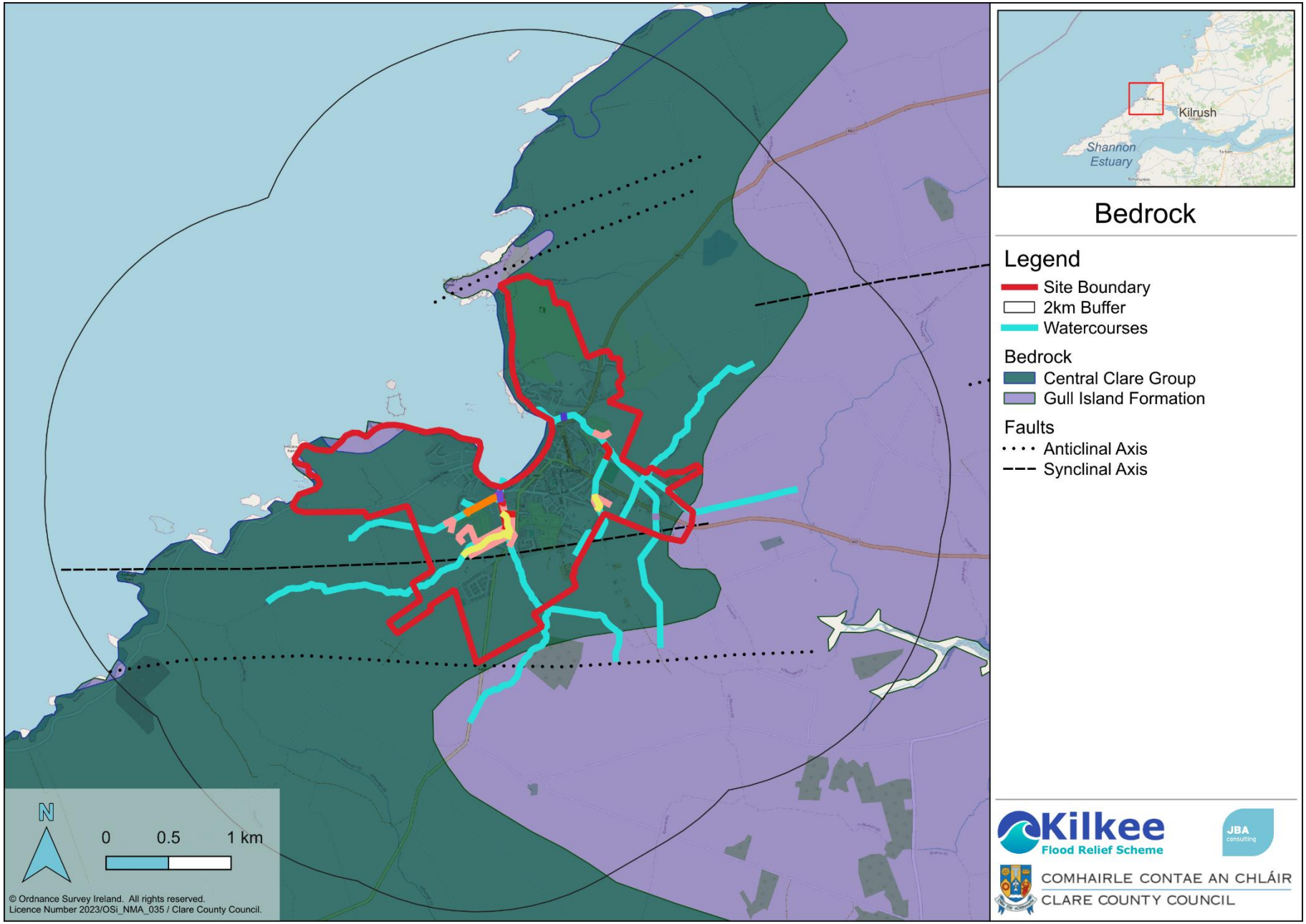


Figure 8-1: Bedrock geology of Kilkee

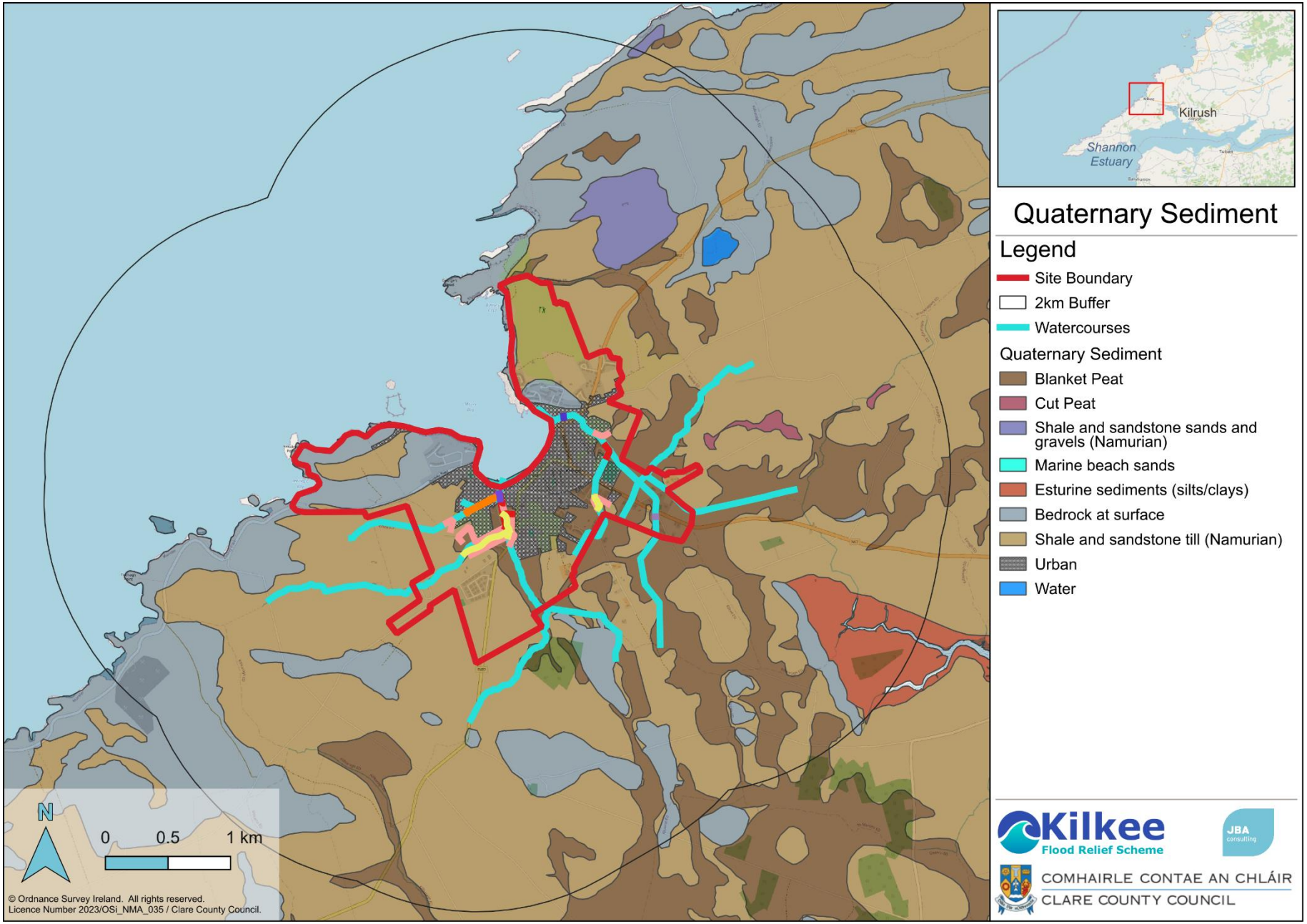


Figure 8-2: Quaternary sediment and subsoil of Kilkee

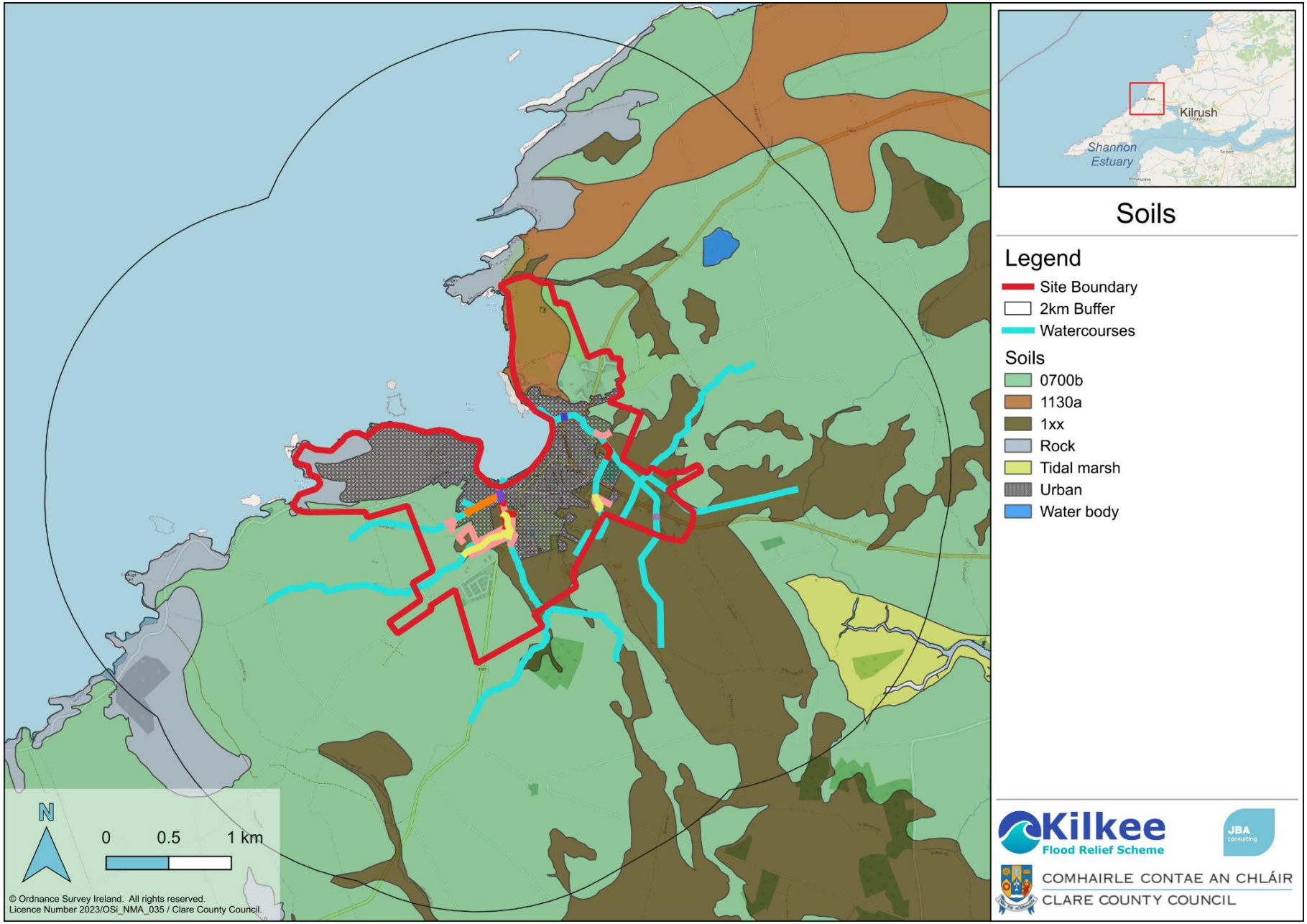


Figure 8-3: Topsoil of Kilkee

8.4 Site Investigation

A site investigation was undertaken by OCB Geotechnical between 17th November 2021 and 3rd June 2022. A draft report was issued on the 15th of July 2022. The site operations included:

- Six (6) Cable Percussion Boreholes
- One (1) Standpipe installation
- Five (5) Dynamic Probes
- Twenty-one (21) Trial Pits
- Three (3) Seawall Inspection Pits
- Seven (7) Slit Trenches

The purpose of the site investigation was to provide geotechnical and environmental information that would inform the design and construction of a proposed flood relief scheme.

Ground Conditions

Typical ground strata observed across trial pits in the locations of proposed flood measures was highly variable, with a general description below:

- 0 - 0.3mbgl - Topsoil – Soft silty clayey occasionally sandy soil with low gravel content
- 0.1 - 1mbgl - Made Ground - Soft greyish clayey, silty, sandy, gravelly soils with increasing cobble content with depth
- 0.3 - 3mbgl Subsoil – Soft to stiff silty clay occasionally sandy, often gravelly with higher cobble content

Gravels and cobbles were described as angular to subangular in the majority of samples.

Driller records show refusal at several boreholes indicating boulders or weathered bedrock from 0.9 - 9.8m. Shallow refusals are more likely to be boulders. The deepest refusal was encountered in BH1-07, close to the discharge point of the Victoria Stream.

Groundwater was struck in 16 of the 21 trial pits at a depth ranging between 0 – 2.10m with an average of 1.38m. Grey and orange mottling was evident across the majority of trial pits indicating waterlogging and anaerobic conditions for significant parts of the year. Soils textures varied. Made ground was encountered in 11 of the trial pits, and clay soils with high sand and silt content as well as gravel textures were observed in the majority of trial pits. The range of plasticity indexes recorded was 10 – 26, with an average of 17.6. A high clay content is reflected in this range which was recorded over 6 samples.

The average pH of samples was 7.55 with a minimum of 7.1 and maximum of 8.1 across 6 samples. These values are typical for saline soils, although salinity was not tested. An elevated concentration of water-soluble sulphate, of 413mg/L, was recorded in IP1-02 B5 which is likely due to the presence of sea water. Other values ranged from 9 – 92 mg/L with an average of 39.6 mg/L across 5 samples, excluding the value recorded in IP1-02 B5 as an outlier. Soil moisture content was generally within the 20 – 40% range expected in clay soils[146].

Flood relief measures are proposed in soils that range from dry to very wet, neutral to slightly basic pH, and high clay content with low volumes of silt, sand, and small gravels, which increase with depth.

Contaminated Ground

The site investigation found no evidence of contamination across the area of study. Made ground was encountered in 11 of the trial pits. A full suite of chemical testing was not performed on samples, and a monitoring program will be implemented during the construction phase to test excavated soil.

[146] Malcolm J. Brandt, K. Michael Johnson, Andrew J. Elphinston, Don D. Ratnayaka (2017) Chapter 3 - Hydrology and Surface Supplies, Twort's Water Supply (Seventh Edition)

EPA Licensed Facilities and Waste Facilities

The Lisdeen Waste Recovery facility (Registration number W0170-01) is located southeast of Kilkee. The site is a former landfill that now accommodates a domestic waste bring facility. The site completed environmental monitoring in 2022 in compliance with the Conditions and Schedules of their Licence. There were no complaints and 2 minor non-compliances at the site in 2022 related to exceeding water trigger levels.

There are no Seveso sites or other licensed facilities within 2km of Kilkee.

Minerals/Quarries/Mines

During the desktop survey, what appears to be a sand and gravel quarry southwest of Kilkee and south of Foohagh Point was identified using Google Maps. However, there is no record of a quarry in this location in the GSI database or on the historical 6-inch map.

No presence of minerals has been recorded within 2km of the town. The closest are coal sites, approximately 2.5 – 3km northeast from Kilkee.

Geological Heritage

Foohagh Point is a geological heritage site of National Importance and may be proposed as a Natural Heritage Area (NHA) by the Geological Survey Ireland (GSI).

Foohagh Point stretches along the coastline from Kilkee to ‘the Candlestick’, an impressive sea stack formation southwest of Foohagh Point. The site includes several rock formations protruding from the sea including Bishop’s Island and a collection of rock-enclosed tidal pools called the Pollock Holes, as well as the Diamond Rocks and Knockroe point. All of these features are a striking display of geological formation and form part of the Kilkee Cliff walk and the Wild Atlantic Way.

Foohagh Point is an example of a growth fault which causes sediment and sedimentary rocks to thicken towards the fault axis. The Central Clare Group overlies the progradational slope system of the Gull Island Formation, which emerges at points along the coastline (Figure 8-4). It is a defining feature of Kilkee and draws significant numbers of tourists each year in addition to visitors for educational purposes.

The proposed development area does not fall within the site and proposed works are not anticipated to have an impact on the integrity or visual amenity of the site’s geology.

Figure 8-4: Foohagh Point (GSI, 2023)

8.5 Predicted Impact

Potential impacts are discussed regarding the 'do nothing' scenario, during construction of the scheme, and during operation of the scheme, without mitigation measures in place. Mitigation measures are outlined in Section 8.6.

Do Nothing Scenario

Under the 'do nothing' scenario the site would remain in its current condition. In the event of the proposed scheme not being implemented, the intermittent deposition of alluvial sediment onto the flood plain of the Atlantic, Victoria, and Well Streams would continue during flood events. Parts of Kilkee which flood would also be vulnerable to contamination through pollutants borne by flood waters travelling through urban areas and settling onto the land as flooding recedes. Over time this could result in a reduction in the water quality of Moore Bay which currently holds an ‘Excellent’ WFD Status. Outside of flood events there would be no resulting effects on land and soils in the scheme area.

Construction Phase

Most impacts will be from the import and export of soil, contamination, soil exposure, erosion, instability, and soil compaction. Impacts on hydrogeology and groundwater are discussed in Chapter 9.

Construction activities can pose a risk to land and soils. The key civil engineering works which could impact land and soils are:

- Establishment and operation of temporary site and welfare compounds for the duration of the works, including storage of potential pollutants such as fuels, oils, etc.;
- Excavations for the construction of embankments, flood walls, and installation of culverts;
- The storage and use of heavy machinery and construction equipment;
- Import of material for the construction of flood embankments;
- Export of material from excavations.

Site Compounds

Several construction and welfare compounds will be set up as part of the proposed development. The main site compound is proposed for a site on the outskirts of Kilkee to the southeast adjacent to the N67 and St. Senan’s GAA pitch. The smaller welfare compounds are proposed at three other locations.

A welfare compound is proposed for a site off the Well Road which will serve staff operating on the Well Stream and Victoria Stream works. Works for the area will require this site to be excavated to accommodate an underground storage tank. These works will be taking place in a built-up area with space constraints. A second welfare compound in the vicinity will be situated south of the Long Field and will accommodate works proposed for the Victoria Stream. The third compound will be set up behind Waterworld and will serve works proposed for the Atlantic Stream along with the main site compound. Consultation with landowners for temporary use of these sites may be required.

Temporary access roads will accompany the site compounds and will require the import of stone or gravel material. A total volume of 4987m^3 of material will be imported for the construction of temporary access roads, which will subsequently be removed following completion of the proposed development. Due to the temporary nature of the site compounds, impacts on soil and geology are expected to be **temporary, slight, negative**.

Movement of vehicles and construction machinery to and from these sites could potentially impact soils locally through compaction or contamination through stored materials. This is discussed in the following sections.

Excavation

Changes to the soil and geological environment as a result of the scheme will arise predominantly through the excavation and subsequent infilling. A total estimated volume of material to be excavated and removed across all locations is 12,714m^3. Of this, 3,840m^3 is required to establish temporary

access roads to site compounds or site works, 8,574m^3 is required as part of embankment construction, and 297m^3 will be required for the creation of temporary site compounds.

Works at Kilkee Bay Hotel, Dún an Óir Estate, and Sandpark Mobile Park, will include embankments and flood wall raising. These works are situated in areas of peaty soils and subsoils with medium to high clay content. Seasonal waterlogging is evident from the site investigation. Organic content, rootling's and decaying vegetation were noted in several trial pits across these areas. A total of 4446m^3 of material will be removed as part of the western tributary field regrading, embankments, and storage works. This is a location of peat with soil conditions likely to be wet. The Carrigaholt Road Field/Snipe Field embankment will require the excavation of 1,096m^3 of soil.

Topsoil will be reused where possible and exact volumes to be retained will be provided by the appointed contractor. Subsoils unsuitable for the construction of embankments will be exported off-site and disposed of at a suitable licensed facility. Temporary storage of soil will be carefully managed in such a way as to prevent any potential negative impact on the receiving environment and the material will be stored away from any surface water drains. Movement of material will be minimised in order to reduce degradation of soil structure and generation of dust.

Excavation depths are not proposed further than 2m and a total of 44,747m^2 of land will be subjected to earthworks and excavation. Minor stability issues such as spalling, and collapse were noted in the majority of trial pits. Without mitigation the effects of excavation on topsoil would be **temporary, slight, negative**. Due to the shallow excavation depths, effects on subsoils are not anticipated to be significant.

Import of Soil

It is estimated that 20,007m^3 of engineered clay material will be required across the Atlantic Stream and Victoria/Well Stream systems for the construction of the embankments and regrading of storage areas. Suitable topsoil removed during excavation will be retained and used to dress embankments which will be seeded once construction is complete. Seed from Hay from the Long Meadow can be used as a seed source of local provenance. Any additional seed required should contain a suitable species mix with seeds of local provenance of species common or endemic to the area. The importation of infill material may introduce contamination to the site if sourced from inadequate facilities. Responsible sourcing will ensure this impact does not arise. Clean soil will be imported to the site, and the contractor will be required to source the soil from areas that are free of invasive species, i.e., containing no Japanese Knotweed seed or legumes. Without mitigation, the effects of importing soil would be **long-term, slight, negative**.

An indirect impact of the soil import to the site during the construction phase will be the increase in truck movements to the site which are discussed in the next section. This will have a subsequent impact on air quality, noise and nuisance. These impacts are further described in the Material Assets chapter and are not anticipated to be significant.

Accidental Spills and Leaks

There is a risk of localised accidental pollution incidences from the following sources:

- Spillage or leakage of temporary oils and fuels stored on site.
- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- Spillage of oil or fuel from refuelling machinery on site.
- Run-off from in-situ concrete casting.
- Release of pollutants from contaminated excavated material.

The risk of accidental pollution is highest where oils and fuels are stored. All site and welfare compounds are proposed for areas where subsoil permeability is low, and the average groundwater recharge is between 1 – 50 mm/year.

Accidental spillages may result in localised contamination of soils, geology, and groundwater underlying the site, should contaminants migrate through the subsoils. In less permeable soils, contamination of surface water run-off could result. The significance of effects of pollution on soils and

geology would depend on the type of contaminant and extent of the spill. Likely effects arising from spills without mitigation measures would be **temporary, moderate, negative**.

Construction Machinery and Transport

The following construction vehicles and pieces of equipment will be used over the course of the proposed works:

- Four (4) Excavators
- Three (3) JCB/Multi-Purpose Plant/Mini digger
- Four (4) Dumper Trucks
- Two (2) Scrapers/Bulldozers
- One (1) Crane
- One (1) Pump
- Three (3) Compact Rollers
- Eight (8) Site Vehicles

It is estimated that there will be a total of 3,137 vehicle movements for the duration of the works regarding the import and export of material in relation to embankments, access roads, concrete works, and site compounds. Works regarding the Victoria Stream will draw the highest volume of traffic.

A 10t excavator will be required for the transport and placement of the Atlantic Stream screen at the culvert headwall at Waterworld. Due to the high clay content in soils across Kilkee, the risk of soil compaction is high, especially in combination with adverse weather conditions.

Operational Phase

Embankments

Once operational, any impacts on land and soils from the proposed development are likely to be associated with the embankments. The construction of embankments will require the use of impermeable clay and a reinforced geogrid for stability. This will ultimately change the soil environment in these areas to a hard-standing area, with the consequential change in rainwater soakage and storage. These areas are open fields adjacent to residential or holiday home sites. Topsoil and subsoil in these areas are generally peaty with high clay content and do not have a high value. The change in environment will therefore be imperceptible.

There will be an initial flush of loose material during the next heavy rainfall event following construction of the earthen embankments. This will cause an increase in suspended solids in the surface water run-off from the embankment sites. The suspended solids will contribute to the overall solids loading in the Atlantic, Well, and Victoria Streams as well as Moore Bay. The impact of this on water quality will not be significant and will be short-term. As the embankments stabilise and grass cover becomes thicker, the issue of suspended solids run-off from the embankments will lessen. In the long-term no significant impacts on water quality are anticipated. In accordance with the methodology, the overall effects from embankments during the operational phase are expected to be **short-term, slight, negative**.

Stream diversion/realignment

There will be several permanent diversions and realignments of watercourses. A tributary of the Atlantic Stream will be diverted into a storage area bounded by a new embankment, south of Kilkee Bay Hotel. The morphology of the stream will be changed from a straight channel to a meandering one. This diversion is necessary as a combined measure with the embankment to effectively contain flooding.

Similarly, a western tributary of the Victoria Stream will be diverted through a flood storage area and the Victoria Stream will be diverted through an open space within a residential area. These flood storage areas will be connected. Realignment of watercourses from straight channels to those with a more natural morphology will likely have positive effects on biodiversity. These effects will interact with the underlying soils and geology in a positive way through improved exchange between ground and surface water and improved soil biodiversity. In accordance with the methodology, the overall

effects from stream diversion on soils and geology during the operational phase are expected to be **permanent, slight, positive.**

Storage

The Atlantic Stream will be diverted into a storage area bordered by an embankment. During a flood event, the stream will burst from the open channel and flood waters will be retained by the embankment. This mechanism has also been employed on the Victoria Stream and its western tributary. During flood events, flood waters will be contained in areas with high clay content in the soil and where waterlogging is likely based on the evidence of grey and orange mottling recorded during the site investigation. This effect will be intermittent. The overall effects of storage at these locations will be **temporary, slight, negative**.

An artificial underground storage area is to be constructed under an area of land adjacent to the Well Stream U-channel. The storage will not require deep excavation and is located in an area of ground classified as made ground. No significant effects on soil or subsoil are expected from this storage.

Culverts

During operation, the trash screen fitted to the Atlantic Stream culvert will help to reduce pollution and debris and in turn reduce the likelihood of contamination permeating through the hyporheic region into underlying subsoils, groundwater, and geology.

The additional culvert proposed for the Well Stream is not anticipated to have significant effects on the pedological or geological environment.

8.6 Mitigation Measures

Construction Phase

A Construction Environmental Management Plan (CEMP) has been prepared for the proposed development. The site-specific mitigation measures outlined in the CEMP are summarised below, however, the CEMP should be read in full in conjunction with this report.

- The Contractor will be required to produce a Soil Management Programme for the operations at the site. The Programme will contain as a minimum, ways to minimise truck movements across the site to avoid soil compaction, and re-use of suitable material on-site to minimise the quantities that need to be imported.
- Temporary pathways and roads will be constructed to allow for the movement of heavy machinery and minimise the risk of soil compaction.
- Temporary storage of soil will be carefully managed in such a way as to prevent any potential negative impact on the receiving environment. Covering of topsoil stockpiles with rapid vegetation or other means will be considered as part of the construction methodology. The material will be stored away from any surface water drains. Movement of material will be minimised in order to reduce degradation of soil structure and generation of dust.
- Stockpiles will not exceed 1.5m in height and shall be shaped to shed water.
- Fill material will be tested and imported from a licensed facility to ensure no external contamination is introduced to the soil and geological environment.
- Oil and fuel storage tanks shall be stored in designated areas, and these areas shall be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Drainage from the bunded area(s) shall be diverted for collection and safe disposal.
- Re-fuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area (or where possible off the site) which will be away from any existing surface water gullies or drains, or exposed ground or excavations.
- An adequate supply of spill kits and hydrocarbon adsorbent packs will be stored in any refuelling areas and site compounds. All relevant personnel will be fully trained in the use of this equipment.
- A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated stormwater to the underlying subsoil.

- The pouring of concrete will take place within a designated area using a geo-synthetic material to prevent concrete runoff into the soil/ groundwater media. Wash down and washout of concrete transporting vehicles will take place in a designated bunded concrete washout area.

The contractor will be required to carry out a waste characterisation of the material that will be taken off site for disposal. A waste acceptance criteria (WAC) analysis and asbestos levels should be determined on any material that will be taken off site for disposal. All wastes in the European Waste Catalogue are classified by a unique 6-digit code. In this case (waste soil/stones), two List of Wastes (LoW) Codes are applicable to material that may be taken off site for disposal during the construction phase:

- 17 05 03* - Soil and stones containing hazardous substances
- 17 05 04 - Soils and stones other than those mentioned in 17 05 03.

Any soil samples that are found to contain contaminants should be subjected to full quantification analysis. If the waste soil is sent to a waste licenced soil recovery facility, the chemical analysis of the soil must meet the requirements given in Table 3.3 (Summary of Soil Trigger Levels for Soil recovery Facilities) of the Environmental Protection Agency's Draft Publication – Waste Acceptance Criteria and Development of Soil Trigger Values for EPA-Licenced Soil Recovery Facilities, December 2017. The acceptance of this material at a licenced soil recovery facility will be subject to the approval of the facility operator.

Accidental Spills and Leaks

- No bulk chemicals will be stored within the active construction areas. Temporary oil and fuel storage tanks will be kept in the material storage area in suitable containers and will be appropriately bunded as required. Refuelling of vehicles and the addition of hydraulic oils or lubricants to vehicles will take place in designated areas of the site, where possible, which will be kept away from surface water drains.
- Spill protection equipment such as absorbent mats, socks and sand will be available to be used in the event of an accidental release during refuelling. Training will be given to appropriate site workers in how to manage a spill event.
- The following mitigation measures will be taken at the construction site in order to prevent any spillages to ground of fuels during machinery activities and prevent any resulting soil and/or groundwater quality impacts:
    - Refuelling will be undertaken off site where possible
    - Where mobile fuel bowsers are used the following measures will be taken:
    - Any flexible pipe, tap or valve will be fitted with a lock and will be secured when not in use
    - The pump or valve will be fitted with a lock and will be secured when not in use
    - All bowsers must carry a spill kit
    - Operatives must have spill response training
    - Portable generators or similar fuel containing equipment will be placed on suitable drip trays

Operational Phase

Where embankments have been constructed, silt fences will remain in place until the soil on the banks has stabilised and grass has rooted. This is to mitigate against sediment flush during rain events. The ECoW will oversee the implementation and any necessary replacement of silt fences and will liaise with IFI to decide when suitable growth conditions have been reached such that silt fences may be removed. The need to retain silt fences will vary in length of time depending on the environmental conditions. No other significant effects are anticipated during the operational phase. Therefore, no other mitigation measures have been proposed.

8.7 Predicted Residual Impacts

Construction

Following the implementation of the proposed mitigation measures, the residual effects of the proposed development on land and soil will be minimised. Therefore, the effects during the construction phase will be **short-term, imperceptible, neutral.**

Operation

The design of the scheme has been such that there are no predicted effects on land and soils during the operational phase of the development.

Overall, the effects of the proposed development during operation will be **permanent, imperceptible, neutral**.

8.8 Monitoring

Visual monitoring will be undertaken during the construction including the mitigation measures. Any potential contamination such as hydrocarbon and concrete spillages should be immediately investigated and remedied.

Direct discharge to the underlying geological environment during the operational phase is not anticipated and will require no further monitoring.

8.9 Interactions

Surface and Groundwater

Soils and geology share direct links with groundwater and surface water. Soil quality and characteristics such as granularity, pore space, moisture content and texture have effects on the rate of groundwater recharge, infiltration, percolation, transmissivity, and run-off. Similarly, surface water run-off can affect soil quality and condition through deposition or withdrawal of chemicals, suspended solids, and nutrients. Proposed flood relief measures are located at downstream points along the Atlantic Stream, the Well Stream, and the Victoria Stream close to their discharge points at Moore Bay. Moore Bay and the surrounding Shannon Plume north and west have Excellent WFD status. It is therefore imperative that proposed flood measures do not have negative impacts or cause a reduction in quality status.

Effects arising from surface water run-off are further discussed in Chapter 9 of this EIAR. Without mitigation, the interaction between effects on Hydrology and Soils and Geology could result in a **short-term, significant, negative** effect. Through implementation of mitigation measures outlined in this chapter and Chapter 9 of the EIAR, the potential impact through interaction is reduced to **short-term, slight, negative**.

Biodiversity

Interactions between soils, geology, and biodiversity can occur through surface, groundwater, and air pathways. The proximity of the Kilkee Reefs SAC poses a significant risk for the entry of contaminants via surface water run-off, dewatered groundwater, and soil erosion. Introduction of contaminants and suspended solids could lead to habitat degradation of the reefs and have a negative impact on the sediment community complexes present throughout the SAC.

Without the implementation of mitigation measures outlined in this chapter and Chapter 7, potential impacts through interaction would be **short-term, significant, negative**. With the implementation of appropriate mitigation measures, these combined effects would be reduced to **short-term, imperceptible, negative**.

Material Assets

A significant proportion of proposed flood relief measures are in urban areas adjacent to houses, holiday homes or along roads. The temporary use of public roads and private lands will be required during the construction phase. Access to private properties will require appropriate liaison with owners. Diversions, temporary disruptions and increased traffic volumes are anticipated given the estimated 3,137 truck movements required for the movement of materials.

A new storm water sewer is proposed for the Well Stream system. The sewer is not a combined sewer and should not contribute to CSO contamination or flooding. The sewer will be diverted to the existing outfalls.

It is likely that there will be interaction with utility networks such as ESB substations and networks, underground and overhead electric cables and masts, sewer networks, and streetlights which fall within the footprint of works proposed across the proposed development area. Without mitigation, the resulting interaction effects could be **short-term, significant, negative**. Through the implementation of appropriate mitigation measures these effects will be **short-term, imperceptible, neutral**.

Climate

Works where excavation of soil is proposed occur in areas of seasonal waterlogging and peat. Anaerobic conditions in soils can lead to an increase in carbon dioxide. Excavation of 12,714m^3 of material across the scheme area will release sequestered carbon increasing greenhouse gas levels in the air. These effects are further discussed in the chapter addressing Air Quality and Climate, Chapter 6. The interaction of these effects will be **long-term, imperceptible, not significant**.

8.10 Cumulative Impacts

Cumulative effects are the result of several minor or insignificant effects combining to create larger, more significant effect. The assessment of cumulative effects considers existing stresses on the baseline environment as well as developments that are in planning or are underway.

Developments within 5km of the proposed development that are in planning or have been granted permission are fully outlined in Chapter 14.

The largest development falling within 5km of the proposed development is a solar farm at a site southeast of Kilkee (Ref. 16708). The farm will consist of up to 37,800m^2 of solar panels on ground mounted steel frames, underground cables and ducts, 2 no. Electricity control cabins, hardstanding area and all other associated ancillary and site works. The construction period for each development is likely to overlap, however, due to the distance from Kilkee town cumulative impacts are not anticipated to be significant.

The construction phase of the Kilkee Sewerage Scheme is expected to commence in 2024. The chosen site falls along the Victoria Stream adjacent to the proposed storage area and snipe field. This will result in additional construction traffic and materials in a confined area. Liaison between the appointed contractors will be required to mitigate any significant cumulative effects arising from the coincidental construction periods. Significant cumulative effects on soils and geology are not anticipated.

Permission has been granted for several other small residential and commercial extensions within the town. Due to the size and nature of these developments they are not expected to result in significant cumulative effects on soils and geology. Overall, ensuring relevant legislation and proposed mitigation measures are adhered to and implemented, the cumulative effects associated with developments in the area are long-term with an imperceptible impact on land, soils, and geology.

9 Water – Surface and Groundwater

9.1 Methodology

The methodology used in this assessment follows current Irish guidance as outlined above in Chapter 1 and in the following:

- OPW / Department of Environment, Heritage and Local Government planning guidance (2009), "The Planning System and Flood Risk Management".
- Environmental Protection Agency (2022) 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports'.
- Department of Housing, Planning and Local Government (2018) 'Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment'.
- National Roads Authority (NRA) (2009) 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the National Roads Authority'.
- Institute of Geologists of Ireland (2013) 'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements'.
- Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU) as amended by 2014/52/EU). European Union 2017.

Assessment Criteria

The criteria for assessing impacts are explained in the first chapter of this report, and follow the EPA's 2022 Guidelines[147]. For this chapter specifically, in addition to the EPA Guidelines, the NRA[148] criteria for estimation of the importance of surface water and hydrogeological attributes is useful (Table 9.1 and Table 9.2). These criteria have been used to assist in rating the importance of features, which is then combined with the description of effects as shown in the matrix of significance Chapter 1.

Table 9-1: Criteria for Rating Impact Significance of Hydrological Attributes[149]

Importance	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation e.g., 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Quality Class A (Biotic Index Q4, Q5) Flood plain protecting more than 50 residential or commercial properties from flooding Nationally important amenity site for wide range of leisure activities
High	Attribute has a high quality or value on a local scale	Salmon fishery Locally important potable water source supplying >1000 homes Quality Class B (Biotic Index Q3-4) Flood plain protecting between 5 and 50 residential or commercial properties from flooding Locally important amenity site for wide range of leisure activities

[147] Environmental Protection Agency (2022) 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports'

[148] National Roads Authority (NRA) (2009) 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the National Roads Authority'

[149] National Roads Authority (NRA) (2009) 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the National Roads Authority'

Medium	Attribute has a medium quality or value on a local scale	Coarse fishery Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2- 3) Flood plain protecting between 1 and 5 residential or commercial properties from flooding
Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities Local potable water source supplying <50 homes Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1 residential or commercial property from flooding Amenity site used by small numbers of local people

Table 9-2: Criteria for Rating Impact Significance of Hydrogeological Attributes[150]

Importance	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g., SAC or SPA status
Very High	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple well fields Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source
High	Attribute has a high quality or value on a local scale	Regionally Important Aquifer Groundwater provides large proportion of baseflow to local rivers Locally important potable water source supplying >1000 homes Outer source protection area for regionally important water source Inner source protection area for locally important water source
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer Potable water source supplying >50 homes Outer source protection area for locally important water source
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer Potable water source supplying <50 homes

Note: "Extremely high", "very high", and "high" in this assessment will all correspond to "high" significance or sensitivity of a feature in the effects significance matrix (EPA, 2022), in Chapter 1.

9.2 Receiving Environment

Baseline desktop Assessment

This assessment was considered in the context of the available baseline information, potential impacts, consultations with statutory bodies and other parties, and other available relevant information. In collating this information, the following sources of information and references were consulted:

- Latest EPA water quality monitoring data for watercourses in the area, available on www.epamaps.ie;
- EPA Catchment website (www.Catchment.ie);
- Clare County Development Plan 2017-2023, and the Draft County Development Plan 2023-2029;
- The Planning System and Flood Risk Management, Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government (DoEHLG) and the Office of Public Works (OPW));

[150] National Roads Authority (NRA) (2009) 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the National Roads Authority'

- CIRIA (2011). Environmental good practice on site: Construction Industry Research Industry and Information Association publication C692 (3rd edition- an update of C650 (2005). (I. Audus, P. Charles and S. Evans), 2011;
- CIRIA, (2012). Environmental good practice on site –pocketbook; Construction Industry Research and Information Association publication C715 (P. Charles, and G. Wadams), 2012.
- Office of Public Works flood mapping data (www.floodmaps.ie);
- Classification (regionally important, locally important) and extent of aquifers underlying the site perimeter area (www.gsi.ie);
- Natural hydrogeological/karst features in the area and potential for increased risk presented by the activities at the site (www.gsi.ie);
- National Parks and Wildlife Services (NPSW) www.npws.ie on-line database; Protected Register; and
- River Basin Management Plan 2018-2021.
- Kilkee Blue Flag Programme 2023

Kilkee Blue Flag Programme

The review of the Kilkee Blue Flag Programme formed part of the baseline study. Along with the desktop baseline, Kilkee Blue Flag Programme was considered in order to assess water quality of the area. The Blue Flag Programme requires microbiological sampling to be carried out to evaluate Escherichia coli (faecal coliforms) and Intestinal Enterococci (Streptococci). In addition, Microbial Source Tracking (MST) methodology was carried out using genetic faecal microbe markers. These markers are crucial in assessing water samples taken from the Victoria and Atlantic Streams. Moreover, site investigation which included groundwater tests was conducted by OCB Geo (2022) and results of the groundwater level in the FRS area are provided in the groundwater section.

Surface water: hydrological environment

The proposed site is adjacent to Kilkee Bay, with two watercourses, the Atlantic and Victoria Streams, flowing through the town and into the bay. Both streams flow roughly from a southeast to northwest direction and have a number of tributaries and drainage channels which contribute to the flow through the area. The proposed flood defences are in close proximity to the Kilkee Reefs SAC. The reefs are subjected to the great strength of Atlantic breaking waves from the west. Moore Bay provides some protection from tidal currents.

The site is within the Water Framework Directive (WFD) Shannon Estuary North catchment, Doonah_SC_010 sub-catchment and KILKEE_LOWER_010 river sub-basin. The part of the Victoria and Atlantic Streams that falls under KILKEE_LOWER_010 sub-basin flows along the proposed site.

The surface water bodies are shown in Figure 9-2, and described in the following subsections.

Atlantic Stream

The Atlantic Stream is located on the northern side of Kilkee. The river flows for approx. 2.4km before discharging into Kilkee Bay, and is heavily urbanised throughout much of the scheme area. Historically the watercourse has been extensively straightened and deepened, resulting in a steep manmade trapezoidal channel with poor hydromorphology and drainage channel-like characteristics. Bank full heights (from top of the water to top of the bank) are approx. 2-4m high. The site has also been excavated in the recent past with spoil evident on the banks. The stream is approx. 2.5m wide and 0.2-0.3m deep, comprising slow-flowing glide and occasional pool with no riffle areas.

Victoria Stream

The Victoria Stream rises south of Kilkee, and flows for approximately 1.9 km north before draining into Kilkee Bay. The Victoria Stream is heavily urbanised throughout much of the study area. As with the Atlantic Stream, historically the watercourse has been extensively straightened and deepened with a steep (near vertical) trapezoidal channel and bank full heights (from top of the water to top of the bank) of up to 1.8m. Low seasonal water levels with only slight flows were observed during as site visit. The channel is on average approx. 1.5m wide and 0.1-0.2m water depth (from bottom of channel to top of the water) with a profile comprising very slow-flowing glide and pool.

A tidal gate is present on the Victoria Stream near its outfall onto Kilkee Beach, to protect the blue flag status. At times, outfall from the Victoria Stream is of poor quality, due to faecal coliforms. During the bathing season, the Victoria Stream is prevented from discharging onto the beach by this tidal gate; the stream is instead pumped to an outfall discharging into Intrinsic Bay, approx. 1.8km west of Kilkee[151]. In advance of forecasted weather events, the stop logs are removed. For the remainder of the year, the Victoria Stream discharges onto Kilkee Beach.

Victoria Stream tributaries

Two tributaries to the Victoria Stream are within the study area and relevant to the proposed development; the Western Tributary, and the Well Stream, see Figure 9-2. Near the confluence of the Western Tributary, the Victoria Stream has average dimensions of <0.5m in width and <0.1m water depth (from bottom of channel to top of the water) with a profile comprising slow-flowing glide and riffle.

The Well Stream tributary is highly channelised for the majority of its length, and is culverted along Crescent Place, before it joins with the Victoria Stream.

Figure 9-2: Surface Watercourses

Groundwater in the area

The Kilrush groundwater body (IE_SH_G_123) underlies the site. The Kilrush groundwater body has a Good status for 2016-2021, and is Not at Risk. The Miltown Malbay groundwater body (IE_SH_G_167) is north of Kilkee, and its southern extremity is immediately adjacent to the Atlantic Stream Outfall. It is also at Good status and Not at Risk.

[151] Non-Technical Summary –Kilkee Agglomeration, available: https://epawebapp.epa.ie/licences/lic_eDMS/090151b280492c40.pdf.

The EPA groundwater abstractions register was also consulted. This shows all registered groundwater abstractions which are above 25m^3 per day, with grid locations rounded to the nearest kilometre (for privacy reasons). There are no registered groundwater abstractions within the 2km study area (plus 1km to account for grid location rounding). There are no Groundwater Drinking Water Protection Areas, neither Public Source Protection Areas nor Group Scheme preliminary Source Protection Areas.

The GSI dataset was consulted for groundwater karst data. No karst features were identified within 2km of the proposed development. Four wells mapped by GSI fall within 1km of the site. To the west adjacent to the site are two wells used for agricultural and domestic purposes, of poor yield. To the south approximately 500m away is another agricultural/domestic use well with an average yield of 6.5 m^3/day. To the east adjacent to the site is well with no specified use and an average yield of 6.5 m^3/day

Flooding

Extensive flood modelling has been carried out as part of the FRS. The baseline flood extents as modelled by the Design Team for the 1% AEP event are shown for the Atlantic and the Victoria Streams in Figures 9-3 and 9-4. There are a number of mechanisms of flooding in Kilkee.

Flooding from the Atlantic Stream is generally attributed to blockage of the trash screens at the outfall culvert and undersized outfall culverts. Flooding upstream on the Atlantic Stream is restricted to mainly agricultural lands.

Flooding from the Victoria Stream is both fluvial and tidal, however the proposed development defends only against fluvial flooding. A separate coastal scheme is proposed for Kilkee, the works for the coastal scheme will form part of a separate planning application and EIAR.

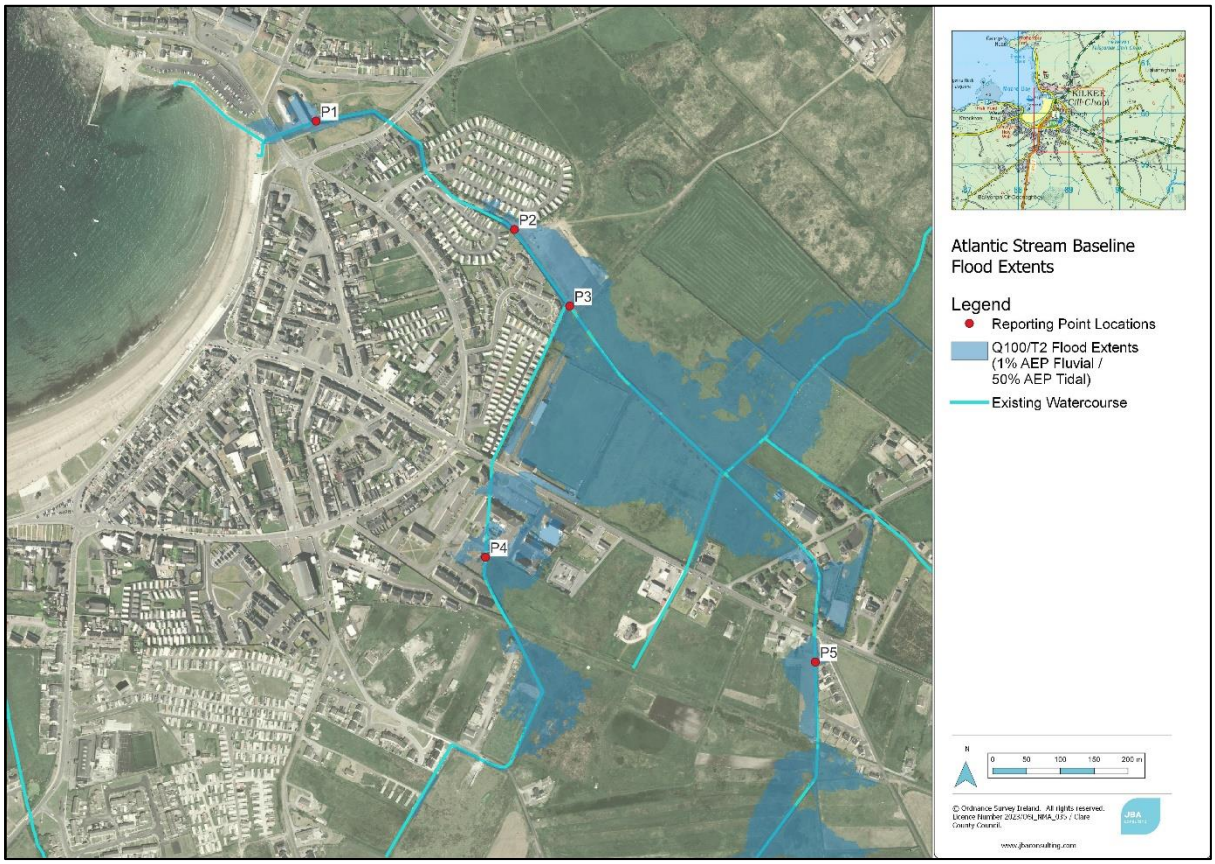


Figure 9-3: Baseline Flood Extents Atlantic stream

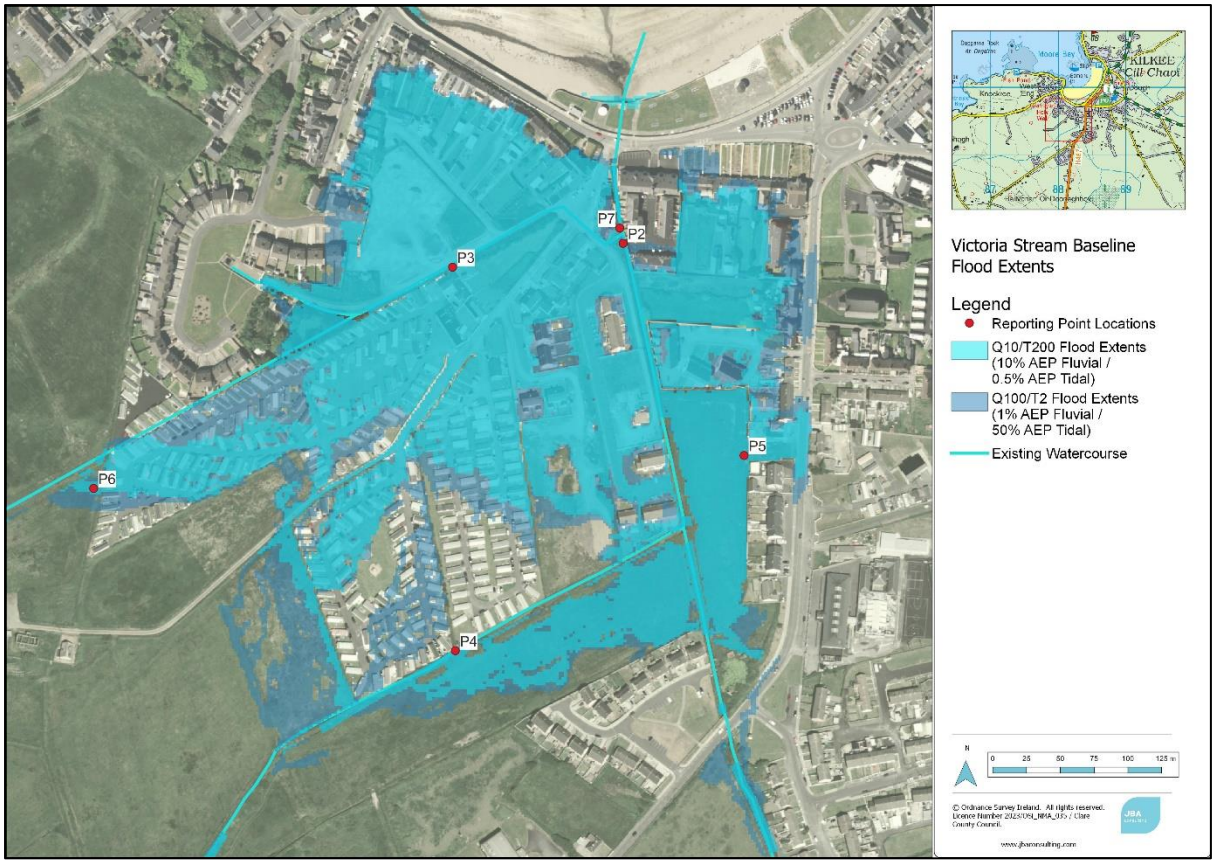


Figure 9-4: Baseline Flood Extents Victoria Stream

Overall evaluation of Hydrological Features

Following the NRA Guidelines[152] on the evaluation of hydrological features, the surface water bodies around Kilkee are of Medium Importance, due to nationally important amenity sites for a wide range of leisure activities. Regarding hydrogeology, the rating is also medium, mainly due to the Locally Important Aquifer.

Environmental conditions

Water Framework Directive Assessment and EPA Q value

The Atlantic and Victoria Streams as specified above are both within the KILKEE_LOWER_010 WFD sub-basin. According to the WFD 2016-2021 assessment, the waterbody has a Moderate status. This means that overall biological, physico-chemical, hydromorphological and pollutants do not support a good ecological status. The risk status of the waterbody is under review.

The EPA's biological river water quality classification (Q values) is based on macroinvertebrate biological sampling at water monitoring stations. No Q value points are on the Atlantic or Victoria Streams, nor are any hydrologically connected to them.

Kilkee Blue Flag (Water Quality)

Kilkee has been recognised as a Blue Flag beach. The sandy beach of Kilkee Bay is a major tourist attraction for Co. Clare. Kilkee Beach has emerged as a prominent centre for a variety of water sports, including kiteboarding, kayaking, surfing, and swimming, in addition to walking and jogging and general coastal recreation.

[152] National Roads Authority (NRA) (2009) 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the National Roads Authority'

Kilkee Beach has achieved an excellent standard in accordance with the EU Bathing Water Directive, in order to achieve Blue Flag status. Blue Flag beaches and marinas must reach a specific set of criteria relating to water quality, information provision, environmental education, safety and beach management.

In addition, the Blue Flag Program requires microbiological sampling to be carried out: Escherichia coli (faecal coliforms): 250 cfu/100mls (95-percentile):2.5E+02/100 Intestinal Enterococci (Streptococci): 100 cfu/100mls. (95- percentile):1E+02/100. 95%-ile compliance with the above limits is required.

Hydrogeological environment

The groundwater bodies underlying the proposed development area are Kilrush and Milltown Malbay (IE_SH_G_123 and IE_SH_G_167). Both are Good status according to the WFD 2016-2021 assessment period, and both are Not At Risk. The permeability of subsoil is classified overall as ‘low’, with the possibility of saturation of the subsoils following heavy rain and increased overland flow.

The Bedrock underlying the site consists mainly of sandstone, siltstone and mudstone. Subsoil directly under the site is composed of shales and sandstone till, blanket peat, and made ground.

Aquifer Classification and Groundwater Vulnerability

The GSI mapping services (GSI, 2023) indicate that the scheme is underlain by a Locally Important Aquifer composed of mudstone, siltstone and sandstone bedrock. The area east of the site is underlain by grey siltstone and sandstone.

Groundwater vulnerability underlying Kilkee (the hydrological and geological characteristics controlling the ease at which a groundwater body may be contaminated) is variable. Most of the area is primarily classified as Low and Moderate vulnerability, with vulnerability increasing to High or Extreme towards the sea. The areas directly underlying the proposed works are mostly low or moderate.

Groundwater Testing (Site Investigation)

Groundwater testing was conducted in different sites within the proposed development area between 17th November 2021 and 3rd June 2022 by OCB Geo, throughout the site area. Utilising cable percussion boreholes, any water strikes encountered during boring were recorded. BH1-07 and BH1-09 struck groundwater at 6.60 m and 0.80 m below ground level respectively without any further change over time. BH1-10 struck groundwater at 1.70 m below ground level, with water increasing to 0.5m after 20 minutes.

9.3 Predicted Impact

Predicted impacts are discussed under the 'do nothing' scenario, during construction of the scheme, and during operation of the scheme. This EIA focused on likely significant effects.

Do-Nothing Scenario

As large parts of Kilkee are within Flood Zones A and B, there is a medium to high probability of continued flooding of residential and commercial buildings under the Do-Nothing Scenario. In the event of a flood without adequate standard of protection, the effect on existing surface and groundwater due to likely contamination is extremely high. Contamination would occur as a result of inundation of roads and potentially contaminated land as the flood waters recede and enter the Victoria and Atlantic Streams. The effect of the do-nothing scenario is **long-term significant and negative**.

Construction phase

During construction, the water environment is at risk from contaminated water entering the waterbody (either surface or groundwater), or likely changes to watercourse morphology and flow patterns. The potential construction phase effects on the water environment will be outlined in the sections below, without mitigation. Mitigation measures will be discussed following this.

Construction will take place adjacent to the Atlantic and Victoria Streams as described in Chapter 4. Excavation of soil and consequently the removal of the soil layer that protects the groundwater bodies has the potential to cause pollution of surface water and groundwater during construction.

The key civil engineering works which have potential to impact on the surface and groundwater environment include the following:

- Installation of a western extension to the existing Well Stream culvert currently located to the north of Cunningham's Holiday Park.
- The existing 240m open channel section of the Well Stream on the Well Road will be upgraded to increase its capacity.
- Construction of a new culvert under Crescent Palace will include a means of sealing the outfall to avoid inflow.
- Demolition and reconstruction of Victoria Court boundary wall as a flood defence wall for 36m.
- Construction of an embankment located between Victoria Court and Victoria Crescent boundaries.
- Realignment of existing section of Victoria Stream. Construction of new flood defence wall along the boundary of Victoria Court. Construction of flood embankment along north and eastern boundary of Carrigaholt Road Field.
- Diversion of open channel to centre of field at Cunningham's Holiday Park (Tributary Field Storage); this will mean the existing open channel will be filled in. An existing embankment around the mobile home park will be demolished and replaced with a new embankment. In addition, construction of new culvert under embankment will link the diversion of Victoria stream.
- Construction of new flood defence embankment in the vicinity of Kilkee Bay Hotel. This will include backfilling the existing stream and constructing a maintenance footpath along the inside of the embankment.
- Raising of boundary walls at Dún an Óir estate.
- Construction of new 100m flood defence embankment in the vicinity of Sandpark.
- Adding a new debris screen upstream of culvert headwall at Waterworld.
- Reprofiling of the road junctions of Well Road / Marine Parade, and Geraldine Place / Marine Parade.
- Nine non-return valves to be constructed into the proposed flood defences on the Victoria Stream (6no.) and Well Stream (3no.), all along the left bank walls.
- Part demolition of the existing overflow chamber, at Atlantic Stream Outfall. Construction of a new elevated cover slab on top of the existing overflow chamber.
- Installation of a manhole on the existing 1200mmØ culvert at Meadow View Court with a grated cover to allow the field to drain and eliminate threat of flooding to adjacent houses. There also is a need to raise the critical infrastructure in the adjacent pump station (electrical kiosk, manhole cover and 2 no. chamber covers).

The potential impacts of these works to the water environment are discussed below:

Excavation and Infilling

The excavation of material and import of fill material will increase the potential for suspended solids entering surface water runoff from the site. The runoff, if improperly managed, would impact on water quality in the Atlantic and Victoria Streams, or other minor drains by increasing suspended solid levels in the water. Increased suspended sediment concentrations have the potential to be detrimental to wildlife and consequently impact the Kilkee Reefs SAC. The potential effects on groundwater will be due to temporary exposure of bare ground during excavation for new flood walls, resulting in groundwater pollution or groundwater level alterations.

According to the significance of effects matrix shown in Chapter 1, the magnitude of potential impacts on water will be **medium**, leading to an **overall moderate and temporary impact** on surface water and groundwater due to excavation and infilling.

Accidental Spills and leaks

During construction, there is a risk of localised accidental pollution incidences from the following sources:

- Spillages or leakage of temporary oils and fuels stored on site;
- Spillages or leakage of oils and fuels from construction machinery or site vehicles;
- Spillage of oil or fuel from refuelling machinery on site; and
- Run-off from concrete and cement during the construction of flood walls.

Accidental spillages would result in localised contamination of surface water, or groundwater underlying the site should contaminants migrate through the subsoils to the underlying aquifer. Soil stripping and foundation construction have the potential to further reduce the thickness of subsoils and the natural protection they provide to the underlying aquifer. Concrete (specifically, the cement component) is highly alkaline and any potential spillages can be detrimental to surface and groundwater quality. Changes in pH of the waterbody resulting from spills of concrete material would have a consequent effect on aquatic species. Machinery on site during the construction phase has the potential to contaminate the surface water if improperly managed and maintained. In addition, the compaction of the soils and subsoils by construction machinery will impact on the drainage function of the soil and hence could increase surface water runoff. The compacted soil will create a pathway for a source, in this case oil/contaminated soil, to enter a watercourse (receptor).

According to the significance of effects matrix as shown in Chapter 1, the magnitude of potential impact on water will be **medium**, leading to a **moderate** and **temporary negative impact** on Surface and Groundwater due to accidental spills and leaks.

Surface Water Runoff

Surface water run-off during the construction phase could contain increased silt levels because of the exposure of bare ground and presence of imported and excavated soil stockpiles. The potential risk of excavated and imported soils bearing contaminants could further negatively impact the existing surface water quality and consequently affect water downstream if contaminants enter into surface water runoff. Runoff containing large amounts of silt or contaminants from soil can cause damage to groundwater underlying the site. Silt-laden or contaminated water can arise from exposed ground and soil stockpiles (prior to reinstatement). Excessive quantities of suspended material entering and depositing in the watercourses have the potential to impact the hydromorphology of the Atlantic and Victoria Streams.

According to the significance of effects matrix as shown in Chapter 1, the magnitude of potential impact on water will be **medium**, leading to **an overall moderate** and **temporary negative impact** due to surface water runoff.

Groundwater pumping

Groundwater pumping (dewatering) in construction serves to regulate groundwater levels in order to facilitate safe and dry working conditions during excavation and to alleviate groundwater pressures on subterranean structures. This has the potential to temporarily alter the groundwater level locally and affect water quality. Groundwater pumping will be required at the proposed boundary wall at Victoria Court and Dún an Óir estate.

According to the significance of effects matrix as shown in Chapter 1, the magnitude of potential impact on water will be **low**, leading to **an overall slight temporary negative impact** on groundwater due to groundwater pumping.

Instream Works and Works Near Water

Works near water will take place at various points throughout the proposed FRS, including at Cunningham's Holiday Park, Well Stream, Victoria Stream, Crescent Place, Victoria Court and Carrigaholt Road, and on the Atlantic Stream at the outfall, the trash screen at Waterworld, and Sandpark.

Instream works include the following:

- Install a western extension to the existing culvert currently located to the north of Cunningham's Holiday Park at Well Stream, including the construction of a new headwall;
- Installation of precast reinforced concrete u-channel in place of existing Well Stream open channel;

- Construction of a new culvert under Crescent Palace along Victoria Stream;
- Existing wall on left-hand bank to be locally thickened and repaired at Victoria Court Wall;
- Reconstruction of Vic Crescent boundary wall as a flood defence at Victoria stream;
- Realignment of existing 170m long section of Victoria Stream at Carrigaholt Road Field;
- Diversion of open channel, construction of new embankment, and construction of new culvert under embankment at the Tributary Field Storage;
- Construction of new headwall with 600Ø inlet culvert under embankment at diverted Atlantic stream open channel and installation of a trash screen on inlet;
- Adding a new debris screen at upstream of culvert headwall at Waterworld along the Atlantic stream;
- Installation of the new manhole on the existing culvert at Meadow View Court; and
- Elevating the cover of the manhole and installing new flap valves at Atlantic Stream Outfall.

Instream works have the potential to negatively affect the riverbed, riverbanks, water quality, and aquatic species, increase sedimentation, and change the hydromorphology of the watercourse. Such works might also disrupt the continuity of riparian corridors or increase flows and stream power, resulting in loss of riparian vegetation. The riparian zone's natural ability to filter out pesticides, sediments, and nutrients before they enter the watercourse could be harmed by this loss. Additionally, this loss could cause increased bank erosion and added sediment to the waterbodies. The mobilisation and increase of sediments could result in contaminated water entering the watercourses, with potential impact on the existing WFD status of the sub-basin. Sediment laden with other contaminants such as E. coli (faecal coliforms) or Intestinal Enterococci (Streptococci) could also be mobilised by instream works.

According to the significance of effects matrix as shown in Chapter 1, the magnitude of potential impact on water will be **medium**, leading to an **overall moderate** and **temporary impact** on surface water and groundwater due to instream works and works near water.

Modifications to the surface water drainage network

Modifications to the existing surface water networks will include:

- installation of two pump stations and sub-surface storage – one adjacent to Clare Co. Council compound on Well Road, other within field east of embankment below Victoria Court (catering for Carrigaholt Road drainage systems);
- a 450mm carrier drain under Well Road to intercept existing surface water outfalls and direct them to a single outfall on Well Stream. The Well Stream tributary will be contained within this system and will be examined again during the detailed design stage. Overflow waters will be temporarily stored before being pumped over the defences into the stream; and
- At Carrigaholt Road, approximately 200 m of 225 Ø sewer to deal with spills from existing networks during flood events and will be pumped over the defences into Victoria Stream.

A CCTV drain survey (Clare Drains, 2022) was performed to evaluate drain conditions, culvert damage and identify any related problems such as damaged joints, cracks, deformities, obstructions or issues with pipe gradient. The works during the construction phase will be continuously monitored in order not to cause damage to the existing surface water drainage network system

According to the significance of effects matrix as shown in Chapter 1, the magnitude of potential impact on water will be **low**, leading to an **overall temporary** and **slight negative impact** on water due to changes to the surface water drainage network

Hydromorphology

During construction, temporary slight negative effects are possible on the hydromorphology of the Atlantic Stream, with indirect effects downstream as it discharges to Moore Bay. Improvement of a short length of flood wall (wall height increase using in situ concrete) at Dun An Oir Estate, construction of embankment at Sandpark mobile park, and the new pipe under the embankment at Kilkee Bay Hotel have the potential to increase sedimentation and runoff entering the nearby waterways. If this occurs in large quantities, it could lead to temporary changes to stream morphology and flow rates.

According to the significance of effects matrix as shown in Chapter 1, the magnitude of potential impact on water will be **low**, leading to an **overall temporary** and **slight negative impact** on water due to changes to the hydromorphology

Based on the assessments of potential impacts above, the overall impact on the surface water will be **temporary, moderate, negative effects**, according to the EPA 2022 Guidelines.

Based on the assessments of potential impacts above, the overall impact on the groundwater will be **temporary, moderate, negative effects**, according to the EPA 2022 Guidelines.

Mitigation measures will be taken in order to reduce these impacts to **temporary Slight effects**.

Operational Phase

The potential impacts on the water environment during the operation phase will be as follows.

Hydromorphology

The scheme has the potential to change the hydromorphological regime of both the Atlantic and Victoria Streams. Defences placed instream or along riverbanks can change flow patterns and the natural functioning of the watercourse, and can impact both upstream and downstream flow.

Changes to the hydromorphology of the watercourse could have significant effects on sediment transport, with knock-on effects on habitats and species. Table 9-3, Table 9-4, and Table 9-5 show the difference in in-channel velocity once the scheme is in place for the 1% AEP event (design event).

In the Victoria Stream, the model considered both a fluvial flood risk (100yr fluvial flood event modelled with a 2yr tide) and a coastal flood risk (200yr coastal event with a 10yr fluvial event). The most significant increase regarding coastal events will be at the existing culvert at Marine Parade that discharges to Kilkee Bay, with velocity increases ranging from 1.6 to 3.5 m/s. Another slight coastal risk would be located at the downstream end of the proposed U-channel on the Well Stream at Well Road, with a velocity increase of 0.66 m/s. The fluvial flood risk model identified another slight increase in velocity of 0.88 m/s. Other changes in peak velocity around other Victoria Stream FRS areas are negligible.

In the Atlantic Model, was considered only a fluvial flood risk (100yr event, which is modelled with a 2yr tidal event). All changes in peak velocity around the Atlantic Stream FRS area is negligible. Changes in velocity will be slight throughout the FRS (Atlantic and Victoria), with values less than 2 m/s for the 1% AEP event and lower still for lower magnitude events.

The node locations are illustrated in Figure 9-5.

Table 9-3: 1% AEP event peak velocities (m/s), Victoria coastal flood risk

Node	Undefended velocity	Defended velocity	Difference
02DNG00759I1	1.052	1.052	0.00
02DNG00566	0.948	0.948	0.00
02DNG00464I	0.874	0.874	0.00
02DNG00147	0.567	0.611	0.04
01DNG00313	0.923	0.918	-0.01
27VIC00019	0.671	0.783	0.11
27VIC00010I	1.671	1.535	-0.14
27VIC_5C2	1.66	3.522	1.86
01FHG00493I2	1.218	1.222	0.00
01FHG00401I4	1.27	1.309	0.04
01FHG00184I	1.109	1.187	0.08
27VTB100055	1.048	1.048	0.00
27VTB1_46I2	1.134	1.151	0.02

27VTB100029	0.91	0.957	0.05
27VTB00022C	0.436	0.58	0.14
27VTB100008	0.402	1.06	0.66

Table 9-4: 1% AEP event peak velocities (m/s), Victoria fluvial flood risk

Node	Undefended velocity	Defended velocity	Difference
02DNG00759I1	1.069	1.069	0.00
02DNG00566	1.04	1.04	0.00
02DNG00464I	0.985	0.985	0.00
02DNG00147	0.565	0.589	0.02
01DNG00313	1.066	1.024	-0.04
27VIC00019	0.661	0.959	0.30
27VIC00010I	1.828	1.626	-0.20
27VIC_5C2	1.829	1.873	0.04
01FHG00493I2	1.368	1.37	0.00
01FHG00401I4	1.449	1.47	0.02
01FHG00184I	1.245	1.216	-0.03
27VTB100055	1.261	1.264	0.00
27VTB1_46I2	1.134	1.134	0.00
27VTB100029	1.018	1.083	0.06
27VTB00022C	0.47	0.683	0.21
27VTB100008	0.404	1.289	0.89

Table 9-5: 1% AEP event peak velocities (m/s), Atlantic fluvial flood risk

Node	Undefended velocity	Defended velocity	Difference
01KLE00129	0.51	0.51	0.00
01KLE00250	0.558	0.558	0.00
01KLK00303	1.3	1.267	-0.03
01KLK00454	0.811	0.807	0.00
01KLK00650	0.116	0.113	0.00
01KLK00807	0.391	0.474	0.08
01ROA00000	0.562	0.444	-0.12
01ROA00085	0.744	0.739	-0.01
02KLK00130	0.725	0.715	-0.01
02KLK00258I	1.015	1.014	0.00
02KLK00459	0.503	0.513	0.01
02ROA00192	0.323	0.323	0.00
02ROA00464	0.42	0.42	0.00
02ROA00670	0.324	0.325	0.00
27ATLA00012	1.214	1.217	0.00
27ATLT100040	0.078	0.077	0.00

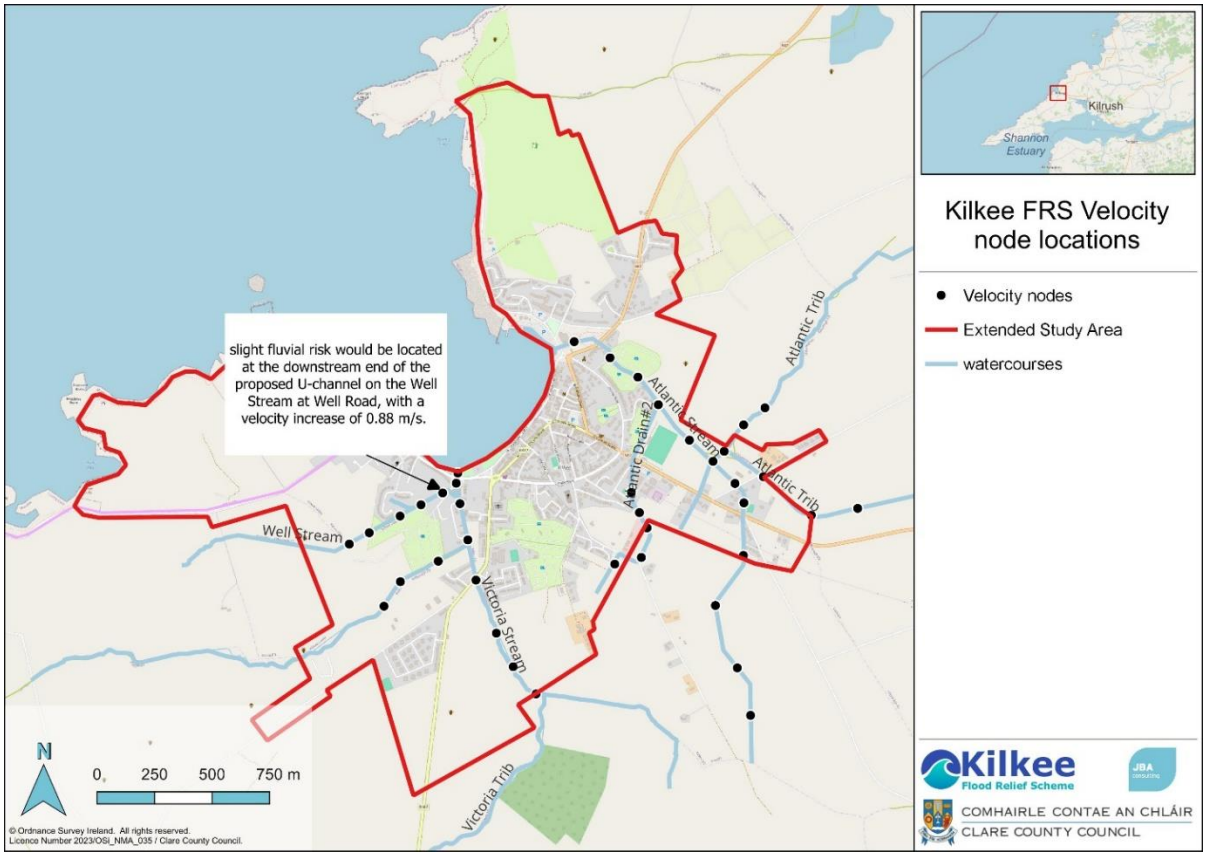


Figure 9-5: Location of velocity nodes.

Operational stage impacts on the hydromorphology of the Atlantic Stream are not likely to occur due to the nature of the works, and the connection between the Atlantic Stream and its floodplain remains open, with flooding only prevented from occurring in developed areas.

Operational stage impacts on the hydromorphology of the Well Stream are likely to occur. The existing riverbed and channel will be removed and replaced with a precast concrete u-shaped channel. With no mitigation in place, the natural functioning of the Well Stream will be **significantly negatively impacted for the long-term**.

Once operational, positive impacts to hydrology and hydromorphology are likely on the Western Tributary and the Victoria Stream due to the channel realignment and introduction of a flood storage area, allowing the river to be connected to its floodplain. The flood storage area along the Western Tributary in particular will act as a constructed wetland, helping to return the stream to a state of natural functioning. At present the Western Tributary is channelised and straightened in this location; the realignment will allow the stream to renaturalise over time.

According to the significance of effects matrix as shown in Chapter 1, the magnitude of potential impact on water will be **medium**, leading to an **overall permanent** and **moderate negative impact** on water due to changes to the hydromorphology.

Groundwater Recharge

Potential impacts to groundwater recharge during operation phase are related to ground hardening due to access creation for plant and vehicles for maintenance purposes, by reducing infiltration capacity. Increased overland drainage could occur due to compaction of surfaces, and increased hard standing has the potential to reduce infiltration and groundwater recharge.

According to the significance of effects matrix as shown in Chapter 1, the magnitude of potential groundwater impacts will be **low**, leading to an **overall temporary slight negative impact** on water due to changes to the groundwater and surface water quality.

The operational impacts on surface and groundwater, with no mitigation measures in place, will be **long-term, moderate, negative.**

9.4 Mitigation Measures

In the impact assessment discussed above, a range of potential effects on water were identified. Mitigation measures in the construction and operational phase of the proposed scheme will be implemented to reduce these adverse effects. Most measures are required during the construction phase as it will pose the greatest level of risk.

In the sections below the mitigation measures for the do-nothing scenario, construction phase and operation phase are discussed.

Do Nothing Scenario

In the do-nothing scenario, no mitigation measures will be required.

Construction Phase

To reduce the predicted impacts to water because of excavation and infilling, accidental spills and leaks, surface water runoff, and instream works during the construction phase of the scheme, the following mitigation measures are proposed.

Best Practice Construction Methods

A preliminary Construction Environmental Management Plan (CEMP) has been prepared for the proposed scheme and will be put in place by the appointed contractor. The preliminary CEMP was prepared in accordance with the following:

- National and International Legislation
- Environment Liability Regulations
- Best Management Guidelines

The CEMP will be used by the contractor to prevent and minimise environmental effects during construction.

Surface Water Runoff and Silt Control

Mitigation measures for the protection of surface and groundwater quality from silt and suspended solids on site involve silt control. They include proper planning of works, site compound construction, storage management and excavation plans, as follows:

- Planning of works will be done based on weather conditions forecast and monitoring to minimise risk of run-off from the site;
- The contractor will construct a site compound at a location remote from any drains;
- Storage locations and topsoil piles will be placed in appropriate places, distant to existing drains/sewerage within site;
- All soil stockpiles shall be covered (i.e., with a tarpaulin or vegetated, or sealed by excavators) to minimise the risk of rain/wind erosion. Vegetation will be established as soon as possible on all exposed soils;
- In the event of an extended dry period, stockpiles will be dampened using a water to minimise the risk of airborne particles entering watercourses;
- Excavations will remain open for as little time as possible before the placement of fill to minimise the potential of water ingress into excavations;
- The CEMP includes measures for the protection of water quality, including a Surface Water Management Plan and Pollution Control Plan (Section 6.2.1). It addresses sediment control during the construction works and the potential risk of release of sediment or various pollutants into local watercourses;
- Management/Response plans will be implemented to identify mobilisation of soil particles/pollution and initiate the interception and treatment of pollution/silt run-off;
- Silt fencing or other appropriate measures shall be put in place downstream of exposed soils or soil stockpiles. Silt fences will also be put in place around the newly constructed embankments.

Accidental Spills and Leaks

To avoid and manage accidental spills and leaks a series of measures listed below will be implemented. The main contractor and sub-contractors will be responsible to ensure their implementation:

- An Environmental Emergency Plan for the site will be established by the main contractor prior to work commencing. As a minimum the Emergency Plan will contain contact details for statutory bodies such as the NPWS, Clare Co. Co. and IFI. All site workers will be made aware of the plan and its location in the site offices;
- There will be no refuelling of machinery within or near the river channel. Refuelling will take place at designated locations at distances of greater than 30 metres from the watercourse;
- No vehicles will be left unattended when refuelling and a spill kit including an oil containment boom and absorbent pads will be on site at all times;
- Any fuel needed to be stored on the site will be stored appropriately and at a location that is set back from the river. All other construction materials will be stored in this compound. The compound will also house the site offices and portable toilets. This compound will either be located on ground that is not prone to flooding or will be surrounded by a protective earth bund to prevent inundation;
- All vehicles will be regularly maintained and checked for fuel and oil leaks;
- All liquids, solids and powder containers will be clearly labelled and stored appropriately in sealable containers. Storage of fuels and oils will be in the main contractor's compound only;
- Spill protection equipment such as spill kits, absorbent mats, oil booms, and sand will be available for use in the event of an accidental spill. These will be disposed of correctly if used and replaced with new ones immediately. Disposal records for used absorbent materials will be retained by the Site Manager;
- The contractor shall implement measures for the regular inspection of bunds and emptying of rainwater (when uncontaminated). Bunding must have a minimum capacity of 110% of the volume of the largest tank or 25% of the total storage capacity, whichever is the greater. Bunding shall be impermeable to the substance that is being stored in the tank;
- The use of settling lagoons, settling tanks, or equivalent, with outflow control measures may be used for the interception of surface water or groundwater pumped from an active working area;
- If a spillage of a hazardous material to groundwater occurs, the groundwater will be contained and pumped to a tank or holding vessel prior to shipment off site for disposal. The contractor will maintain disposal records. The contractor will identify the cause of the spillage and mitigation measures and controls will be put in place to prevent a repeat. The CEMP for the site will be updated and contractors and sub-contractors will be made aware of the amendments;
- The Contractor will clean equipment prior to delivery to the site. The Contractor will avoid using any equipment which leaks fuel, hydraulic oil, or lubricant. The Contractor will maintain equipment to ensure efficiency and to minimise emissions;
- No excavation shall take place below the water-table on the site;
- Management/Response plans will be implemented to identify mobilisation of soil particles/pollution and initiate the interception and treatment of pollution/silt runoff; and
- Precast elements should be maximised to avoid wet concreting in close proximity to water. The new u-shaped channel of the Western Tributary will be precast.

Instream Works

To reduce the potential impacts from instream works the following mitigation measures are proposed:

- For managing the risk to water quality, adherence to best practice guidance, pollution prevention and sediment management measures like the use of oil booms, spill kits, and silt fences will be applied. All instream works will be supervised by an Ecological Clerk of Works (ECoW), and safe concreting measures will also be implemented;
- Silt mitigation measures will be established prior to the excavation within the Well, Atlantic and Victoria Streams; and
- To mitigate impacts to any fauna or flora as a result of instream works, reference Chapter 7.

Flooding during construction

There is a possibility that a flood will occur during the construction phase. To ensure that Kilkee does not become vulnerable to floods during construction, the contractor will be required to monitor conditions that may cause inundation. In the event of a storm, measures will be taken to minimise silt runoff from open excavations where possible. All works undertaken near the banks will be fully consolidated to prevent scour and run-off of silt. Consolidation may include use of protective and biodegradable matting or geotextiles on the banks and the sowing of grass seed on bare soil. Where possible and practical, earth works will take place during suitable weather conditions, to reduce the risk of flooding which could result in mobilisation of significant quantities of unconsolidated material.

Operation Phase

To reduce the predicted impacts on hydromorphology and groundwater recharge the following mitigation measures are proposed:

Groundwater recharge

Chisel ploughing will be carried out by the contractor to loosen the soil that will be compacted during construction. Chisel ploughing will reduce soil compaction on the site and promote seed growth; this will increase infiltration rates, reducing runoff rates from the site.

Hydromorphology

Natural bed material will be used to cover the base of the proposed precast u-channel. Where possible, this material will come from the existing Well Stream bed material, which will be retained and stored for this purpose. It will be crucial to maintain the same gradient of the Well Stream, to allow deposition of natural material in the new stream bed. In addition, stone-textured imprint will be used on internal bank faces. Textured imprints on the inside face of the channel will help to create a new hydromorphological regime, as shown in Figure 9-6.

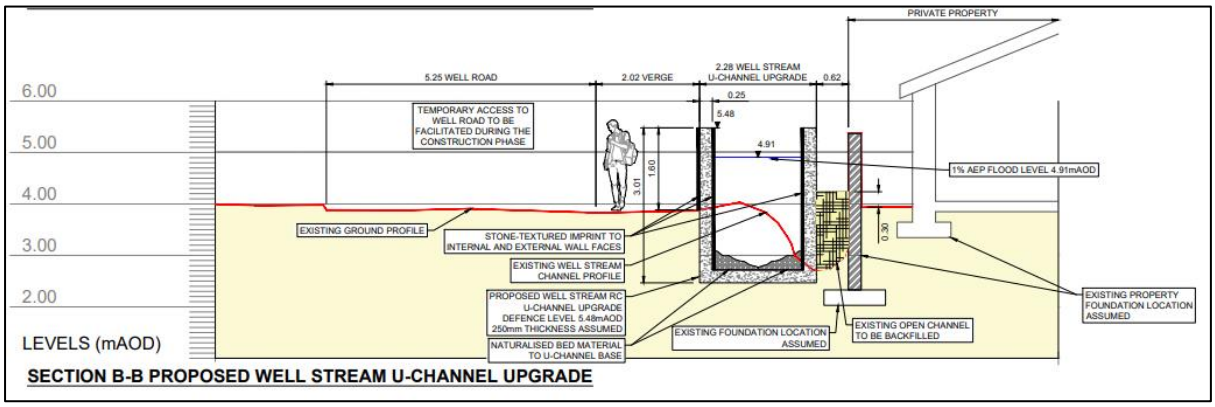


Figure 9-6: Section of the reconstructed Well Stream, showing proposed textured imprints.

9.5 Residual Impact

Following the implementation of the recommended mitigation measures and the final design and layout of the scheme, the magnitude and significance of the residual impacts is discussed in the following sections.

Construction Phase

Provided that mitigation measures are followed closely during the construction phase of the scheme, the residual impact to surface water and groundwater bodies will be reduced to **temporary, slight negative to imperceptible**.

Operation Phase

During the operation phase of the project, considering the design considerations benefitting surface and groundwater bodies, the residual impact will be **long-term** and **slight**, with a **neutral impact on**

quality, i.e., an effect which causes noticeable changes to the character of the environment without affecting its sensitivities.

Monitoring

The site-specific CEMP will set out the monitoring requirements for the scheme during the construction stages. Monitoring will ensure the implementation of mitigation measures during construction. All monitoring records should be maintained by the Project Manager or their nominated assistant. The monitoring will include:

- An inspection record of environmental mitigations on site in accordance with the CEMP.

Monitoring of surface water and groundwater on quantitative and qualitative parameters during construction will be carried out. As a minimum the following parameters will be recorded in surface waters: pH, conductivity, chemical oxygen demand, suspended solids and total dissolved solids. Parameters for groundwater will include as a minimum, total petroleum hydrocarbons, pH, conductivity, suspended solids and total dissolved solids. For bathing water testing will include microbiological sampling including cryptosporidium and e-coli. If monitored levels exceed the recommended threshold, mitigation measures to protect surface and groundwater will be reviewed by the environmental manager acting on behalf of the contractor.

On-going water quality monitoring in the Atlantic and Victoria Streams will identify the success of the mitigation measures/operating practices installed.

9.6 Interactions

Impacts to surface and groundwater have the potential to interact with the following environmental factors:

Biodiversity, discussed in Chapter 7: The Victoria and Atlantic streams flow into the Kilkee Reefs SAC, which is a valuable habitat for a number of significant and protected species. Impacts on waterbodies could affect the SAC or aquatic habitats and species. Mitigation measures included in the Water chapter and the Biodiversity chapter will ensure that no significant interactive effects occur.

Land and Soils, discussed in Chapter 8: Groundwater and aquifer characteristics and activity are largely dictated by geology and overlying soils. Impacts such as soil compaction, reduction of water infiltration into soil, and alteration in groundwater flow are directly related to both soil and geology, and surface and groundwater. Soil compaction is not expected to be significant. Mitigation measures outlined in Chapter 8 include a soil management programme and the construction of temporary pathways to reduce soil compaction.

Population and human health, discussed in Chapter 6: Impact on water quality interacts with the impacts on population and human health because of drinking water and quality of bathing water of Kilkee bay. Mitigation measures included in this chapter will ensure that no significant interactive effects occur.

Material Assets, discussed in Chapter 10: Construction vehicles moving on site during the construction phase could interact with water quality due to hydrocarbons entering the surface water drainage. Mitigation outline above in this chapter and Chapter 10 will help reduce risk of interactions with water quality.

9.7 Predicted Cumulative Impacts

Chapter 14 discusses the identification of nearby projects that have the potential to cause cumulative impacts with the proposed FRS. Other than the Kilkee Sewerage Scheme, no cumulative impacts are likely for Water, due to the size and nature of other developments in the area.

Uisce Éireann is progressing the planning stage of a project to install a new wastewater treatment plant in Kilkee. The project will bring several benefits to Kilkee such as improved water quality in the receiving waters at Intrinsic Bay, in compliance with national and EU regulations relating to the treatment of wastewater. In addition, there will be an improvement regarding protection of recreational swimming, fishing, boating and sightseeing waters. The cumulative impact of the proposed

development and the proposed Sewerage Scheme will likely be positive, due to the likely positive operational impacts from both.

10 Material Assets

10.1 Methodology

Material assets, as described in the EPA Guidelines[153], covers three separate aspects: roads, traffic, and transport, built services or utilities, and waste management. These three aspects will be discussed in this chapter.

The roads, traffic, and transport section describes the existing transportation system in the vicinity of and leading to the proposed Kilkee FRS. This section also examines the various aspects of the construction and operation of the development which have the potential to impact on roads, traffic and transportation, and the magnitude of these impacts are considered prior to mitigation. Mitigation measures are then discussed, and the residual impact (post-mitigation) is outlined. This section was undertaken using a desk-based study. The assessment of roads and traffic identifies roads, footpaths, and public transport routes that will be affected during the construction phase of the proposed scheme. Information in this chapter is also taken from the Kilkee Flood Relief Scheme Buildability Report.

TII's 2014 publication "Traffic and Transport Assessment Guidelines"[154] was consulted to determine whether or not a standalone Traffic and Transport Assessment was required for the proposed development. Using the thresholds contained in Section 2 of the above guidelines, it was determined that the proposed development does not require a Transport Assessment.

The assessment of utilities included a desk-based exercise to identify utilities (i.e., underground and overground utilities, electrical infrastructure, water services infrastructure, etc.) that will be affected by the proposed scheme. On-site surveys have also been carried out, such as a manhole survey and walkover surveys by members of the Design Team.

The assessment of waste included a calculation of quantities of waste likely to be produced during the construction phase. Details of likely truck movements in relation to waste are also included in the chapter.

10.2 Receiving Environment

Roads, Traffic, and Transport

Roads in Ireland are classified as motorways, national (primary and secondary), regional and local roads. TII has overall responsibility for the planning and supervision of the construction and maintenance of motorways, national primary and national secondary roads. Local authorities have responsibility for all non-national roads. The hierarchy of road types throughout Ireland is outlined in Table 10-1 below.

The existing road network in the general vicinity of the proposed development is outlined below. The N67 is the main road in the area and passes through the town, and connects Killimer Ferry Terminal with Galway. The R487 feeds into the town from the south at Carrigaholt Road, running to the southwest tip of County Clare at Loophead Lighthouse. The N68 connects Ennis to Kilrush and the N67.

Within Kilkee, the Strand Line on the beach front is the terminus of the R487, with O'Curry Street running parallel to the rear in a northeast/southwest direction. Kilkee town centre is semicircular in shape. Moore Bay is to the East with roads such as Chapel Street, Corry Lane, Railway Road and

[153] Environmental Protection Agency (May 2022) *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*. Environmental Protection Agency, Ireland

[154] TII (2014) *Traffic and Transport Assessment Guidelines*, PE-PDV-02045. Available at: https://www.tiipublications.ie/library/PE-PDV-02045-01.pdf [Accessed 09/01/2024]

Erin Street. Circular Road encloses the town centre and is bisected by the N67. Other minor roads in the town radiate outwards from Circular Road and contain residential housing estates.

Table 10-1: Road classification in Ireland

Road Category	Description
Motorways	These are high quality multiple lane roads with limited grade separated junctions. They are high speed roads (up to 120kph) predominantly provided to facilitate strategic traffic, with reduced journey times.
National Primary Roads	These are predominantly single carriageway, with some that are dual carriageway. Generally high speed roads (100kph), they also facilitate strategic traffic, with reduced journey times.
National Secondary Roads	These are medium distance through-routes connecting important towns, serving medium to large geographical areas and links to primary routes to form a homogeneous arterial network.
Regional Roads	Predominantly single carriageway roads of regional and local importance. These receive higher priority in maintenance criteria than Local Roads; hence tend to be structurally sound.
Local Roads (Primary, Secondary and Tertiary)	The local road system is operated in three tiers defining local importance, usage and maintenance priorities. They form a network of single carriageway roads of varying quality.

During the summer months, the tourist population in Kilkee is much larger than the local population, putting significant pressure on the town's road infrastructure. Throughout Kilkee, traffic congestion and parking issues are caused by the high volume of cars. However, it is essential to remember that during most of the year, the majority of the traffic is local. The town's Traffic Management Plan addresses both seasonal and daily traffic management needs, by implementing alternative traffic routes.

Local traffic will be impacted by the construction traffic travelling to and from the site. Temporary road closures and diversions will also likely be required during construction. Communication of these measures will be developed for the scheme.

Site Compounds

A site compound with adequate material storage space will be established adjacent to the N67 on the outskirts of the town to provide safe access for delivery materials and minimise frequent plant movements within narrow streets where pedestrian access is often not provided. A final location for this compound will have to be agreed with CCC and the prospective contractor. Smaller welfare compounds will be established in closer proximity to the works locations, providing welfare and refuelling services for the works, removing the need to track or return machinery to the main compound at the end of each shift.

Victoria Stream Locations

A separate welfare compound can be established in the existing Clare County Council compound on the Well Road, to serve all staff operating on the Well Stream and Victoria Stream works. A compound will be established just off the Old Carrigaholt Road to serve both the development of the Western Storage area and the Well Road embankment.

Atlantic Stream Locations

The existing space behind Waterworld can provide a suitable location for a welfare compound. Access would be through the existing access point at the rear of the Waterworld building and also double as access to the trash screen unit on the Atlantic Stream. There will also be welfare compounds located at both Sandpark and the rear of Dún an Óir estate.

Utilities

Underground utilities will be found in multiple locations around the site, and already serve the existing town of Kilkee. While deep excavations are generally not required, impacts to utilities will occur during

the construction stage. Both the Uisce Éireann Pumping Station and the ESB sub-station are at risk of flooding in the 1% AEP. For maps of the utilities, refer to Appendix F.

Victoria Stream

- Drainage system beside 21 Victoria Court, across both walls of the Victoria Stream, north of Carrigaholt Road field, the Tributary Field, two existing sewers at proposed storage field. Existing overflow culvert pipes of the Well Stream flow into the Victoria Stream at Victoria Park.
- Public street lighting is present between 20 and 21 Victoria Court.
- ESB substation in the vicinity of a wall in Victoria Park.
- ESB Overhead powerlines at the entrance to the field of Victoria Court embankment works, across the Victoria Park wall, the western and southern side of Carrigaholt Road field.
- ESB underground cables running beside Victoria Park wall and south of Carrigaholt Road field.
- Eir cables near southern part of the Victoria Court embankment works.

Atlantic Stream

- ESB underground cables in the vicinity of the Atlantic Stream works at Sandpark mobile home park.

No impacts are anticipated on any existing utilities at Kilkee Bay Hotel, Dún an Óir estate, Waterworld or at the Atlantic Stream Outfall.

Wastewater Treatment Works (WwTW)

Kilkee has no WwTW and all effluent is currently pumped to the sea to the south of Kilkee. Uisce Éireann have proposed to construct a WwTW south of Kilkee, with works expected to start in 2024. In the tourist season in summertime the Victoria Stream is blocked by using a temporary weir arrangement at the outfall to the beach and storm flow is diverted to the foul pump station and pumped to the foul effluent outfall. The temporary weir can be removed, or overtopped, if a storm occurs. Emergency overflow may occur from two discharge points (SW2 and SW3) into the Victoria Stream. Emergency overflow discharges only occur if there is a period of very heavy rainfall together with both foul and storm pump dysfunction and/or a power outage and backup generator failure.

Waste

Waste Management

There is a Bring Bank located in Kilkee Town Centre Car Park, which receives small household recyclables, e.g., plastic bottles, aluminium cans, glass bottles/jars, and textiles. This facility is not located within the Flood Zone A or B extents. The nearest recycling centre and transfer station is in Lisdeen on the N67 between Kilkee and Kilrush.

10.3 Predicted Impact

Roads, Traffic, and Transport

Construction Phase

Victoria Stream

Construction Vehicle Movements

There will be an estimated total of 2,674 truck movements during the construction phase for the Victoria Stream. These are required for; all material to be removed for construction, concrete deliveries, incoming engineering fill for embankment construction, and stone deliveries and removal. These truck movements will take place across the construction phase, working out at approximately 7 truck movements per day. This will result in a **temporary slight negative impact**.

Impacts to Private Access

The installation of the u-channel at the Well Stream will require the temporary closure of the Well Road, serving one property owner. The landowner will also require a culvert to be installed on their land.

The Crescent Place culvert works will require a diversion through the existing Well Field Estate. This traffic diversion will temporarily remove parking spaces outside the properties of Crescent Place.

A temporary wayleave and a road crossing will be required on Caravan Park Road during the works on the Well Stream embankment.

A temporary wayleave will be required on the Well Road in respect of the existing house during the works. The temporary disruption will have a negative impact on access to Crescent Place during the construction phase. Also, 10 properties, 1 business and 1 public area will be affected by a temporary land take, with all areas to be reinstated after completion of works.

The proposed works will result in temporary restrictions or disruptions to access for these properties, leading to a **temporary moderate negative impact**.

The affected properties in this location are shown in Chapter 4.

Temporary Road Closures

The proposed works on the Crescent Place Culvert on Well Stream will cut off access to Well Road, the ESB sub-station and the Uisce Éireann facility. The temporary traffic management system will have a negative impact on access to properties during the construction phase. The temporary closure of a private road used by Uisce Éireann located to the rear of Victoria Park will be required to construct the wall at Victoria Stream. These impacts will be **temporary slight negative**.

The affected properties in this location are shown in Chapter 4.

Atlantic stream

Construction Vehicle Movements

There will be an estimated 631 truck movements associated with the Atlantic Stream construction phase. This includes; incoming engineering fill and material removed for construction of the embankments, upgrades to the ESB access road, and stone deliveries and removal, working out at approximately 2 truck movements per day.

These impacts will be **temporary slight negative.**

Impacts to Private Access

An ESB substation exists at the end of the proposed access road off the N67 Kilrush Road. A temporary way leave will be required on this road during the works. During the duration of the works at Dún an Óir estate, the public parking area and loop road width will be reduced. A private road will need to be used for access during construction of the proposed works at the Atlantic Stream, Sandpark mobile home park.

The affected properties in this location are shown in Chapter 4.

These impacts are expected to be **temporary slight negative.**

Temporary Road Closures

The Crescent Place Culvert works on the Well Stream will cut off access to Well Road, the ESB sub-station and the Uisce Éireann facility. The works will require a road diversion for the duration of the works through the existing Well Field Estate. Access to the works area to install the debris screen is from the existing western entrance at Waterworld, where this area will be temporarily closed. The works on the Atlantic Stream outfall manhole will require closure of part of the promenade. This should extend to ensure that all seating areas immediately below and beside the works area are temporarily closed off for the duration of the works.

The affected properties in this location are shown in Chapter 4.

These impacts will be **temporary slight negative.**

Operational Phase

Victoria Stream

A rear access to one property exists over the existing Well Stream upgrade at Well Road. This access will be closed during the works and a new access installed as part of the permanent works. The impact of this action will be **long-term neutral.**

Atlantic Stream

Once the proposed development is operational, no impacts to roads are expected to occur. The operational impact on utilities will therefore be **neutral**.

Utilities

Construction Phase

Victoria Stream

During the works, there will be periodic shut-offs of water services and foul services at Crescent Place. The sequencing of these works will be agreed between Uisce Éireann, Clare County Council and the property owners. During construction, foul water will be redirected to the pumping station to the rear of Victoria Park.

Existing overflow culverts from the Well Stream flow into the Victoria Stream at Victoria Park and pass directly under the ESB sub-station. These will be decommissioned as part of the scheme.

Impacts to utilities during construction will be **temporary, slight negative to negligible.**

Atlantic Stream

Part demolition of the existing outfall manhole on the Atlantic Stream Outfall will occur and elevation of the manhole so that it sits above the existing promenade structure. The existing Atlantic Stream culvert will remain in place where a flap valve will be installed above the high-water mark. No foreshore licence is not required for these works.

This impact will be **long-term positive.**

Operational Phase

Victoria Stream

When the two walls are being tied in together at Victoria Court, alterations to the corner of the existing wall may result at the back of this house.

The Uisce Éireann overflow connection between Victoria Stream and the Uisce Éireann pump station will be incorporated into the flood wall upon completion.

A new 900Ø culvert will be constructed with headwalls at either end, under the embankment at the tributary field storage linking up to the Victoria Stream diversion at Carrigaholt Road field.

Once the proposed development is operational, these impacts will be **long-term positive.**

Atlantic Stream

The new debris screen upstream of the culvert headwall at Waterworld will be operational, with a new flap valve installed onto the elevated section on the Atlantic Stream Overflow Outfall. This will discharge onto the promenade during flood events.

Once the proposed development is operational, these impacts will be **long-term positive.**

Waste

Construction Phase

Victoria Stream

Excavations will occur at the following locations;

- 690m³ for the Well Stream embankment.
- 476m³ for the Well Stream u-channel.
- 148m³ for the Victoria Court embankment.

- 403m³ on the left-hand bank beside Victoria Park.
- 215m³ on the right-hand bank at Victoria Crescent.
- 1096m³ for the Carrigaholt Road perimeter embankment.
- 4446m³ for the Western Tributary embankment.

This will result in 7474m³ for the Victoria Stream locations. The majority of this will be disposed of as waste and will be removed to an approved waste soil recovery facility. A portion of the material will be reused as fill where required. Alternatively, the contractor can reuse this material on another site as a by-product while adhering to Article 27 of the EC (Waste Directive) Regulations (2011). This would further reduce the volume of waste generated during excavation. The construction phase impact on waste will be **temporary slight negative**.

Atlantic stream

Excavations will occur at the following locations;

- 800m³ for the Kilkee Bay hotel rear embankment.
- 275m³ for the wall at Dún an Óir estate.
- 150m³ for the Sandpark mobile home site embankment.

This will result in 1225m³ for the Atlantic Stream locations. The majority of this will be disposed of as waste and will be removed to an approved waste soil recovery facility. A portion of the material will be reused as fill where required. Alternatively, the contractor can reuse this material on another site as a by-product while adhering to Article 27 of the EC (Waste Directive) Regulations (2011). This would further reduce the volume of waste generated during excavation. The construction phase impact on waste will be **temporary slight negative**.

Operational Phase

Once the proposed development is operational, debris will collect at the debris screen upstream of the culvert headwall at Waterworld. This is designed to do so and will not affect the operation of the screen, with the waste to be removed upon each inspection. The operational impact on waste will therefore be **long-term positive.**

10.4 Mitigation Measures

Roads, Traffic, and Transport

Construction Phase

Construction vehicles will be required to adhere to a Construction Traffic Management Plan (CTMP) to be prepared by the appointed contractor. The CTMP will include the following:

- Adherence to relevant laws, regulations, and standards governing construction activities and traffic management. Key aspects will be adherence to traffic regulations, permitting and licensing, environmental regulations, health and safety standards, local authority requirements, emergency response plans, and public consultation.
- Deliveries will be limited to working hours (08:00 to 19:00 Monday to Friday, 08:30 to 14:00 Saturday, and none on Sundays or public holidays, or as determined by the County Council).
- Construction vehicles will use a designated haul route, agreed in advance with Clare County Council. This will utilise the N67 and avoid the use of Kilkee Town Centre where possible. Some limited use of the centre of Kilkee will likely be required due to the location of proposed works, however this will be kept to a minimum. Construction vehicles will use Circular Road to move between the Victoria Stream works and the compound on the N67 wherever possible, in order to avoid the Strand Line and O'Curry Street.
- A wheel wash facility will be setup if required to ensure that sediment does not leave site and get deposited on roads to and from the site. Periodic road cleaning around the site will also take place if required.
- All necessary traffic safety precautions shall be undertaken by the Contractor to ensure the safety of all traffic and pedestrians using the existing roads adjacent to the site and connecting minor

roads during the execution and completion of the Works, and all precautions shall be taken to minimise disruption to the local residents.

Victoria Stream

Traffic management measures are required to minimise impacts from truck movements on roads. Several temporary access roads will be in use, as shown in Section 4.3. During works at the Well Stream embankment, immediately west of Cunninghams Holiday Park, a temporary access road will be installed from the Old Carrigaholt Road north to the Well Stream embankment. This will include a temporary way leave, and open channel crossings.

Local access will be provided to Well Road during the closure of the road throughout the installation of the u-channel.

The Crescent Place culvert works will require access arrangements for residents, to facilitate the temporary diversion for Well Road, ESB sub-station and the Uisce Éireann facility, through the existing Well Field Estate lasting for the duration of the works. The works will be constructed in two phases to facilitate vehicle access;

- Phase 1 – Outlet to centre of Crescent Place
- Phase 2 – Centreline to Well Stream Inlet

This diversion will also retain the rear access to the properties that face onto Marine Parade. For those properties in Crescent Place and Victoria Park, access will be available through Crescent Place, with a stop-and-go system in place with traffic travelling over the recently installed section of the new culvert.

Temporary restricted access will be given to the Uisce Éireann access road during construction of the walls on both banks of the Victoria Stream, adjacent to Victoria Park and Victoria Crescent. Access here will be widened to the right-hand side green area whilst the wall is being constructed. Temporary traffic management measures, including localised signage, advanced advertisement and site accommodation works will also be required.

Protection of utilities at the Carrigaholt Road field will include; adequate cover and protection over underground cables and underground sewage pipes, and protection of overhead cables and posts.

Access from the following areas will be maintained and regular road sweeping will occur during construction;

- Carrigaholt Road.
- The road from Carrigaholt Road to Victoria Court embankment
- The private road used to access the Uisce Éireann site at the rear of Victoria Park.
- Existing carriageways, from the Old Carrigaholt Road to tributary field storage site.

The proposed works will result in temporary restrictions or disruptions to access for these properties. These impacts will be **temporary slight negative**.

Atlantic stream

Widening of the access road entrance off the N67 Kilrush Road, via the ESB substation will be required to facilitate HGV access at the Kilkee Bay Hotel works.

Access from the following areas will be maintained and regular road sweeping will occur during construction;

- The N67 Kilrush Road.
- Dún an Óir estate road.
- The private road located at the rear of the lower section of the Sandpark mobile home park.

Once the proposed mitigation measures are put in place, impacts to roads, traffic and transport during construction will be **temporary, slight, negative.**

Operational Phase

Victoria Stream

As no impacts on roads are expected on the Victoria Stream sites once operational, no mitigation measures are proposed for the operational phase. Therefore, the operational impact on roads, traffic, and transport will be **neutral**.

Atlantic Stream

As no impacts on roads are expected on the Atlantic Stream sites once operational, no mitigation measures are proposed for the operational phase. Therefore, the operational impact on roads, traffic, and transport will be **neutral**.

Utilities

Construction Phase

Victoria Stream

Any disruptions to services will be agreed with the relevant service providers and will be communicated in advance to the relevant property owners. Further mitigation measures for utilities are not required. Maintenance of adequate cover over 2 no. existing foul sewers at the tributary storage field will occur and details of the depth of the foul sewer will be sought prior to construction.

Decommissioning the Well Stream overflow pipes will involve capping off the existing culvert either side of the ESB substation to avoid disruption to the substation. The existing pipes follow the route of Victoria Park and pass directly underneath the substation, the new culvert at Crescent place will replace these overflow pipes.

Impacts to utilities during construction will be **temporary, slight negative to negligible.**

Atlantic Stream

Any disruptions to services will be agreed with the relevant service providers and will be communicated in advance to the relevant property owners. Further mitigation measures for utilities are not required. Impacts to utilities during construction will be **temporary, slight negative to negligible.**

Operational Phase

As no impacts on utilities are expected once operational, no mitigation measures are proposed for the operational phase. The operational impact on utilities for both areas will therefore be **neutral**.

Waste

Construction Phase

A Resource Waste Management Plan (RWMP) will be produced by the appointed contractor to help manage, reduce, and dispose of waste arising during the construction phase. The RWMP will outline waste reduction techniques, guidelines to be followed, and the waste disposal streams to be used during the development. All construction waste will be segregated and removed to an approved location.

With the proposed RWMP in place, the impact on waste during the construction phase for both areas is expected to be be **temporary, slight, negative.**

Operational Phase

As no impacts on waste are expected once operational, no mitigation measures are proposed for the operational phase. The operational impact on waste for both areas will therefore be **neutral**.

10.5 Residual Impacts

Roads, Traffic, and Transport

The construction management plan will take into account construction vehicles and mitigate any issues with vehicles on public roads, minimising the impacts to the public road network during

construction stage. Appropriate phasing of construction works will enable access to the properties in a safe and controlled manner. Once the proposed mitigation measures are put in place, the residual impact to roads, traffic and transport during construction would be **temporary, negligible.**

Utilities

Mitigation measures discussed in the previous section will reduce the environmental impact of the proposed development however, there are some impacts that cannot be avoided in the short term, such as short-term disruptions to water main, foul sewer, or ESB stoppages for several hours during the connection of services. Residents will receive notices if stoppages are foreseen. There are no additional impacts expected once services are introduced. The overall residual impact during the construction phase from disruption of services has been assessed as **temporary, negligible.**

Waste

Once the proposed development is operational, waste will collect at the debris screen upstream of the culvert headwall at Waterworld. This will relieve pressure on the culvert and reduce blockage, therefore benefiting the wider area in times of flooding. The debris screen is designed to do this, with waste to be removed upon each inspection. The operational impact on waste will therefore be **long-term slight positive.**

10.6 Interactions and Predicted Cumulative Impacts

Interactions

Construction vehicles moving on site during the construction phase could result in hydrocarbons entering the surface water drainage system, leading to effects downstream. This is mitigated against by measures included in the Water chapter for the prevention of pollution or increased sedimentation. The mitigation measures are also included in a preliminary Construction Environmental Management Plan (CEMP), which outlines the site compound location (away from any drains) and require all vehicles to be maintained frequently and to carry spill kits at all times. Without mitigation in place, this could lead to a temporary significant negative effect. However, with the measures outlined in this chapter and the Water chapter, the interaction between these will be **temporary, imperceptible, neutral**.

Cumulative Impacts

The cumulative effects of the proposed development in combination with other relevant existing, planned and permitted projects have been assessed to determine whether these would give rise to significant effects on the environment. The list of projects outlined in Chapter 14 has been consulted; no significant negative impacts on Material Assets are expected.

The Kilkee Sewerage Scheme is expected to improve the treatment of wastewater in Kilkee. When complete, there will be a positive cumulative impact with the proposed FRS.

If projects listed in Chapter 14 go ahead at the same time as the proposed development, there could be a cumulative impact on roads due to increased construction traffic. However, given the size of the proposed development and the other developments in the area, **no significant cumulative effect is expected**.

11 Cultural Heritage

11.1 Introduction

Overview

This cultural heritage chapter presents the results of a terrestrial and underwater archaeological impact assessment of the proposed Kilkee FRS in Kilkee, Co. Clare. The assessment forms an integral part of the wider EIAR with regard to a planning application for the development. The proposed development consists of flood relief defences centred around two primary tidal streams, the Atlantic and Victoria Streams, for further details see Chapter 4 - Description of Proposed Development. From the onset of the Kilkee FRS scoping, the Scheme has been designed with an emphasis on minimising the potential for impacting on cultural heritage (see Section 5.8 of the EIA Screening and Scoping for Fluvial Works Report).

The assessment is a combination of desk-based research and the results of a site survey. The survey included a visual inspection, walk over survey along with a wading, metal detection survey (Licence: 23R0543; 23D0114). This research identified areas of cultural significance including both archaeology and architectural heritage which may be impacted by the proposed development. A description of the potential impacts is presented along with recommended mitigation measures.

11.2 Methodology

Aims and Objectives

The assessment was undertaken in order to accomplish the following:

- Ascertain the character, condition and extent of any archaeological areas, features, or objects likely to be affected by the proposed works, including any associated temporary works and the likely impact of the proposed works on these remains;
- Accurately locate these archaeological areas, features, or objects and document the findings in documented and map/digital format;
- Describe same and discuss their likely provenance;
- Recommend appropriate measures for the avoidance of these remains or, where this cannot be achieved, recommend measures to mitigate the impact of the works;
- Incorporate all the above to inform the flood relief project.

Conventions, Legislations and Guidelines

Though no protected monuments, structures, or known protected wrecks will be directly impacted by the proposed development, all relevant conventions, legislations and guidelines informed the assessment. The proposed development zone is also in an Architectural Conservation Area (ACA) in County Clare giving protections against external works which may affect the character of the area under Sections 81 and 82 of the Planning and Development Act, 2000. The assessment was undertaken with due regard to the following national and international protective conventions, guidelines and legislation:

- Historic and Archaeological Heritage and Miscellaneous Provisions Act, 2023 (National Monuments Act. 1930 to 2014 remains in effect Section 225 and a number of non-heritage related “miscellaneous” provisions in Part 13 of the Act have entered into force.)
- National Monuments Act, 1930, amended 1954, 1987, 1994, 2004 and 2014
- Heritage Act, 1995
- National Cultural Institutions Act, 1997
- The Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous) Provisions Act, 1999
- Planning and Development Act, 2000
- Frameworks and Principles for the Protection of the Archaeological Heritage, 1999, Department of Arts, Heritage, Gaeltacht and the Islands
- Local Government (Planning and Development) Act, 2000

- European Convention on the Protection of the Archaeological Heritage (the 'Valletta Convention') ratified by Ireland in 1997
- Council of Europe Convention on the Protection of Architectural Heritage of Europe (the 'Granada Convention') ratified by Ireland in 1997
- International Council on Monuments and Sites (ICOMOS), advisory body to UNESCO concerning protection of sites and recommendation of World Heritage sites ratified by Ireland in 1992
- Archaeology and Flood Relief Schemes: Guidelines, 2023
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, 2022

Desktop Study

A detailed desktop study was undertaken to ensure all available literature and background information was considered to inform the underwater archaeological potential of the area under investigation. This included research focused on the proposed works, the full Scheme Area (as defined in Figure 1-1) and the larger region. The following sources were consulted as part of the desktop survey:

- The Record of Monuments and Places (RMP) compiled by the Archaeological Survey of Ireland comprises lists, classifications of monuments and maps of all recorded monuments with known locations and zones of archaeological significance. The monument records are accessible online via the National Monuments Service (NMS; Department of Housing, Local Government and Heritage) Historic Environment Viewer, accessible at www.archaeology.ie
- The Wreck Inventory of Ireland Database (WIID) and the Wreck Viewer include a broad range of cartographic, archaeological, and documentary sources concerning wreck data. Each entry in the inventory gives information on the ship's name, type of vessel, port of origin, owner's name, cargo, date of loss, and other relevant information where available. While the WIID contains information on approximately 18,000 shipwreck records (both those with known and unknown locations), the Wreck Viewer contains the same information for those wrecks but only those with known locations. The WIID and Wreck Viewer are accessible online via the National Monuments Service (NMS; Department of Housing, Local Government and Heritage) Wreck Viewer, accessible at www.archaeology.ie
- Ordnance Survey of Ireland (OSI) historic and contemporary maps were examined to measure the changing landscape.
- The Record of Protected Structures (RPS) is a list of all protected buildings in a given area, as designated by the Local Authority. This may be due to a structure's architectural, historical, archaeological, artistic, cultural, social, scientific, technical, or industrial importance.
- The National Inventory of Architectural Heritage (NIAH) identifies, records, and evaluates the post-1700 architectural heritage of Ireland, uniformly and consistently to aid in the protection and conservation of the built heritage. NIAH surveys provide the basis for the recommendations of the Minister for Housing, Local Government and Heritage to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS).
- The Excavations Bulletin online database, known as the Database of Irish Excavation Reports (www.excavation.ie) was consulted to review past archaeological investigations in the area.
- National Museum of Ireland Topographical Files hold details of any artefactual material recovered in Ireland from the 18th century to the present. These are sorted to County and Townland.
- Logainm: The Placenames Database of Ireland is a comprehensive management system for data, archival records and placenames research conducted by the State. It provides information on Irish placenames, their translationmeaning, and related historical references. Such references may also be used to track place names such as oral traditions, historic sources (e.g. 19th century or earlier charts), and documentary sources (e.g. the School's Folklore Collections).It provides the translations and meaning of placenames may also be used to track place names such as oral traditions, historic and documentary sources.
- The National Folklore Collection (duchas.ie) holds digitised copies of much of the work undertaken by the National Folklore Commission including the Main Manuscripts Collection and School's Folklore Collection.
- The Clare County Development Plan 2023–2029 contains policies and objectives for archaeological, architectural and cultural heritage including Protected Structures, Architectural

Conservation Areas, industrial heritage, archaeology, underwater archaeology, linguistic heritage, folklore and oral culture, amongst others.

- Cartography: Several historic maps and charts were examined (see references below for a full list). These maps provide insight into the changes to the coastline over time along with changes in structure locations and navigational routes that may inform ship traffic and ship losses.
- Aerial Photography: A variety of low and high-altitude aerial photography was examined (see references below for a full list).
- Built Heritage Surveys of County Clare: A number of surveys were reviewed to provide a comprehensive insight into the built heritage of Kilkee including Clare Coastal Architectural Survey 2008, Clare Industrial Heritage Survey 2008, Clare Railway Bridge Survey (Interim) 2015, Clare Stone Slate Roof Survey 2007, Clare Thatched Building Survey 2005, Clare Town & Village Photographic Survey 2009 and West Clare Railway Structures Survey 2005.
- Other National and International Monument Lists were also referenced. The international lists include: UNESCO World Heritage Sites (WHS) and Tentative World Heritage Sites. National lists include: National Monuments in State Care; Sites with Preservation Orders; Record of Historic Monuments (RHM); County Council Architectural Conservation Areas (ACAs); the Urban Archaeology Survey; the Walled Towns of Ireland; the Inventory of Historic Gardens and Designed Lanscapes; Irish Historic Towns Atlas; the National Inventory of Intangible Cultural Heritage.
- Documentary sources: Several historical and archaeological sources were examined (see references below for a full list).

Figure 11-1: Working shot of wade and metal detection survey of Atlantic Stream from the SE.

Site Survey

The majority of the survey was made up of a visual inspection, walk-over survey as much of the proposed works are to take place alongside the streams and in fields. Where works are proposed within streams, a wading, metal detection survey was carried out (Figure 11-1). Any potential archaeological material encountered was considered with regard to date, function and provenance. Of the material encountered, the majority was modern in nature, with just a small number of post-

medieval finds (e.g. butter knife, sherd from a whiskey jar). The site survey took place on 20th November and 21–23 December 2023. Surveys were undertaken under licences 23R0543 and 23D0114.

11.3 Receiving Environment

Archaeological and Cultural Heritage Overview

A detailed description of the archaeological and historical background is included in the Underwater Archaeological Impact Assessment submitted to the National Monuments Service. Below is a brief overview of the cultural heritage of Kilkee area with reference to the broader area of the Loop Head peninsula.

There is no evidence of Mesolithic (c. 8000–4000 BC) or earlier occupation in Kilkee or Loop Head Peninsula. The closest sites include a potential Palaeolithic bear patella with man-made cut marks from Gwendoline Cave, Co. Clare, c. 45km northeast of Kilkee (Dowd and Carden 2016), and Mesolithic shell middens at Fanore More and Doolin, Co. Clare, c. 53km northeast of Kilkee (Lynch 2017).

There is likewise a paucity of evidence for Neolithic (c. 4000–2400 BC) activity on the Loop Head Peninsula. There is one possible megalithic structure known in this area, at Kilkee Upper (CL056-040002) which Westropp (1913, 221) described as 'two slabs of flagstones and I think a third under the others, to all appearance the ruin of a dolmen.'

There is more evidence of human activity in the area of the Loop Head Peninsula during the Bronze Age (c. 2400–500 BC) with some 12 barrows and 5 standing stones. The activity of the region, however, is still greatly centred around more inland sites such as Mooghaun fort c. 54km east-northeast. The landscape surrounding this fort became important both socially and economically in the Middle Bronze Age, though Kilkee remained on the outskirts (O'Sullivan 2001, 121). However, a bronze flange-hilted sword dating to the Bronze Age was recovered in Kilkee in 1966 (NMI 1966:104).

The Iron Age Ireland Project which collected all known Iron Age (c. 500 BC–AD 400) evidence in Ireland found no such evidence between Loop Head and the Fergus Estuary (Becker et al. 2008). Though it must be understood that a lack of such evidence does not indicate that there was not a human presence in the area. There is, however, some suggestion that much of Clare saw a true lull in human activity as evidenced by significant woodland regeneration before the end of the 3rd century AD (Nugent 2007, 65).

The evidence for Early Medieval occupation in the area around Kilkee, Co. Clare is in sharp contrast to the little evidence known previously. This is especially evident when the sheer number of ringforts in the area is considered. Ringforts are the typical embanked settlements of farmsteads associated with the lords and other land owners of the time. There are 289 such sites known in the area from Doonbeg and Moyasta down to Loop Head; six of which are located within the Scheme Area for the flood relief scheme (CL056-004, CL056-036, CL056-037, CL056-039, CL056-043, CL056-044).

The area belonged to the Corca Bhaiscin potentially before the 5th century (Nugent 2007, 64–5). The group reportedly traces their history back to the 2nd century AD to the son of the King of Ireland Conaire Mor, Cairbre Baschain (O'Donovan and Curry 1841).

One of the 'Twelve Apostles of Ireland,' St Senán mac Geirrcinn, patron saint of the Corca Bhaiscin, also has an early connection to Kilkee. Senán was born in the area of Clare north of the Shannon estuary sometime around the 6th century. He reportedly founded numerous monasteries including Inis Cathaigh (Scattery Island), Co. Clare, c. 11km southeast of Kilkee. He is said to have crossed to Bishop's Island, c. 2.5km west of Kilkee, and there is a holy well dedicated to St Senan in Kilkee Upper (CL056-042) (Westropp 1913; Nugent 2007, 65; Breen 2009; Ó Riain 2011, 557–60; Clare County Library n.d.).

The Vikings began raiding Ireland as early as AD 795, and were establishing permanent bases in Ireland by the mid-9th century. The monastery on Scattery Island was raided in 837 and 972, though the raids came from a southern sea route or along the River Shannon with little evidence to support Vikings in Kilkee (Nugent 2007, 64 & 68; Stout 2017).

Mahon O'Brien, ancestor to the MacMahons, colonised Corca Bhaiscin in the 11th century, displacing the O'Domhnaill chiefs who held the land previously. By the 14th century, the tríocha céadtra of the Corca Bhaiscin was paying tribute to the overlord of the Dal gCais O'Briens. After the MacMahons supported Edward Bruce in his claim over Ireland, they were pushed into the area known as 'Western Irros' in the 'wedge-like district ending in Loop Head' (Westropp 1913, 217; Nugent 2007, 70–7). It is under this group that Kilkee is first noted in the literature as Cil Caeidhe in c. 1390. The name refers to a church, though there is no record of a church in the townlands surrounding the bay, Bá Chill Chaoi, dating to before the recording of the name. It has been suggested that the name refers to a burial ground (CL056-040001) understood to have been a children's burial ground or cillín (O'Donovan and Curry 1839; Westropp 1913, 217–8; 18E0750). This site is located within the Scheme Area, though not directly within the footprint of proposed works.

In the 15th century, a castle (CL056-041002) is believed to have been built at Kilkee under the petty lords, the MacSweenys, who held the area under the MacMahons. The MacSweenys continued to occupy Kilkee as late as 1651, though under different overlords after MacMahon captured the Earl of Thomond's brother, Daniel O'Brien, in 1585, and was subsequently expelled by the Earl and forced to forfeit his lands to O'Brien in c. 1585 (Westropp 1913, 217–8).

The Late Medieval Period is one defined by an influx of new religious orders beginning in the 12th century and by the Anglo-Norman invasion of 1169. The latter invasion pushed the Gaelic lords of Ireland westwards. Eventually conquests by the Anglo-Normans moved westward as well with strongholds such as Bunratty, Co. Clare, c. 57km east of Kilkee, taking hold in the mid-13th century until the defeat of the invaders in 1318 at Dysart O'Dea. The region remained in Gaelic control until 1570 (Power n.d.; Nugent 2007, 72–3).

There is slightly more evidence of the new religious orders that formed during this time than there was of the Anglo-Norman conquest in 'Western Irros.' By the mid-15th century, it is recorded that the barony of Moyarta owed rents and tithes to Clare Abbey located in Ennis, Co. Clare, c. 50km northeast of Kilkee (Nugent 2007, 121–2). Approximately 1.8km south of proposed works in Kilkee is a church site (CL056-07001) in Kilfearagh which sits on the site of an early church from 1302 (Westropp 1900, 165; Large 2011; McInerney 2014, 14).

Kilkee was occupied by the MacSweenys until 1651. At around this time it was temporarily used as a barracks for Cromwellian soldiers (Westropp 1913, 218–9). The Down Survey of Ireland (1656–8), which mapped the country for redistribution of lands after Cromwell's victory, shows 'Quilqui' with a prominent house and a castle at this time. The descendants of Daniel O'Brien who was granted the land around and including Kilkee in the late 16th century, became Lord Clare and had overall control of the area until 1688 when it was confiscated due to their support of James II. The years following saw the land traded between many hands, first by the Earl of Albemarle who then sold it to a group of local gentry (Webb 1878; Westropp 1913, 218–9; Ó Siochrú 2009). By the end of the 18th century most of Kilkee was owned by local families (Westropp 1913, 218–9). The owners of Kilkee house, the MacDonnell family, moved to New Hall near Ennis in 1764, allowing the house, located on the western side of Moore Bay, to fall into ruin (Ó Dalaigh, 2008, 130).

By this time, Lloyd (1778) described the estate house of Kilkee as 'the most western seat on the coast… a spacious and regular old modelled house with many out offices situated on the brink of a delightful bay and a pleasant beach decorated with sandhills and sheltered from the N.W. wind by a commanding eminence' (from Westropp 1913, 220). Though there is no mention of a village at this time, nor is one illustrated on a map dating to c. 1800, Kilkee is known to have grown rapidly from this point onward with 153 houses reported in 1831 (ibid.; Lewis 1837, 100; O'Flanagan 2021, 433).

By the early 19th century Kilkee was a popular holiday location with a route serving passengers between Limerick and the village via the Shannon Estuary on steamers and then over the small stretch of land from Kilrush via horse and cart or jaunting cars (Lewis 1837, 100; Ó Dalaigh 2008, 124; Foley and Ryan 2021, 289). It has been suggested that Kilkee was developed simply as an offshoot of the much longer established town of Kilrush (Ó Dalaigh 2008, 124). The railway into Kilkee, completed in 1892 (NIAH 20301006) allowed for day trips with a much faster route available (Westropp 1913, 213; O'Flanagan 2021, 441). The station at Kilkee closed in 1960 (Ayers 1997).

The nearby Dough Bog was also important at this time as a source for turf fuel for the Limerick area. A report of the turf cutting industry of the bog in 1814 stated that 150 boats were used to carry the turf from the bog to Poulnasherry Bay. This is likely an over-inflated figure including both turf boats and fishing vessels along with flat-bottomed 'cots' which would have been used to carry the turf through smaller watercourses to the larger turf boats located in deeper channels (Mac Cárthaigh 2011). Lewis (1837, 93) also indicates that there was a strong fishing industry in the area with approximately 50 canoes reported at Farahie Bay and half again at Moore Bay. These canoes would have been the native currach as it was one of the only boats that could function in the area with its lack of sheltered landing points (Mac Cárthaigh 2008, 521–2). Considering how central smaller craft were to the activities of the area, the potential for remains of these unrecorded vessels within the waterways around Kilkee needs to be borne in mind.

Cartographic Research

The changing landscape and development of Kilkee area during the last four centuries is demonstrated in cartographic sources. 'Moore Bay' appears on several 17th century maps including Baptista Boazio's 'Irlandiae' (1606), John Speed's 'Mounster' (1610), Gerhard Mercator's Irlandiae Regnum (1628), Janssonius's 'Provincia Connact' (1636), Jan Jannson's 'Hibernia regnum vulgo Ireland' (1650), and Giacomo Giovanni Rossi's I'irlanda o'uero Hibernia by (1689).

The Down Survey of Ireland (1656–8) annotates 'Quilqui' in approximately the same location as the modern townlands of Kilkee Lower and Upper. It is shown adjacent to 'Balleonan' (Ballyonan or Doonaghboy) and 'Dwogh' (Dough). A castle and a large house are both indicated in Kilkee in the barony map while only the castle is shown on the county map. The latter also shows a church at 'Killferagh' (Kilfearagh) to the south and the inland water channels reaching towards Moore Bay from Poulnasherry Bay in the southeast.

Moore Bay and Kilkee continue to appear in maps and charts throughout the 18th Century with variations of their spellings such as 'Qulque' on Rocque's 'A map of the Kingdom of Ireland' (1785) and 'Killfie' on Beautforts's 'Memoir of a map of Ireland' (1797).

Particularly interesting is Murdoch Mackenzie's 1775 'A Maritime Survey of Ireland' which illustrates Kilkee as a sheltered bay with sands behind. Two houses are illustrated. Mackenzie also noted tidal levels and anchorages. Near the shoreline he remarks 'there is no safe anchorage in any part of this bay [Mal Bay] when in blown […] between the north and southwest points.' Further out towards the Arran Islands he notes 'the stream of tide here, scarce sensible'.

A map of the area from c. 1800 shows 'Killqui' and 'Dough' on either side of Moore Bay with sandhills separating the two in the present-day location of Kilkee town. Two houses are again shown, but instead of being located on the same side of the bay, one is shown on either side. Dough Bog is also indicated along with The Victoria and Atlantic Streams (Brown 2022).

The First Edition 6-inch Ordnance Survey map (1842) is the first map to show the village at Kilkee in detail (Figure 11-2). The Scheme Area under investigation is primarily shown as greenfields surrounding the village which is located most densely on the southeast and west of Moore Bay. The eastern big house indicated on the c. 1800 map is most likely those illustrated here as 'Atlantic Lodge' though the western house is more difficult to discern. The latter may be Deerpark Lodge or may no longer be present. Other named houses in the area include Doonaghboy House, Desmond Villa, Curran Cottage, Summer Lodge, Sandpark Lodge and Willington Place. The latter two are within the town proper along with a school house, a church (NIAH 20301011), an R. C. chapel and a coastguard station. Atlantic Lodge is shown to have its own bath house and two other baths can be found overlooking the strand. In the northwest section of the area there are a few areas of rough pasture along with a deer park and an amphitheatre. Archaeological heritage indicated on the map include St. Senan's Well (CL056-042), a graveyard (CL056-040001), an earthwork (CL056-034), six ringforts (CL056-004, CL056-036, CL036-037, CL056-039, CL056-043, CL056-044) and a souterrain marked 'cave' (CL056-044002).

The Second Edition 25-inch Ordnance Survey map (1898) shows how quickly the town grew between 1842 and 1898 (Figure 11-3). The town proper is now encompassed by a 'Circular Road' with buildings filling the area on both sides of the main street, now marked 'Queen Street,' rather than

being concentrated on the north. There are also more than double the buildings on the west side of the Bay. Many of the same named structures are still present, though a few have been renamed including Doonaghboy House, now Brook Lawn; Atlantic Lodge, now Atlantic House; and Wellington Place, now Moore's Hotel. New named houses include Cliff Cottage, Sunnyside, Parochial House, three terraces and several hotels (most notably for the proposed works, Victoria Hotel). The coastguard station has been moved to the east side of the bay and there is now a constabulary barracks nearby. Other named structures include the church (NIAH 20301011) and R. C. Chapel previously mapped along with a Methodist chapel, a convent, several schools, a few smithies, a dispensary, a bank, a court house, a convalescent home, baths and numerous quarries and gravel pits in various states of use. A boat house for Atlantic House is shown with a slip and a breakwater. The railway station (NIAH 20301006) for Kilkee along the 'South Clare Railway' line is also shown at this time.

Many of the same archaeological features are still illustrated except for the earthwork (CL056-034) and a ringfort (CL056-004); the latter is now shown as a gravel pit. New archaeological features now mapped include 'The Ruined Tower' (CL056-031), a fish pond (CL056-035), a castle site (CL056-041002) with earthworks (CL056-041001, CL056-041003) and two megalithic structure stones (CL056-040002).

The Ordnance Survey maps show several potential cultural heritage sites which are referred to as Cultural Heritage Sites (CHS) (Table 11-7; Figure 11-3) within the text by CHS identifying numbers. On the first edition map (1842), the Atlantic Stream runs roughly in the same channel as it does today. The bridge across Atlantic Stream on Pound Street/N67 (CHS2) is illustrated on the map just northwest of a 'Spa Well' along the stream (CHS1). No infrastructure, archaeology, or buildings are shown in the area of the remaining proposed works at Atlantic Stream or Atlantic Stream outfall beyond the nearby 'Lisnaleagaun' ringfort and souterrain ('cave') (CHS3) (Figure 11-4). Victoria Stream works are centred around three townland boundaries (Table 11-1). Extensive works are proposed along the boundary between Dough and both Kilkee Lower and Ballyonan or Doonaghboy, Victoria Stream (CHS4), the boundary between Kilkee Lower and Ballyonan or Doonaghboy western tributary (CHS5), and Kilkee Upper and Kilkee Lower (CHS6). Though these works also follow the lines of historic roads and stream channels, little other infrastructure is depicted beyond the nearby 'St. Senan's Well' (CHS10) (Figure 11-6).

Table 11-1: Townland boundaries through which works are to take place.

Cultural Heritage Site No.	Boundary Type	Townlands
CHS4	Stream (Victoria Stream)	Dough, Kilkee Lower, Ballyonan or Doonaghboy
CHS5	Stream (Western Tributary)	Kilkee Lower, Ballyonan or Doonaghboy
CHS6	Stream (Well Stream)	Kilkee Upper, Kilkee Lower

On the second edition map (1898), similar infrastructure is seen along the area of proposed works at Atlantic Stream. In place of the 'Spa Well' is marked a foot stone and a well (CHS1). Two possible crossing points are depicted along the course of Atlantic Stream, though not annotated and may just refer to a shallow area facilitating a crossing. Propose options (embankment or channel realignment may impact these potential features). A likely modern earthwork (CHS7) is depicted just north of the proposed screen replacement behind Waterworld. The proposed works near Kilkee Bay Hotel are located in a field adjacent to the old West Clare Railway Route (CHS8). The rectangular culverts and overflow converge over a 19th century cut channel at the Atlantic Stream Outfall just east of a boat house, slip, and breakwater (CHS9) (Figure 11-7 and 11-8). Victoria Court, where works are proposed in the area of Victoria Stream, is in the plot of the Victoria Hotel on this map. At least one other well (CHS11) is illustrated along the route of the Well Stream tributary near St. Senan's Well (CHS10) and a foot stone (CHS12) was located within the proposed area of the Well Stream u-channel upgrade.

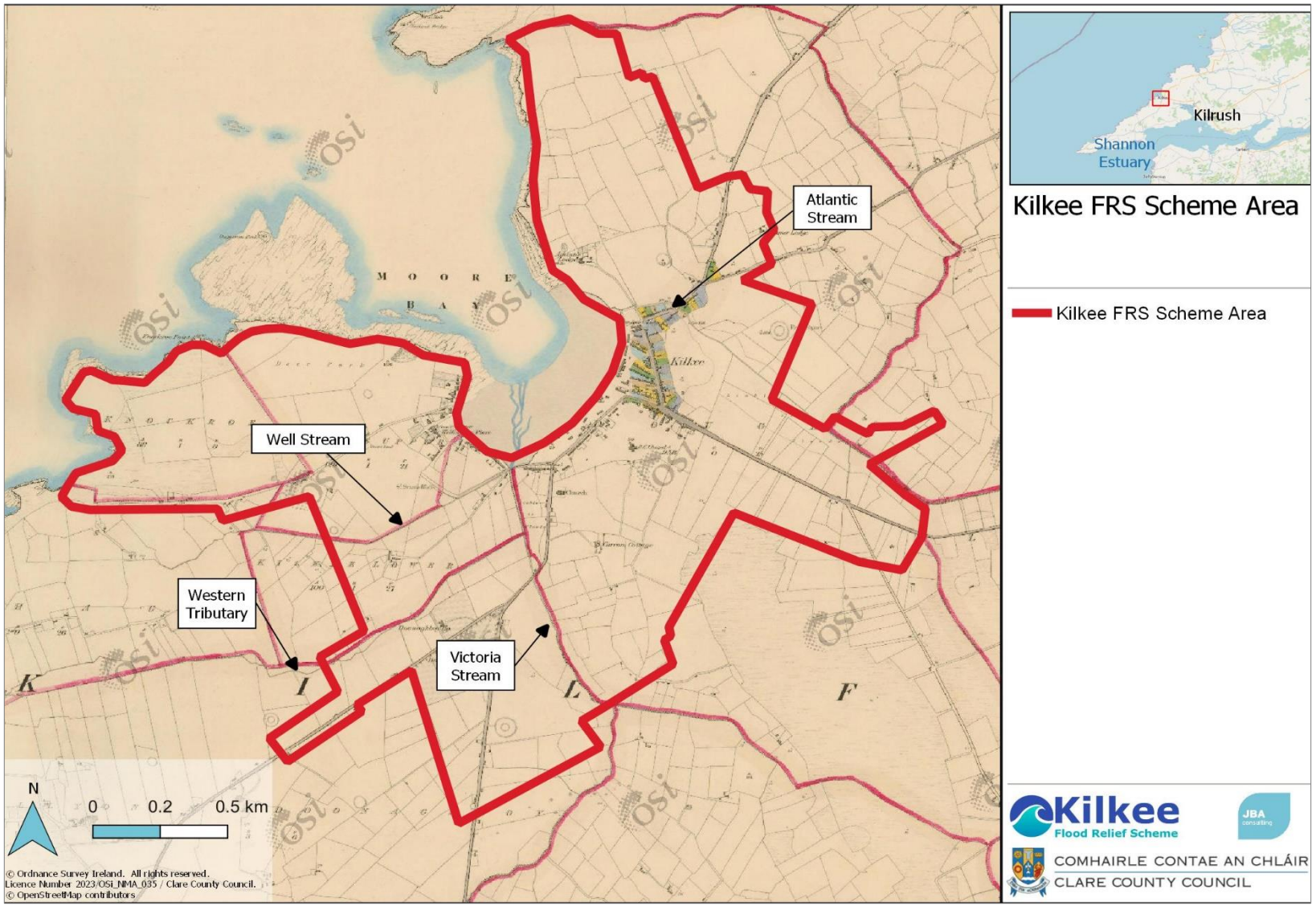


Figure 11-2: OSI First Edition 6-inch map (1842) of the Scheme Area outlined in red.

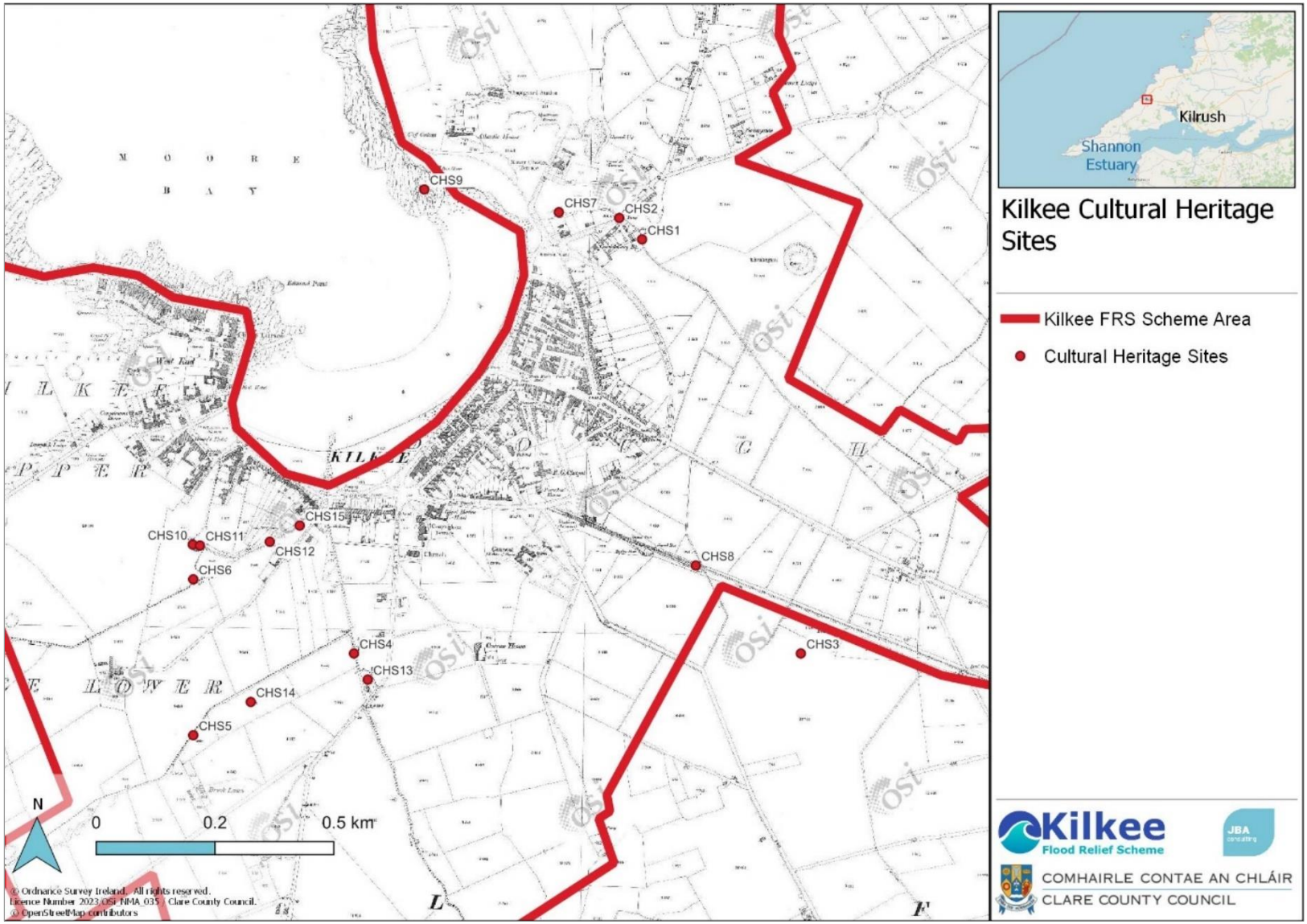


Figure 11-3: OSI Second Edition 25-inch map (1898) of the Scheme Area outlined in red and CHS indicated.

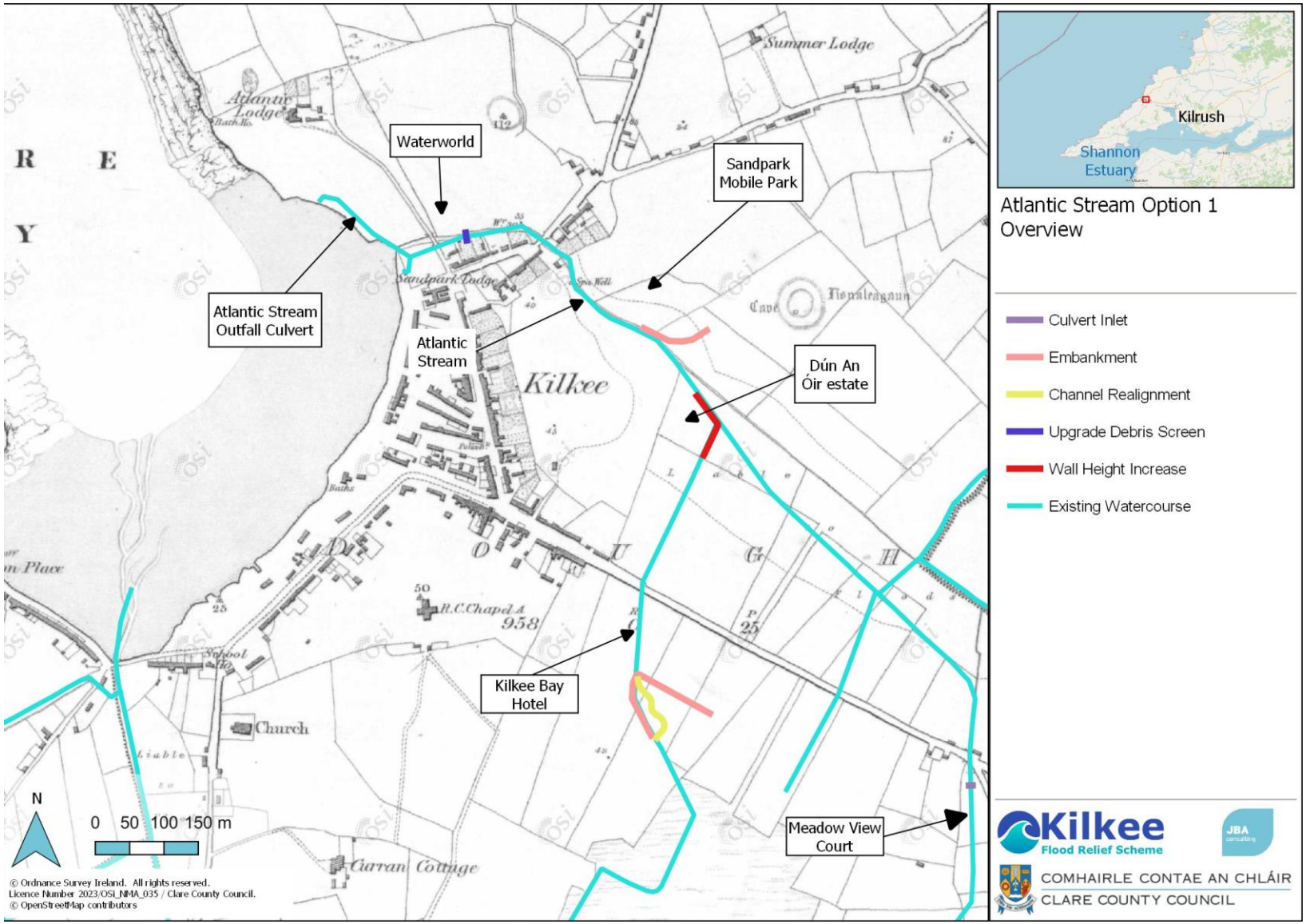


Figure 11-4: First Edition OSI map (1842) with Atlantic Stream proposed works overlaid.

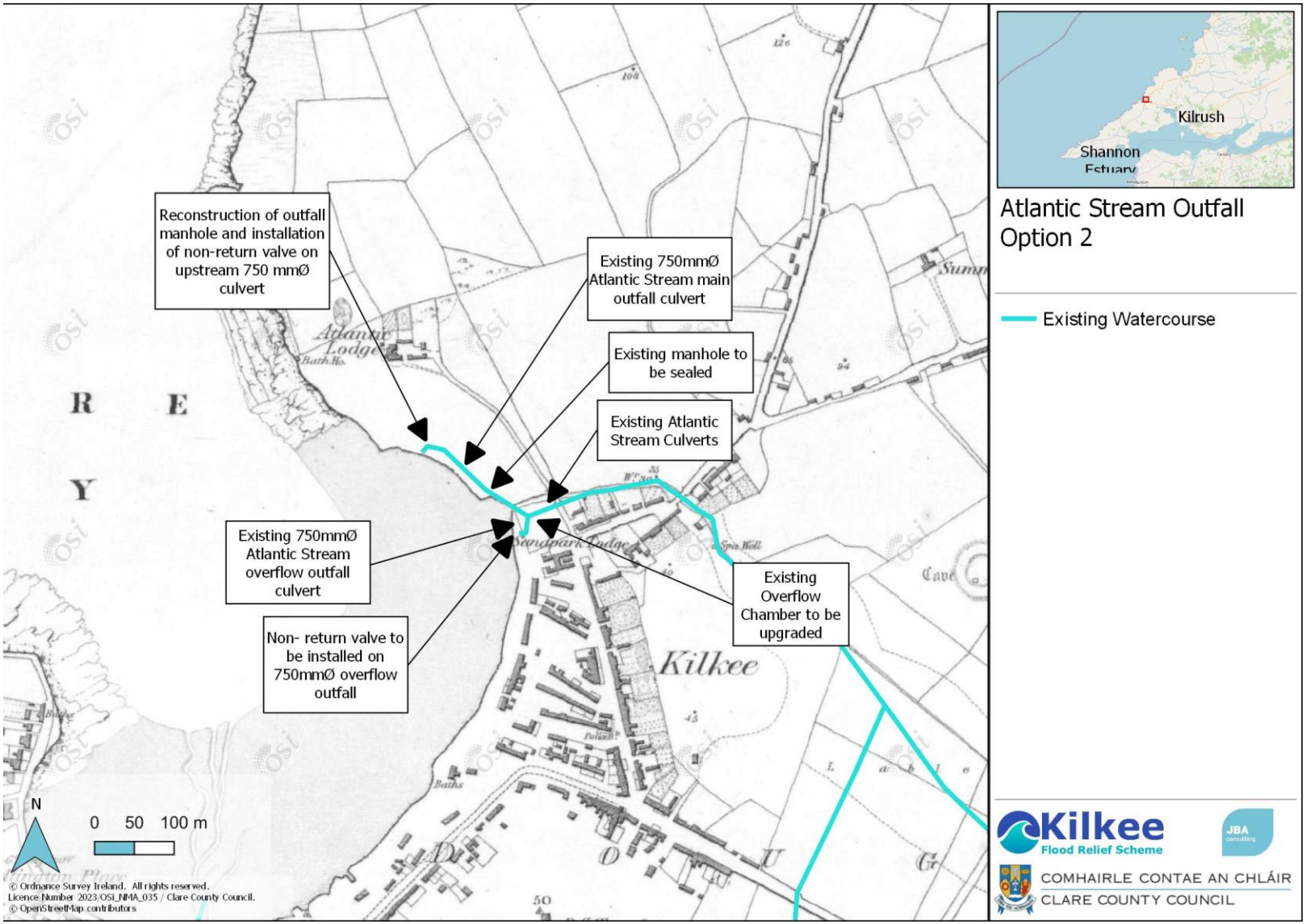


Figure 11-5: First Edition OSI map (1842) with Atlantic Stream Outfall proposed works overlaid.

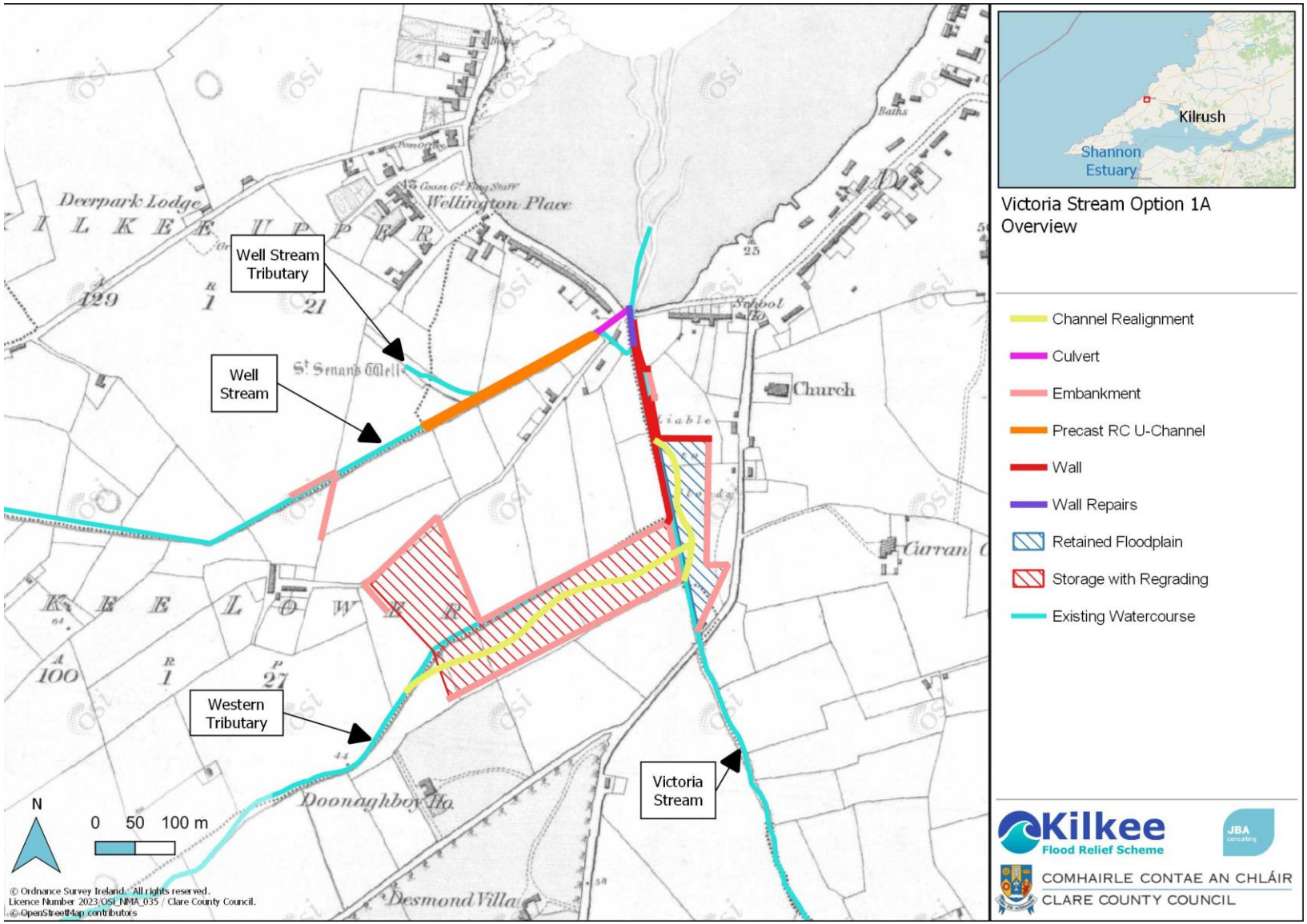


Figure 11-6: First Edition OSI map (1842) with Victoria Stream proposed works overlaid.

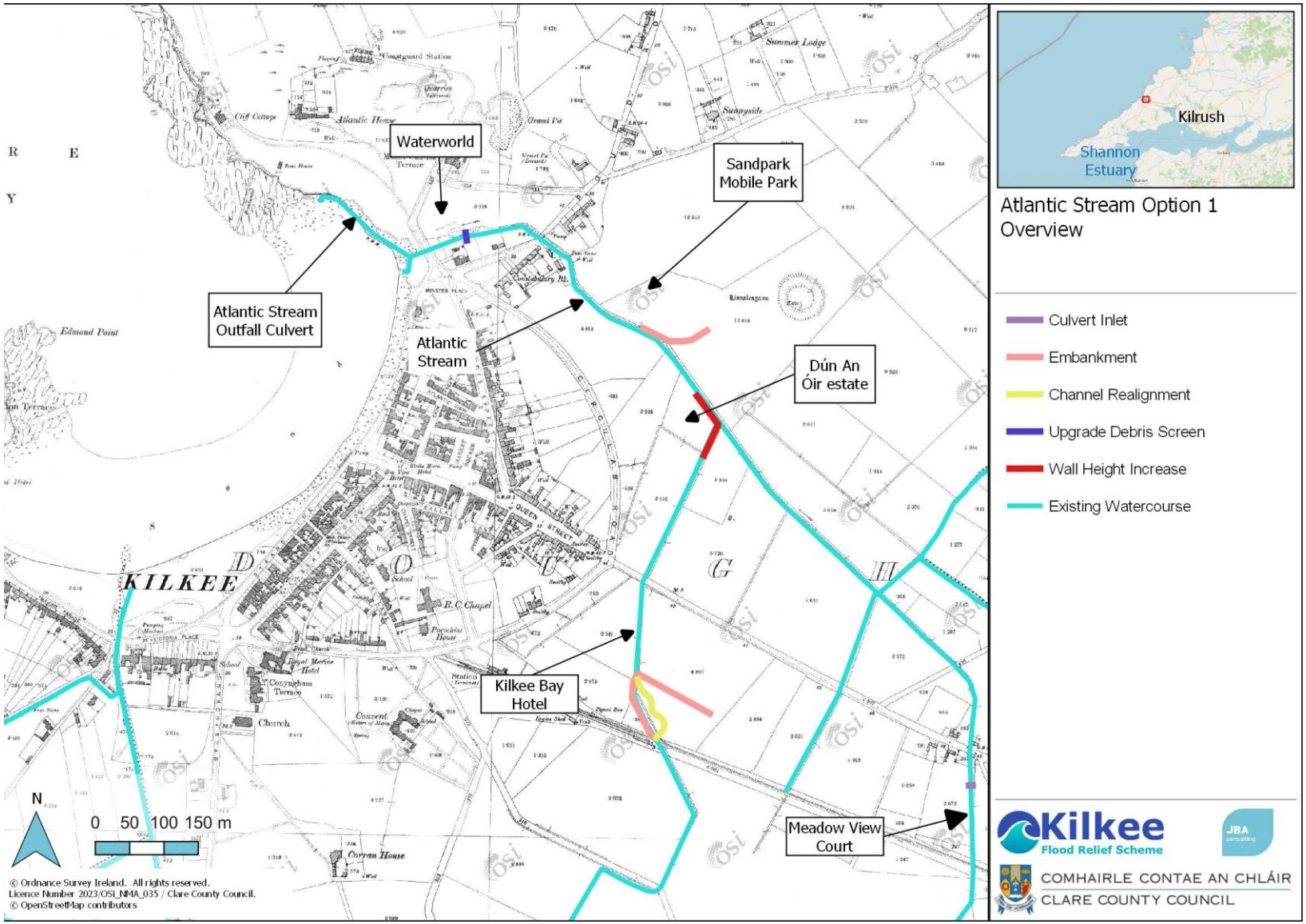


Figure *11-7:* Second Edition OSI map (1898) with the Atlantic Stream proposed works overlaid.

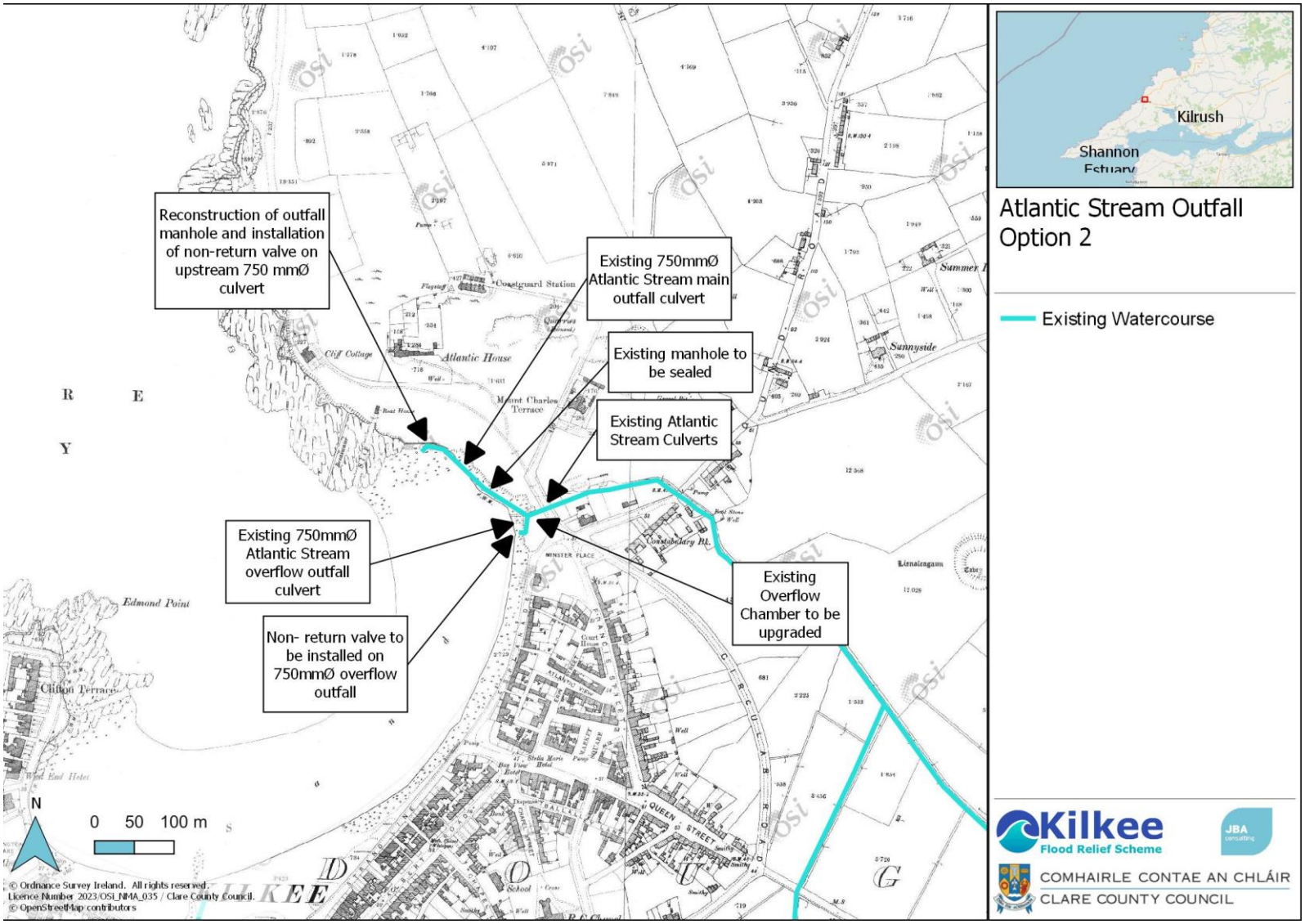


Figure 11-8: Second Edition OSI map (1898) with part of the Atlantic Stream Outfall proposed works overlaid

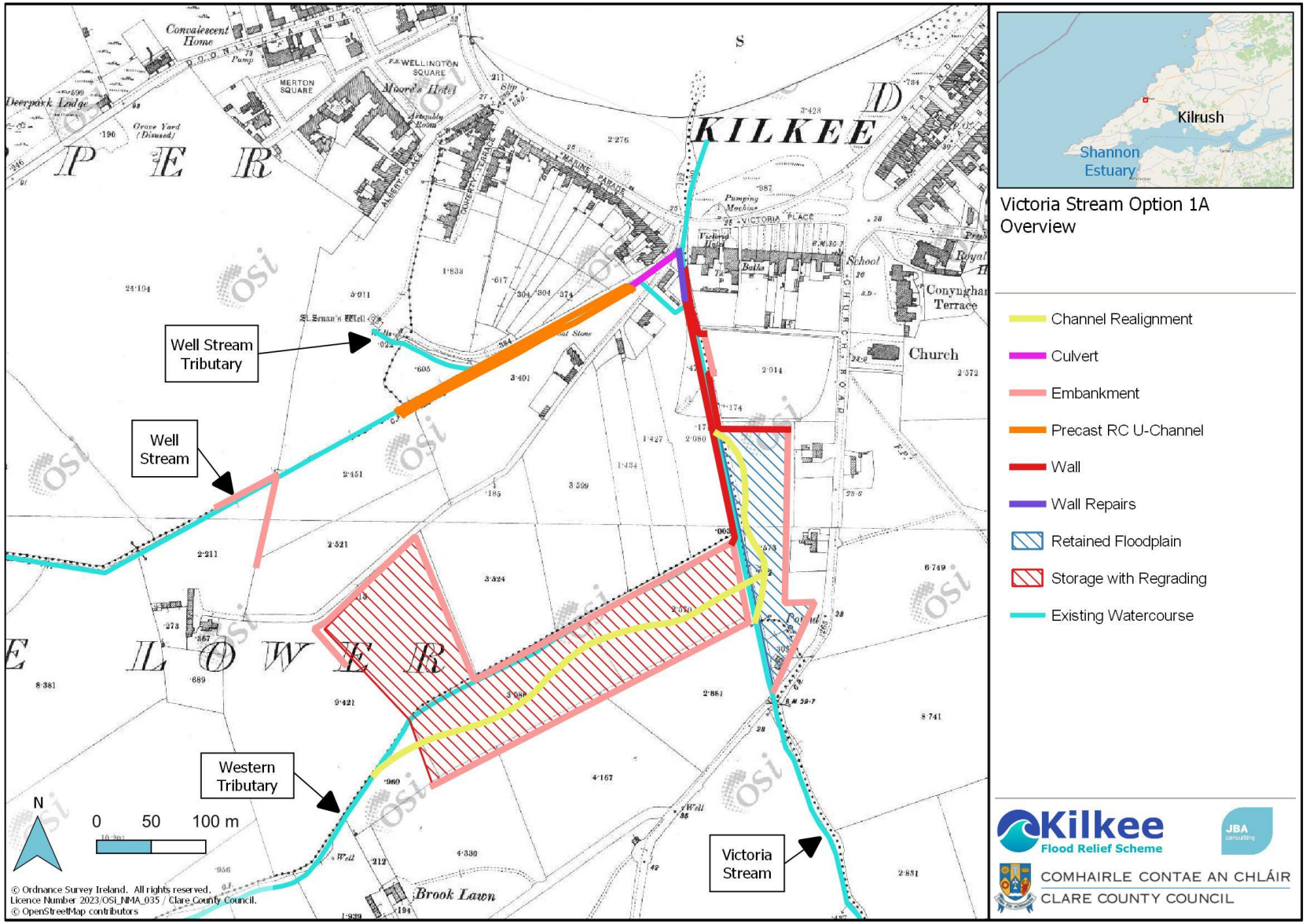


Figure 11-9: Second Edition OSI map (1898) with Victoria Stream proposed works options overlaid.

Recorded Archaeological Sites

Record of Monuments and Places (RMPs)

Section 12 (1) of the National Monuments Act 1994 made provision for the establishment and maintenance of a Record of Monuments & Places (RMP). Under this Act, each site recorded in the Record of Monuments and Places is granted statutory protection. When the owner or occupier of a property, or any other person proposes to carry out, or to cause, or to permit the carrying out of any work at or in relation to a recorded archaeological monument they are required to give notice in writing to the Minister for Housing, Local Government and Heritage 2 months before commencing that work.

There are 17 monuments listed in the Record of Monuments and Places within the Scheme Area (

Figure 11-10; Table 11-2). The sites within the boundary primarily date to the Early and Late Medieval, though standing stones (CL056-102) are commonly believed to be Bronze Age in date and the megalithic structure (CL056-041001) may be Neolithic.

A holy well (CL056-142) is located adjacent to Well Stream Tributary, though no works are to take place within the Zone of Notification (ZON) for this site.

Figure 11-10: RMPs for archaeological sites within the Scheme Area.

Table 11-2: RMPs for archaeological sites within the Scheme Area.

RMP ID	Townland	Type	ITM	Description (archaeology.ie)
CL056-004	Dough	Ringfort - rath	488805E, 660541N	Depicted on the OS map as: Hachured (1842)
CL056-031	Kilkee Upper	Structure	487295E, 660213N	Depicted on the OS map as: 'The Ruined Tower' (1923)
CL056-034	Kilkee Upper	Earthwork	487382E, 659641N	Depicted on the OS map as: Hachured (1842)
CL056-035	Kilkee Upper	Fish-pond	487493E, 660229N	Depicted on the OS map as: 'Fish Pond' (1923)
CL056-036	Kilkee Upper	Ringfort - rath	487576E, 659509N	Depicted on the OS map as: Hachured (1923)
CL056-037	Kilkee Lower	Ringfort - rath	487570E, 659030N	Depicted on the OS map as: Hachured (1923)
CL056-039	Kilkee Upper	Ringfort - rath	487708E, 660037N	Depicted on the OS map as: 'Castle Field' (1923)

CL056-040001	Kilkee Upper	Burial ground	487713E, 659851N	Depicted on the OS map as: 'Grave Yd (Dis)' (1923)
CL056-040002	Kilkee Upper	Megalithic structure	487742E, 659833N	-
CL056-041001	Kilkee Upper	Earthwork	487859E, 660042N	Depicted on the OS map as: Hachured (1923)
CL056-041002	Kilkee Upper	Castle - tower house	487853E, 660043N	Depicted on the OS map as: 'Castle (Site of)' (1923)
CL056-041003	Kilkee Upper	Earthwork	487857E, 660046N	Depicted on the OS map as: Hachured (1923)
CL056-042	Kilkee Upper	Ritual site - holy well	487956E, 659680N	Depicted on the OS map as: 'St Senan's Well' (1923)
CL056-043	Ballyonan/ Doonaghboy	Ringfort - rath	488214E, 658758N	Depicted on the OS map as: Hachured (1923)
CL056-044	Dough	Ringfort - rath	489235E, 660276N	Depicted on the OS map as: Lisnaleagaun
CL056-044002	Dough	Souterrain	489235E, 660253N	Depicted on the OS map as: 'Cave'
CL056-102	Dough	Standing stone	489349E, 660389N	In a flat field of rushes overlooked by a ridge to N. A flat, thin standing stone (max. H 2.05m; Wth c. 0.4m; T c. 0.15m) oriented NE-SW. The top slopes and is slightly higher at the NE end. The stone leans slightly to the SE. In 2003 a small set stone was noted at the base. A ringfort (CL056-044----) is c. 110m to the SW.

National Monuments

National monuments fall into three categories; National Monuments in the ownership or guardianship of the state; National Monuments in the ownership or guardianship of a local authority or monuments subject to a Preservation Order. Under Section 14 of the National Monuments Act 1930 (as amended) the Minister for Housing, Local Government and Heritage, must give written consent for any works to take to take place at or in relation to any National Monument.

No National Monuments are located within the Scheme Area.

Sites with Preservation Orders

The National Monuments Act 1930-2014 provide for the making of Preservation Orders and Temporary Preservation Orders in respect of National Monuments. Under Section 8 of the National Monument Act 1930 (as amended) the Minister for Housing, Local Government and Heritage can place a Preservation Order on a monument if, in the Ministers' opinion, it is a monument the significance of which, warrants protection and that it is in danger of being or is actually being destroyed, injured or removed or is falling into decay through neglect. The Preservation Order ensures that the monument shall be safeguarded from destruction, alteration, injury, or removal, by any person or persons without the written consent of the Minister.

There are no sites with preservation orders located within the Scheme Area.

Architectural Heritage

Record of Protected Structures

Section 10(2)(f) of the Planning and Development Act 2000 (as amended) states that the Local Authority's County Development Plan shall include objectives for: "The protection of structures, or parts of structures, which are of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest."

Section 51(1) of the Planning and Development Act 2000 (as amended) indicates the rationale for providing a Record of Protected Structures, stating that:

"For the purpose of protecting structures, or parts of structures, which form part of the architectural, heritage and which are of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest, every development plan shall include a record of protected structures, and shall include in that record every structure which is, in the opinion of the planning authority, of such interest within its functional area."

Accordingly, Clare County has prepared a Record of Protected Structures for the County Development Plan 2023-2029 which was utilized in the preparation of this assessment. The development plan lists 26 protected structures within the study area for the scheme (Table 11-3; Figure 11-11). None of these structures are within the footprint of the proposed works, though the embankment behind Kilkee Bay Hotel will sit adjacent to the railway line associated with the Kilkee Railway Station (RPS 403; NIAH 20301006). The West Clare Railway Structures Survey (2005) describes the Kilkee Station as in 'good condition much original features remain such as awning etc'.

Table 11-3: Record of Protected Structures, National Inventory of Architectural Heritage and Clare Coastal Architectural Heritage Survey within the Scheme Area.

RPS	NIAH	CS	Name	Townland	Date	ITM
398	20301001	-	Allied Irish Bank	Dough	1880–1900	488477E, 59863N
399	20301002	-	Bank of Ireland	Dough	1870–1890	488528E, 59921N
406	20301003	-	Nolan's	Dough	1860–1880	488576E, 59962N
408	20301004	-	Purthill's Guest House	Dough	1880–1900	488608E, 59995N
308	20301005	-	Chapel Gate	Dough	1830–1840	488713E, 59826N
403	20301006	-	Kilkee Railway Station (former)	Dough	1890–1895	488776E, 59713N
401	20301008	-	Bernadette House	Dough	1840–1860	488789E, 59959N
511	20301009	058	East End Boathouse	Dough	Late 19th c.	488456E, 60453N
410	20301011	-	St James's Church of Ireland	Dough	1840–1850	488420E, 59653N
481	20301012	-	Church at Geraldine Place	Kilkee Lower	1860–1880	488001E, 59725N
400	20301014	-	Bayview House	Kilkee Upper	1860–1900	487848E, 59867N
404	20301017	-	End-of-terrace, Merton Square	Kilkee Upper	1840–1860	487890E, 59932N
409	20301021	-	Sykes House	Kilkee Upper	1840–1850	488044E, 60145N
402	20301022	-	Clifton	Kilkee Upper	1840–1850	488020E, 60150N
396	20301023	-	3 Clifton Terrace	Kilkee Upper	1845–1850	488040E, 60132N
407	20301024	-	Semi-detached, West End	Kilkee Upper	1800–1840	488017E, 60041N
395	20301025	-	2 McDonnell Terrace	Kilkee Upper	1860–1900	487946E, 60157N
397	20301026	-	8 Marine Parade	Kilkee Lower	1860–1880	488168E, 59795N
411	-	-	West End House	Kilkee Upper	1830–1840	487982E, 59950N
571	-	-	Arcadia Cinema	Dough	1940–1960	488446E, 59849N
572	-	062	Band Stand	Dough	1930–1950	488313E, 59803N
573	-	-	Murphy's Bar	Dough	1850–1870	488745E, 60062N
574	-	-	Parochial House	Dough	1900–1920	488666E, 59775N
576	-	060	Seawall and Promenade at Strandline	Dough	1845–1865	488558E, 60043N
578	-	063	Marine Parade	Kilkee Upper	1880–1920	488055E, 59905N
579	-	065	Sea Baths	Kilkee Upper	1940–1980	487737E, 60255N

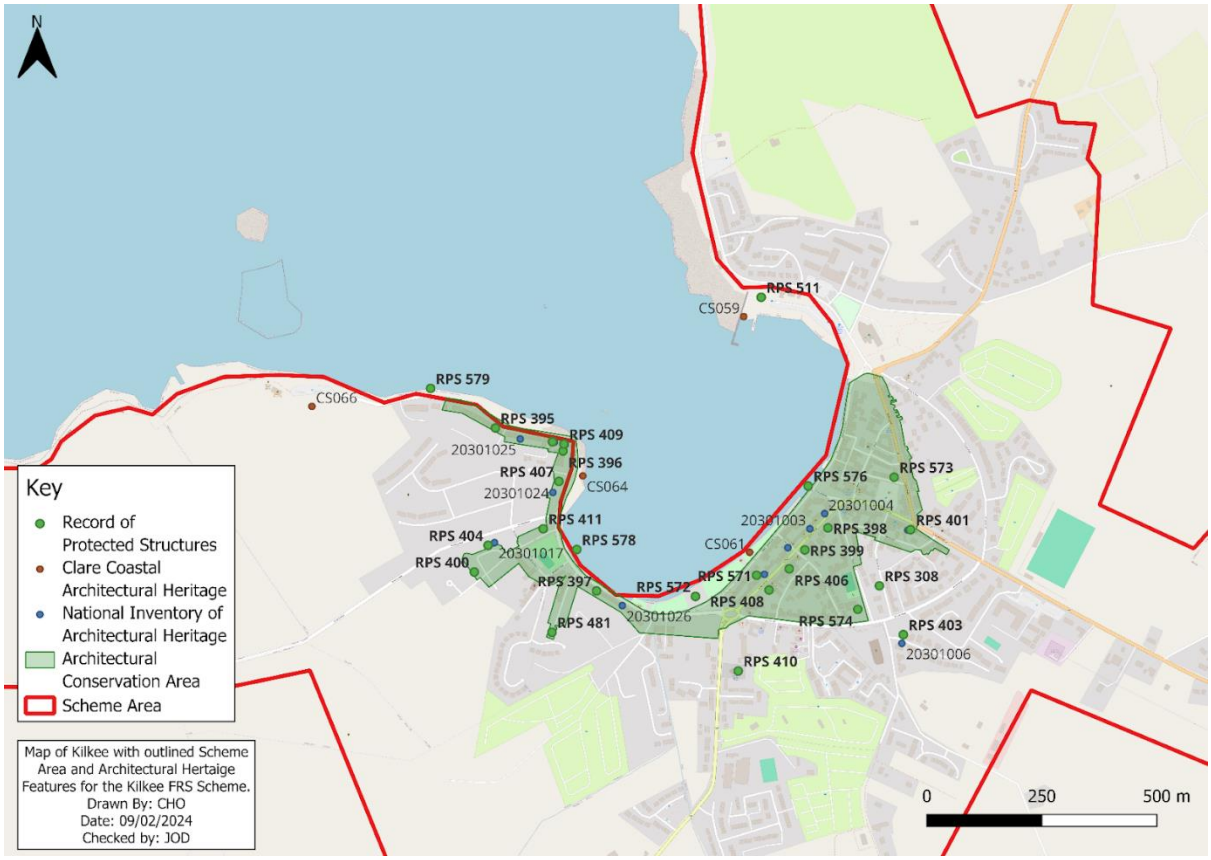


Figure 11-11: RPS, NIAH, and ACA of Kilkee within the Scheme Area.

Architectural Conservation Area (ACA)

An architectural conservation area (ACA) is a place, area, group of structures or townscape, taking account of building lines and heights, that is of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest or that contributes to the appreciation of a protected structure, and whose character it is an objective of a development plan to preserve. A planning authority recognises, by making provision in the development plan for the protection of these areas, that in many cases, the protection of the architectural heritage is best achieved by controlling and guiding change on a wider scale than the individual structure, in order to retain the overall architectural or historic character of an area (Architectural Heritage Protection, 2011).

Clare County Council have designated a significant portion of Kilkee town as an ACA (Figure 11-11). The County Development Plan notes that *Kilkee has retained its unique character as a 19th century bathing place. The town contained several protected structures and many fine buildings. A large area of the town centre is designated as an ACA, recognising the historical and architectural importance of the townscape and layout of the core area*.

Undesignated Elements of Built Heritage

Some features of built heritage are undesignated but nonetheless contribute to the character of the area. Such features include stone walls, culverts, historic ironwork, foot bridges, fording points and street furniture. The desktop study drew from several cartographic sources and previous published surveys to compile a list of such features within the Scheme Area. Additional features were identified during in the site inspection (see Section 11.3: Site Survey).

The Clare Coastal Architectural Heritage Survey (2008) discusses the bathing places in Kilkee related to the 19th-century development of the coastline. There are, however, no such structures recorded as remaining in the town. Other features noted included the protected structures of the East End Boathouse (RPS 511), the Band Stand (RPS 062), the Seawall and Promenade at Strandline (RPS 060), the Marine Parade slipway (RPS 578), and the Sea Baths (RPS 579) (Table 11-3). Added to this list are a pier and slipway, a lifeguard hut, sea baths on the western side of the strand, and a fish

pond, also located on the northwest side of Moore Bay. None of these are located within areas of proposed works (Table 11-4). A bath house is noted on the 1st edition OSi map but this seems to have been incorporated into 'Cliff Cottage' on the 2nd edition OSi map.

The Clare Town & Village Photographic Survey (2009) included 317 photographs of buildings throughout the town of Kilkee. These formed the streetscapes of the Promenade, 'Jimmy's Hill', O'Curry Street, Chapel Street, O'Connell Street, Erin Street, Market Square, Atlantic View, and Gratten Street.

No sites are listed on the Industrial Heritage Review of County Clare (2008) within the town of Kilkee or its constituent townlands.

Likewise, there are no railway bridges to include on the Clare Railway Bridge Survey (Interim) (2015). No structure was noted in the Clare Stone Roof Survey (2007) or the Clare Thatched Building Survey (2005) from the area of Kilkee.

Table 11-4: Clare Coastal Architectural Heritage Survey Sites (CS) not listed on the Record of Protected Structures.

CS	Name	Townland	Date	ITM
059	Pier & Slipway	Dough	1885–1890	488432E, 660423N
061	Life Guard Hut	Dough	1940–1980	488445E, 659911N
064	Sea Baths, Clifton Terrace	Kilkee Upper	1940–1980	488082E, 660077N
066	Fish Pond	Kilkee Upper	16th–17th c.	487493E, 660228N

National Monuments Service (NMS) Wreck Inventory of Ireland Database (WIID)

The National Monuments Service (NMS) has compiled a database of shipwrecks from around the coast of Ireland – the Wreck Inventory of Ireland Database (WIID). The inventory lists c. 18,000 wrecks comprising both known and unknown losses, and with both known and uncharted locations, from within Ireland's territorial waters and to the edge of Ireland's Continental Shelf. Wrecks with known locations, numbering nearly 4000, are mapped and can be viewed on the NMS's online Wreck Viewer.

The area around Kilkee includes a record for 16 wrecks, though only one of these has known locational information (Table 11-5). The wreck (W11300) with known coordinates is located c. 3km southeast of the Scheme Area within the inland channel of Poulnasherry Bay. Two wrecks – the Edmund (1850) and Guiding Star (1888) is recorded as lost near Edmund Point, which is located on the western extent of Moore Bay, while the others are recorded variously as 'near', 'off', or just as lost at 'Kilkee'. So, their specific locations are unknown.

Table 11-5: Wrecks listed on the National Monuments Service Wreck Inventory in/ near Kilkee.

No.	Name	Classification	Date of Loss	Place of Loss
W06085	Ajax	Fishing boat	12/02/1888	Kilkee Bay
W06117	Owen Glendower	Pleasure Boat	1851	Kilkee
W06164	Edmund	Barque	19-20/11/1850	Duggarna Rocks, Edmund Point, off Kilkee Bay
W06185	Fulmar (SS)	Screw Steamer	31/01/1886	Kilkee and Farrihy, between/ Slyne Head and Loop Head, between
W06195	Guiding Star	Schooner	23/04/1888	Duggerna Reef, Kilkee Bay / Moore Bay, Kilkee
W06282	Unknown	Canoe	Unknown	Kilkee Station, Near
W06320	Waterlilly	Schooner	October 1836	Kilkee, Near
W11300	Unknown	Unknown	Unknown	52.66681, -9.58512 Kilkee, Co Clare, Poulnasherry, Blackwier Bridge, Doonbeg
W13523	Breeze	Unknown	19/02/1833	Kilkee, Mal Bay
W13570	Clarence	Unknown	30/01/1836	Kilkee, off
W13998	Unknown	Schooner	26/01/1840	Kilkee, rock near

W15170	Unknown	Lifeboat	10/07/1895	Kilkee
W16000	Unknown	Unknown	28/05/1854	Kilkee
W17685	Unknown	Unknown	22/10/1889	Claxowen/Gloxlowen, near Kilkee
W18506	Muriel	Unknown	28/03/1881	Kilkee, County Clare, near?
W18508	Alta	Unknown	09/12/1881	Kilkee, near?

National Museum of Ireland (NMI) Topographical Files

The Topographical Files of the National Museum of Ireland (NMI) holds details of any artefactual material recovered from the 18th century to modern day. A bronze flange-hilted sword (NMI 1966:104) and a copper alloy mount (NMI 2013:184) were reported from Kilkee, though it is unknown if these were from the townland of Kilkee Upper or Kilkee Lower. A copper alloy sixpence (NMI 1995:979) and a copper alloy suspension fitting (NMI 1995:980) were found within the townland of Dough.

Previous Archaeological Investigations

Four archaeological excavations have taken place in the townlands within the Scheme Area (Table 11-6). Only one of these investigations identified potential archaeological features. Testing in 2018 (18E0750) in Kilkee Upper revealed features which may relate to the burial ground (CL056-040001) now beneath a modern home. The features were not investigated further.

Table 11-6: Previous archaeological excavation in the area.

Licence	Townland	ITM	Description (excavations.ie)
04E0525	Kilkee Upper	487363E, 659997N	Two trenches were mechanically excavated in the course of pre-development testing at Kilkee Upper, beside a fish pond. The stratigraphy encountered in both trenches was similar and consisted of a grey-brown sandy topsoil (c. 0.2-0.25m deep) which overlay a grey-yellow, sticky natural boulder clay with occasional small and medium-sized stones. The boulder clay was excavated for a depth of 0.4m. The excavation did not reveal any features of archaeological significance.
15E0100	Dough	488666E, 660550N	Monitoring was undertaken at the Kilkee sea wall remedial works along the Strand Line Road (L-2021). During monitoring, it was revealed that the sea wall is a 19th-century structure and that the soil banked up on the interior of the wall is similarly of 19th-century date. It was noted that this 19th-century fill has been cut and re-cut by a number of modern service trenches. No features of archaeological interest were identified within the development area. Any further groundwork affecting the sea wall will require to be monitored by suitably qualified archaeologist.
18E0750	Kilkee Upper	487675E, 659835N	Testing of the site of a proposed new dwelling at Dunlicky Road, Kilkee Upper townland, Kilkee, Co. Clare revealed a number of features and deposits of archaeological potential. Although undated, these features appear to be of some antiquity and may relate to neighbouring monument CL056-040001 burial ground, now sited beneath a 20th-century house. The monument is recorded as a graveyard shown on historic maps and noted in antiquarian sources as a children's burial ground, but thought to possibly be the site of the original church that provided the 'cill' in the name 'Kilkee'. Rich soil from a 20th-century cattle shed may account for some of the deposits on site. Full excavation or monitoring followed by excavation is recommended as a condition of planning permission.
22E0257	Foohagh; Kilkee Upper; Kilkee Lower	487400E, 659560N	Monitoring was carried out during the partial replacement of the existing foul and storm rising mains at the western edge of the town of Kilkee, within the townlands of Kilkee Upper, Kilkee Lower and Foohagh, passing close to ringfort CL056-036. The western 1,200m greenfield section of the pipe route was laid in an open-cut trench, with the eastern portion laid by directional drilling. Within the greenfield part approximately 11m of the 20m-wide wayleave was stripped of topsoil before the pipe trench was excavated. Monitoring was concentrated on topsoil stripping and, where natural subsoil was not initially exposed, on the subsequent trench

			excavation. The part of the scheme laid by directional drilling was not monitored. No archaeological deposits or features were identified during monitoring.

Intangible Assets and Folklore

In December 2015 Ireland ratified the UNESCO 2003 Convention for the Safeguarding of the Intangible Cultural Heritage. Intangible cultural heritage 'refers to the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognise as part of their cultural heritage. This intangible cultural heritage, transmitted from generation to generation, is constantly recreated by communities and groups in response to their environment, their interaction with nature and their history, and provides them with a sense of identity and continuity, thus promoting respect for cultural diversity and human creativity' (https://uis.unesco.org/en/glossary-term/intangible-cultural-heritage)

West Clare has a long tradition of Gaelic sports, music, storytelling and traditional boat building (currachs and turf boats in particular). The tradition of visiting holy wells is well documented in Kilkee and St. Senan's Well (CL056-042), located in close proximity to the proposed works, is still venerated. The well reputedly supplied drinking water as early as the 6th century, contemporary with the life of St. Senan (Clare Champion 1997; Kilkee Heritage 2020). Local lore recounts that St. Senan himself placed a nearby standing stone in front of the well to mark the water supply during the time of a drought (Clare Champion 1997). In 1839 John O'Donavan noted that 'stations' were still carried out at St. Senans well. Stations (also called pattern or rounds) is the ritual practice of reciting prayers while walking, sometimes barefooted, around the site following a prescribed pattern specific to the particular well and consuming or washing in water from the well in order to receive a blessing or protection.

Early collectors of folklore in West Clare include Lady Augusta Persse Gregory and Thomas Johnston Westropp (Lysaght 2008, 541–2). The former first published on the subject in 1920. The latter published many articles concerning the lore of the region between 1910 and 1913. The Irish Folklore Commission gathered stories and lore in West Clare starting in 1929, though it wasn't until many years later that the south-west was reached. Tadhg Ó Murchú was a prominent collector for the commission in the south-west starting in 1942 (*ibid*. 552). Five questionnaire correspondents for this work were from Kilkee (*ibid*., 569–70). Six primary schools from Kilfearagh Parish, including Kilkee and Kilkee Convent, participated in the 1937–8 Collecting Scheme Schools Collection (*ibid*. 577).

The Main Manuscript Collection from Kilkee is made up of well documented Irish language stories about people, events, superstitions, and general lore of the area. Many of the participants were specifically chosen due to their knowledge as storytellers and tradition keepers. The prominence of Irish in the recordings was a conscious choice as the commission sought to capture the Irish dialect in the region even though most of the younger generation in the area only spoke English and the native tongue was also in decline with elders (Lysaght 2008, 554–5). The English language traditions from the area were not specifically recorded until 1955 by Seán Mac Craith (*ibid*. 557–8).

One student wrote of a story related to 'Burn's River' [Byrne's Stream] to the north of Atlantic Stream. She relayed the story of a little boy who was kept in the cove by giants and escaped by swimming the watercourse. The boy's family name was Burns, hence the name of the cove and stream (NFCS 98:332). Other submissions about Kilkee include place-lore about a coastal the caves Sailor's Grave (NFCS 628:151), the Doctor's Room (NFCS 628:153), and the Gougs (NFCS 628:279–80); a poem about leaving a childhood in Kilkee behind for a better chance in America (NFCS 601:124–6); descriptions of place names in the area primarily focused along the shoreline (NFCS 628:72–8; NFCS 633:318) and specifically near Chimney Bay (NFCS 628:278); a history of Kilkee focused on the last 140 years and the Catholic Church (NFCS 628: 264–6).

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Site Survey

The survey focused on areas that will be subject to significant ground disturbance during construction stage as well as cultural heritage sites in the vicinity of the proposed works.

The survey comprised a walk-over survey, a wade survey and metal detection survey. To ensure clarity, areas of proposed works were numbered 1–13 (Figure 11-12). Observations from the survey are discussed below. Cultural Heritage Sites (CHS) (Table 11-7) encountered during the survey are indicated in the text by CHS identifying numbers.

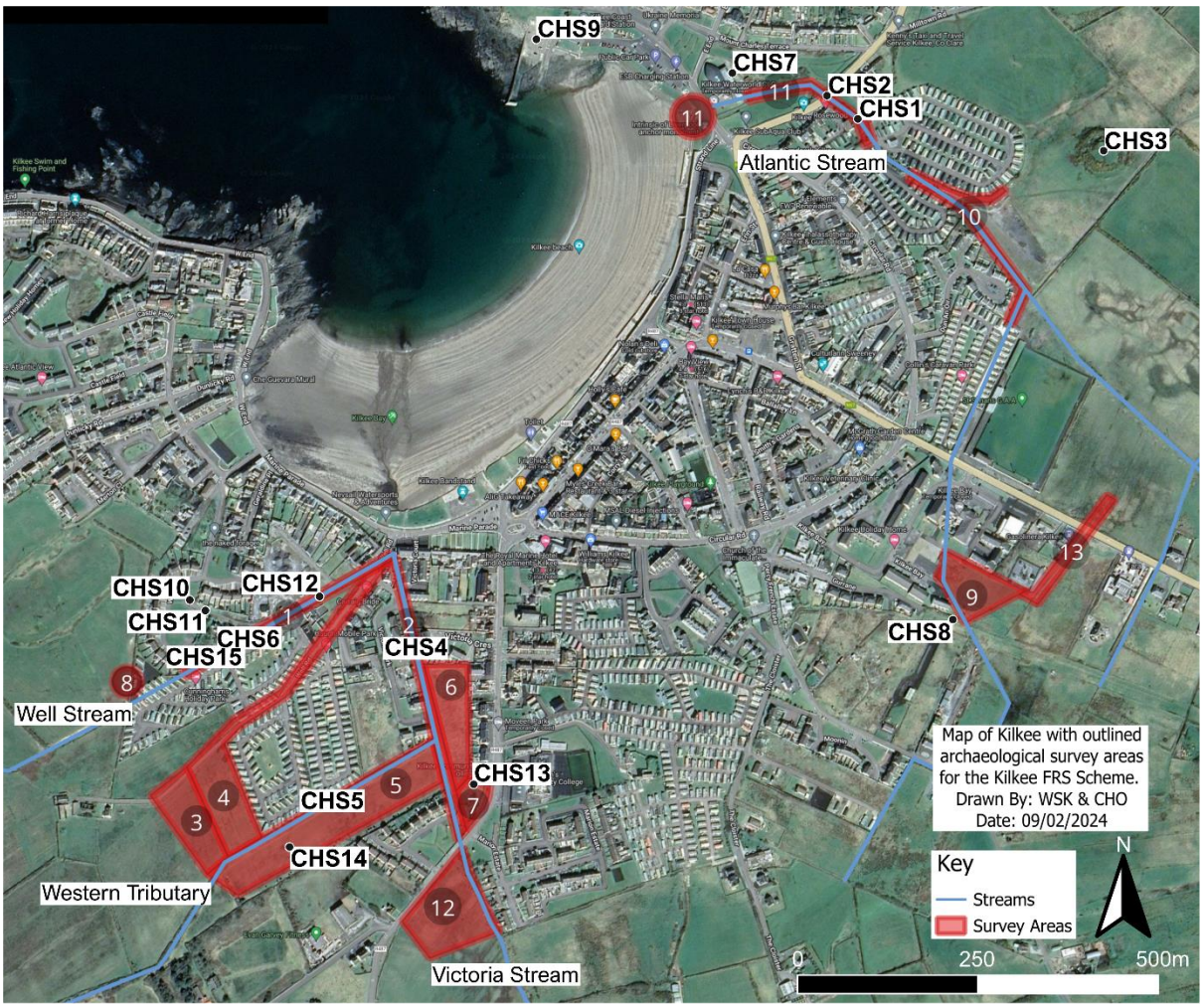


Figure 11-12: Numbered areas surveyed in Kilkee based on proposed works and Cultural Heritage Sites.

Limitations

Victoria Stream was heavily overgrown which prohibited a thorough visual survey. The proposed works in this stream mainly involve redirecting the stream and infilling the current course. The eastern section of the Atlantic Stream (Area 10) was similarly heavily vegetated, not allowing for comprehensive visual survey.

The fields themselves varied in overgrowth with vegetation reaching *c*. 2m in height Areas 6 and 7, Area 13, and in the ditch surrounding Area 9, obscuring any potential topographical indicators of above ground or buried archaeology.

Area 1

Area 1 consists of Well Stream and its adjacent banks. The survey included an inspection of the nearby holy well due to its proximity to the proposed works.

St. Senan's Well (CL056-042; CHS10) is located beside a tributary stream just north of Well Stream. A 19th-century crenelated well-house is located to the southeast of the holy well. The site is surrounded by a stone perimeter wall with metal fencing, the line of which respects an earlier upright stone with three circular incisions.

The open channel of well stream was inspected and the streambed was metal detected. A number of modern concrete features were noted as well as poorly preserved remnants of drystone revetment walls (CHS15; Figure 11-13).

Figure 11-16: Drystone wall sections along the south bank in Area 1 taken from the northwest.

Area 2

Area 2 consists of the open channel of Victoria Stream within the Scheme Area. It flows in a general south to north direction. For the majority of the survey area, the stream was flanked by heavily vegetated earthen banks measuring c.0.8m in height. On the approach to the culvert at Well Road, 85m of the east bank and 49m of the west bank is reinforced with a concrete wall. No cultural heritage features were recorded.

Areas 3 and 4

Areas 3 and 4 comprise two fields to the north of Western Tributary. They consist of wet grassland in use as rough pasturage. No cultural heritage features were recorded.

Area 5

Area 5 consists of a linear field on the southern bank of Western Tributary. Two possible earthworks (CHS14) were noted during the survey (Figure 11-14). The first was a linear rise along the western end of the field running north-northeast to south-southwest. It measured *c*. 7m wide and *c*. 27m long with a height of less than 0.5m. Just northeast of this was an ovular mound roughly in line with the linear. It had an east-west diameter of *c*. 20m and a north-south diameter of *c*. 11m with a maximum height of *c*. 0.6m. The date and nature of these features is unknown. They have the potential to be archaeological in nature, but it is also possible that the features are of a modern or geological origin as several manholes were noted within the field and therefore the earthworks may be associated with these for access to services. Service maps of the area show no known services following the line of the possible earthworks though the linear rise may have been built up to allow for movement of machines through otherwise marshy land and the ovular mound may be a deposit of backfill material.

The Western Tributary was heavily overgrown, and no features of cultural heritage were noted within the stream.

Area 8

Area 8 focused on where the proposed embankment and culvert works will cross the townland boundary between Kilkee Upper and Lower (CHS6) to the west of Area 1. Two streams converge at this location: the northeast-southwest Well Stream, which follows the townland boundary, and a southeast-northwest field drainage stream. Well Stream, at this location, was comprised of two parallel channels heavily covered by vegetation. The southeast-northwest field drainage stream was lined by drystone walls (CHS15; Figure 11-15). After converging, the two streams continue as Well Stream, passing through concrete culverts to the north.

Areas 9 and 13

Area 9 is greenfield pastureland located south of the Kilkee Bay Hotel. A stream borders the western limits of the field before entering a culvert along the northern field boundary. The culvert was completely obscured by overgrowth. An earthen embankment lines the eastern side of the field, and a significant rise is evident in the southeast corner of the field. The rise continues into the south of area 13. Area 13 itself comprises fields surrounded by embankments, which were heavily overgrown. The

south-eastern side of the area contains two parallel southwest-northeast running streams. This area is not part of preferred works.

Figure 11-14: Possible earthworks in Area 5 from the southwest.

Figure 11-15: Drystone boulder wall in Area 8. Left: taken from the west-southwest. Right: with concrete culvert taken from the south-southwest.

Area 10

Area 10 includes the eastern length of the Atlantic Stream and an embankment around the southern edge of Sandpark mobile park. The embankment follows an overgrown, east-west field boundary drain, which joined the Atlantic Stream through a culvert under the access road. The Atlantic Stream runs roughly northwest to southeast through the area, with heavily vegetated banks, obscuring some of the watercourse. The southwest bank was topped by a modern concrete wall and wooden fence.

The ringfort (CL056-044; CHS3) is located in a field to the east of the area, on a slight rise in elevation (Figure 11-16).

Figure 11-16: View of the ringfort (CL056-044) from Atlantic Stream in Area 10 from the southwest.

Area 11

Area 11 is located along Atlantic Stream where the proposed works are to take place to the east of Kilkee Waterworld and at the outfall culvert on the seafront. The stream banks are generally heavily vegetated and are, in places, reinforced with boulders. Erosion along portions of the banks revealed modern pottery sherds.

It passes under a road bridge (CHS2) facilitating the N67 carriageway. This bridge displays several phases of construction, with the earliest portion corresponding with a structure shown on the OSi historic maps (Figure 11-4; Figure 11-7). The original bridge construction is visible to the east, and comprises roughly squared random rubble bonded with lime mortar. The bridge was widened to the west and services were inserted through the original soffit (Figures 11-17 to 11-22).

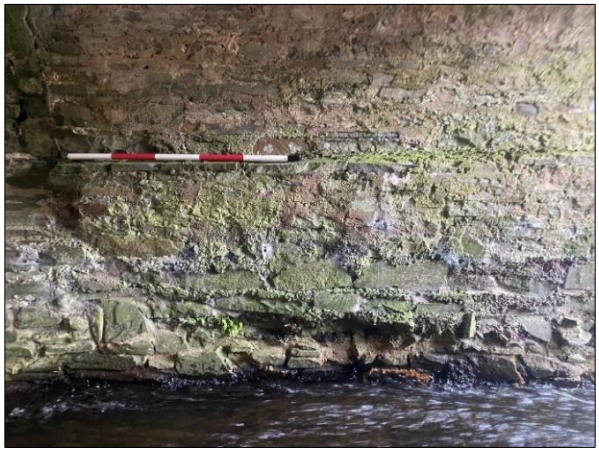
The stream passes under a modern metal footbridge and through a trash screen before entering a large concrete culvert at Kilkee Waterworld. Another modern timber footbridge is also located c. 7m upstream form the trash screen.

The outfall culvert is located along a concrete, stepped promenade with stone facing. The manhole is incorporated into the promenade, located within a large concrete block c. 2m above the foreshore.

Figures 11-17 to 11-22

Transition between north-western extension and original stone bridge face taken from the northwest.

Interior of stone arch with crossing services taken from the southeast.



Interior of north-eastern bridge extension, showing multiple phases of stone construction taken from the northeast.

View of stream entering the bridge with drystone wall on either bank taken from the northwest. Various phase of construction is evident within the bridge structure, including the earliest phases.

Sub Eastern face of the stone bridge taken from the southeast.

Northeast stone revetment wall with two drains seen when viewed from the southwest and varied construction periods evident.

11.4 Discussion

Whilst archaeological sites in the surrounding area attest to earlier settlements, the town of Kilkee itself developed mainly in the 19th Century. Located on the western seaboard and traversed by a network of fresh water streams, the town became a notable Victorian seaside resort. Prior to the advent of rail transport the watercourses in the town were traversed at high tides with shallow bottom vessels. The presence of archaeological sites and features — such as its fording points and stepping stones — increased the potential for artefactual material to be found within the streams and the historic references to shallow craft utilising the watercourses also indicated the potential to identify or encounter remains of such craft within the stream routes.

Fifteen features of cultural heritage significance were identified during the survey, including revetment walls, culverts and a bridge (Table 11-7). There are no recorded archaeological monuments or protected architectural structures within the proposed works areas, though two lie in close proximity: St. Senan's Well (CL056-042) and Lisnaleagaun Ringfort (CL056-044). A portion of the scheme lies within the Architectural Conservation Area for Kilkee town. However, there are no NIAH or protected structures in the immediate vicinity of the proposed works. Within the Scheme Area as a whole are 17 protected archaeological monuments (RMPs) and 26 protected structures of architectural significance (RPSs). The baseline significance of cultural heritage in the area is **very significant** with **low to medium** sensitivity. The likely future receiving environment in the absence of the project is addressed in Section 11.5 below under the Do-Nothing Scenario.

The survey informed on the potential level of impact that the in-stream works will have on the underwater heritage and similarly, the land-based works will have on potential terrestrial archaeology. In turn, it was possible to attribute significance levels to perceived impact. This is set out in Sections 11.5 and 11.6 below which lists the known and potential impacts for the proposed works and recommendations made based on those perceived levels of impacts.

Table 11-7: Cultural Heritage Sites identified during the archaeological impact assessment.

Cultural Heritage Site No.	Survey Area/ Waterway	Townland	ITM	Description	Baseline Significance/ Sensitivity
CHS1	Atlantic Stream	Dough	488901E, 660322N	'Spa Well' on the First Edition OSi map and foot stone and well on the Second Edition OSi map along the Atlantic Stream	Negligible
CHS2	Atlantic Stream	Dough	488853E, 660367N	Bridge across Atlantic Stream on Pound Street/N67 illustrated on First and Second Edition OSi maps	High
CHS3	10	Dough	489235E, 660276N	'Lisnaleagaun' ringfort (CL056-044) and souterrain (CL056-044002)	High
CHS4	2/ Victoria Stream	Dough, Kilkee Lower, Ballyonan or Doonaghboy	488295E, 659451N	Townland boundary	Low
CHS5	5/ Western Tributary	Kilkee Lower, Ballyonan or Doonaghboy	487957E, 659279N	Townland boundary	Low
CHS6	1, 8/ Well Stream	Kilkee Upper, Kilkee Lower	487976E, 659607N	Townland boundary	Low
CHS7	Atlantic Stream	Dough	488726E, 660379N	Earthwork depicted on Second Edition OSi map north of Waterworld	Low
CHS8	9	Dough	489014E, 659636N	West Clare Railway Route and Old Signal Post	Medium
CHS9	11/ Atlantic Stream and Moore Bay	Dough	488443E, 660427N	Boat house, slip, and breakwater depicted on the Second Edition OSi map near the Atlantic Stream Outfall	Medium

CHS10	1/ Well Stream	Kilkee Upper	487956E, 659680N	St. Senan's Well (CL056-042)	High
CHS11	1/ Well Stream	Kilkee Upper	487971E, 659678N	Well near St. Senan's Well on the Second Edition OSi map	Low
CHS12	1/ Well Stream	Kilkee Lower	488118E, 659686N	Foot stone along Well Stream on the Second Edition OSi map	Negligible
CHS13	7	Ballyonan or Doonaghboy	488324E, 659396N	Pound on the Second Edition OSi map	Negligible
CHS14	5	Ballyonan or Doonaghboy	488078E, 659349N	Possible earthworks observed during survey	High
CHS15	1, 8/ Well Stream	Kilkee Upper, Kilkee Lower	488181E, 659720N	Stone revetments seen periodically along Well Stream during survey	Medium

11.5 Predicted Impact

A summary of all potential impacts, proposed mitigation measures and potential residual impacts is given in Table 11-8 below.

Do-Nothing Scenario

Under the do-nothing scenario there would be no direct impacts on the architectural or archaeological sites in Kilkee. The town, however, would continue to be affected by flooding events. During such flooding, hydrological impacts on potential unrecorded archaeological heritage near the streams would be seen including scouring and undercutting as is presently occurring in Atlantic Stream. Flooding creates periodic negative impacts on the nearby archaeological and architectural heritage which may build up to create long-term damage. Without works, the significance of impact would be **negative, slight and permanent. O**vertime, impacts could build creating **negative, moderate** impacts.

Construction Phase

Archaeology

The proposed works will not directly or indirectly impact archaeological features included in the RMP or SMR.

The possible earthworks (CHS14) identified in Area 5, along the Western Tributary, are not confirmed archaeological monuments and may represent modern-historic or indeed modern interventions. However, if these features are archaeological, then the proposed excavation works could, without the implementation of mitigation measures, result in a negative significant and permanent impact.

Ground disturbance works at the Western Tributary (Areas 3, 4 and 5), Carrigaholt Road field (Areas 6 and 7), the Kilkee Bay Hotel (Area 9) and the Sandpark Mobile Park (Area 10) have the potential to uncover and directly impact on unrecorded subsurface features, deposits, structures and objects of archaeological potential. The significance of such impacts cannot be accurately assessed based on existing information because these areas comprise greenfield sites with no indication of archaeological remains. The impact is likely to be **negative, moderate to profound and permanent**.

Excavation works in-stream and along stream banks including, but not limited to, watercourse widening and deepening and foundation preparations for embankments and walls, have the potential to directly impact unrecorded buried archaeological material. The significance of such impacts cannot be accurately assessed based on existing information because these areas comprise streambeds with no indication of archaeological remains. The impact is likely to be **negative, moderate to profound and permanent**.

While no wrecks are known from within the streams of Kilkee, the importance of small crafts such as currachs and cots during the 19th and into the 20th century suggest the potential for such crafts could be found. This is particularly true of the slightly larger watercourses of the Victoria and Atlantic Stream. It is possible that coherent sections of vessels as well as associated objects from them may be preserved within the underlying streambed sediment. Dredging in the streams has the potential to impact on the remains of unrecorded buried wrecks.

Architectural Heritage

Twenty-six protected structures, an ACA and a small number of non-designated architectural heritage sites were identified within the Scheme Area.

The proposed scheme will not impact directly on architectural heritage features within the Architectural Conservation Area or features included in the Record of Protected Structures and the National Inventory of Architectural Heritage.

Direct impacts are anticipated on one non-designated architectural heritage site (CHS15) identified during the survey. Although very poorly preserved the stone revetment walls along Well Stream contribute to the historic character of the waterway. Their removal, along c. 240m of the stream to facilitate the installation of a precast u-channel, is considered a localised **direct negative impact, slight and permanent** in nature.

Potential indirect impacts are anticipated at the unnamed stone bridge (CHS2) in Atlantic Stream, stone culverts in Well Stream and the West Clare Railway Line (CHS8). There may be a potential for accidental damage to these features during the construction phase due to the close proximity of the construction works. The replacement of the existing debris screen behind Waterworld is located *c.* 100m west of the unnamed stone bridge (CHS2) and the primary national road through Kilkee, N67, traverses the bridge, likely necessitating travel of site equipment across the structure. The closest stone culvert in West Stream is located *c.* 40m northwest to the installation of the precast u-channel. The embankment and excavation works in the area of Kilkee Bay Hotel (Area 9) is directly adjacent to and beneath the West Clare Railway line (CHS8), an area of concentrated activity between its opening in 1892 and its closing in 1960. Without the implementation of appropriate mitigation measures, the potential impact of the proposed works on these features is likely to be **negative, moderate and permanent**.

Intangible Cultural Heritage Assets

The proposed scheme will not have any likely significant negative impact on intangible cultural heritage assets.

Cultural Landscape

A potential visual impact was predicted for the heightening of the wall at Dún An Óir Estate related to the ringfort (CL056-044). Survey of the area indicated that the view of this monument from ground level was already obstructed by the current wall and that heightening of the wall would have a negligible impact. Impacts to the landscape as a whole are discussed in Chapter 12. This found that the 'overall impact to the landscape is expected to be temporary, negative, imperceptible to slight during construction and long-term negative, imperceptible during the operational stage.' Visual impacts during the operational stage were **slight at worst** and **positive at best**.

Operational Phase

Following the successful implementation of archaeological mitigation measures it is predicted that there will be **no further impacts** on cultural heritage during the operational phase.

11.6 Mitigation Measures

A number of mitigation measures are proposed in advance of the Construction Phase. Construction shall not begin until these mitigation measures have been fully implemented and adhered to. A summary of all potential impacts, proposed mitigation measures and potential residual impacts is given in Table 11-8 below.

Pre-Construction Phase

Where terrain proves suitable, a programme of archaeological geophysics shall be undertaken under licence from the National Monuments Service focusing on greenfield areas (Areas 3–7, 9 and 10) including the possible earthwork site in Area 5.

Based on the results of the geophysical survey, a programme of licenced archaeological testing shall be undertaken in advance of the Construction Phase. The results of archaeological testing will inform on the requirement for additional archaeological mitigation measures which may include avoidance, archaeological excavation, or archaeological monitoring.

The possible earthworks (CHS14) shall be subject to archaeological testing to assess their nature, extent and archaeological potential, and to inform required mitigation during Construction Phase.

The original scoping response for the scheme by the National Monuments Service stated that test excavations within the watercourses may be required. Due to the low probability of archaeological remains beneath the sediments of the streams, this is deemed unnecessary.

Consultation with a geophysical surveyor has determined that the ground conditions and state of vegetation makes the scheme area unsuitable for geophysical surveys. The timeline for pre-construction mitigations, therefore, would begin with archaeological testing. Three to four weeks is required for processing the licence application followed by four weeks for archaeological testing and reporting. The results as outlined in the report may generate further mitigation.

Construction Phase

A programme of licensed archaeological monitoring shall be carried out at Construction Stage. The programme shall include archaeological monitoring of all vegetation clearance along the watercourses and greenfields. Any additional unrecorded cultural heritage features such as stone revetments or culverts currently obscured by overgrowth shall be fully recorded. Any ground disturbance works in streambeds and along banks shall be archaeologically monitored. The level of archaeological monitoring of excavation works within greenfields will be determined based on the results of the geophysical surveys and archaeological testing.

Following the vegetation clearance at Well Stream, the stone revetment walls (CHS15) shall be fully recorded with photography, measurements and drawings where appropriate along with any other features revealed by the clearance works in the streams.

Toolbox talks shall be given to make workers aware of features within the streams and along the stream banks (such as CHS2) as well as the West Clare Railway line (CHS8) which are located close to proposed works.

11.7 Residual Impacts

With the implementation of the mitigation measures recommended above there will be only **imperceptible to slight residual impacts** on the archaeological, architectural or cultural heritage resource as any features of significance will be preserved either in-situ or by record. All residual effects would be offset by archaeological recording to preserve disturbed features and materials by record. A summary of all potential impacts, proposed mitigation measures and potential residual impacts is given in Table 11-8 below.

11.8 Interactions and Predicted Cumulative Impacts

There will be no direct interactions between Archaeology & Cultural Heritage and other environmental factors being considered as part of this project. However, there may be an indirect interaction of Archaeology and Cultural Heritage with the Landscape and Visual Impact (Chapter 12) though these are considered **negligible**. Changes in hydromorphology (Water: Chapter 9) may also affect cultural heritage in and near streams overtime; it was found that changes in water velocity will be **slight** throughout the scheme, though with higher risk of a significant long-term impact for Well Stream if not properly mitigated. With mitigation, the impact will be **slight** (Section 9.3). Further, ‘hydraulic analysis and scour potential [was] carried out and assessed throughout the design phase of the scheme’ and it was found that scour prevention was not required (Section 5.2). Air Quality and Dust (Chapter 6) were noted as a potential interaction with cultural heritage, though no interactions are predicted especially as the significance of all Air Quality and Dust impacts after mitigation are **negligible**. Noise and Vibration (Chapter 6) may also occasionally interact with cultural heritage, though no interactions are predicted as ‘there is **no potential** for a vibration impact’ (Section 6.3).

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Table 11-8: Summary of potential impacts, proposed mitigation measures and residual impacts.

Location	Townland	CHS	Potential Cultural Heritage Site	Description of Potential Impact	Significance of Asset	Magnitude of Impact	Significance of Effect	Proposed Mitigation	Residual Impact
Area 1 Well Stream	Kilkee Lower and Kilkee Upper	CHS15	Stone revetment walls	Removal of stone wall	Medium	High	Significant	Archaeological monitoring of and full detailed recording after vegetation clearance	Slight
Area 1 Well Stream	Kilkee Lower and Kilkee Upper	-	Streambed: possible sub-sediment artefacts or unlocated/ unrecorded wrecks	Excavation of streambed and banks	Medium to High	Medium to High	Moderate to Profound	Archaeological monitoring	Slight
Area 1 Well Stream	Kilkee Lower and Kilkee Upper	-	Stone culverts to the northwest of works are located in close proximity to construction work	Installation of precast u-channel	Low	Medium	Slight	Archaeological monitoring and Toolbox talk	Imperceptible
Area 2 Victoria Stream	Kilkee Lower, Dough, and Ballyonan or Doonaghboy	-	Streambed: possible sub-sediment artefacts or unlocated/ unrecorded wrecks	Excavation of streambed and banks	Medium to High	Medium to High	Moderate to Profound	Archaeological monitoring of vegetation clearance and excavation works	Slight
Areas 3–5 Greenfield Areas adjacent to Western Tributary	Kilkee Lower and Ballyonan or Doonaghboy	-	Possible unrecorded subsurface archaeological features	Excavation including topsoil removal	Medium to High	Medium to High	Moderate to Profound	Archaeological monitoring of vegetation clearance; Geophysical survey and pending results follow up testing or monitoring	Slight
Area 5 Western Tributary	Ballyonan or Doonaghboy	CHS14	Possible earthworks	Excavation including topsoil removal	High	Medium	Significant	Archaeological monitoring of vegetation clearance; Geophysical survey and pending results follow up testing or monitoring	Slight

Areas 6 & 7 Greenfield Area adjacent to Church Road	Dough and Ballyonan or Doonaghboy	-	Possible unrecorded subsurface archaeological features	Excavation including topsoil removal	Medium to High	Medium to High	Moderate to Profound	Archaeological monitoring of vegetation clearance; Geophysical survey and pending results follow up testing or monitoring	Slight
Area 9 Kilkee Bay Hotel	Dough	CHS8	West Clare Railway line	Excavation including topsoil removal	Medium	Medium	Moderate	Archaeological monitoring and Toolbox talk	Imperceptible
Area 9 Kilkee Bay Hotel	Dough	CHS8	Possible unrecorded subsurface archaeological features related to the West Clare Railway line	Excavation including topsoil removal	Medium	Medium	Moderate	Archaeological monitoring of vegetation clearance; Geophysical survey and pending results follow up testing or monitoring	Slight
Area 10 Greenfield Area adjacent to Sandpark Mobile Park	Dough	-	Possible unrecorded subsurface archaeological features	Excavation including topsoil removal	Medium to High	Medium to High	Moderate to Profound	Archaeological monitoring of vegetation clearance; Geophysical survey and pending results follow up testing or monitoring	Slight
Areas 10 & 11 Atlantic Stream	Dough	-	Streambed: possible sub-sediment artefacts or unlocated/ unrecorded wrecks	Excavation including topsoil removal and replacement of debris screen	Medium to High	Medium to High	Moderate to Profound	Archaeological monitoring of vegetation clearance and excavation works	Slight
Areas 10 & 11 Atlantic Stream	Dough	CHS2	The stone bridge is located in close proximity to construction work	Replacement of debris screen	Medium	Medium	Moderate	Archaeological monitoring and Toolbox talk	Imperceptible
Do Nothing Scenario	-	-	Potential unrecorded archaeological heritage near streams	Flooding creating hydrological impacts such as scouring and undercutting	Low	Medium	Slight	Overtime, impacts can build creating more long-term and intensive damage	Moderate

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National Inventory of Architectural Heritage (NIAH): http://www.buildingsofireland.ie/niah/

National Library of Ireland: https://catalogue.nli.ie/

Ordnance Survey of Ireland: www.osi.ie

Place names Database of Ireland: www.logainm.ie

Wreck Inventory of Ireland Database & Wreck Viewer, National Monuments Service: www.archaeology.ie

Chapters and Appendices Referenced

Chapter 1: Introduction

Chapter 4: Description of Proposed Development

Chapter 6: Construction Impacts

Chapter 9: Water – Surface and Groundwater

Chapter 12: Landscape and Visual Impact Assessment

Chapter 13: Interactions

Appendix to Chapter 11: Kilkee Flood Relief Scheme Underwater Archaeological Impact Assessment

12 Landscape and Visual Impact Assessment

12.1 Introduction

This chapter of the EIAR was prepared to assess the potential significant effects of the proposed development on landscape and visual amenity. Other effects of lower significance have been included in this assessment to better inform the decision-making process.

This chapter should be read in conjunction with the proposed development drawings, verified photomontages, as well as the Biodiversity and Cultural Heritage chapters of this report for references and descriptions of relevant designations.

12.2 Methodology

The landscape and visual amenity chapter will examine the potential effects of the proposed development on views from residential properties and nearby open spaces, in terms of visual intrusion and visual obstruction and the impact on landscape character areas from the permanent physical changes to the site brought about by the development.

The methodology is based on national and local policy guidelines and best practice methodology. These are:

- Guidelines on Landscape and Visual Assessment (2002); Irish Landscape Institute (ILI)
- Guidelines for Landscape and Visual Impact Assessment (GLVIA), third edition (2013), Landscape Institute (UK)
- Guidelines on Information to be Contained in Environmental Impact Assessment Reports (2022); Environmental Protection Agency (EPA)
- Environmental Impact Assessment of Projects: Guidelines on the Preparation of the Environmental Impact Assessment Report (EIAR) (2017); European Commission (EC)
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (2013); EC.
- Guidelines on Landscape and Landscape Assessment (2000); Department of the Environment, Community and Local Government (DOE)
- National Landscape Strategy 2015-2025; DOE
- Clare County Development Plan 2023-2029;
- Landscape Character Assessment for County Clare, 2004
- Visual Representation of Development Proposals, Landscape Institute (UK, 2019); Technical guidance notes for photomontages

The landscape assessment undertaken is made with regard to the sensitivity of the landscape and its ability to undergo change as outlined in the references above. It will also involve consideration of aerial photography, emerging design drawings, together with visits to the site and environs of the proposed development.

The verified photomontages have been produced in accordance with the GLVIA guidance and are included in Appendix G to facilitate the assessment of visual impacts. The locations for the photomontages have been agreed following liaison with CCC.

Landscape Impact Assessment Criteria

When assessing the potential impacts on the landscape resulting from a proposed project, the following criteria are considered:

- Landscape character sensitivity;
- Magnitude of likely impacts; and
- Significance of landscape effects.

Sensitivity of the Landscape

The sensitivity of the landscape to change is the degree to which a particular Landscape Character Area (LCA) can accommodate changes or new elements without unacceptable detrimental effects to its essential characteristics.

Landscape Sensitivity, often referred to as 'value', is classified using the following criteria which have been derived from a combination of industry guidelines from the Landscape Institute for Landscape and Visual Impact Assessment and professional judgement.

- **Very high** - Areas where the landscape character exhibits a very low capacity for change in the form of development. Examples of which are very high value landscapes, protected at an international level e.g., World Heritage Site, where the principal management objectives are likely to be protection of the existing character;
- **High** - Areas where the landscape character exhibits a low capacity for change in the form of development. Examples of which are high value landscapes, protected at a national level e.g., National Park, where the principal management objectives are likely to be protection of the existing character;
- **Medium** - Areas where the landscape character exhibits a medium capacity for change in the form of development. Examples of which are medium value landscapes, protected at a Local or Regional level e.g., Open space areas mentioned within a County Development Plan, where the principal management objectives are likely to be protection of the existing character;
- **Low** - Areas where the landscape character exhibits a high capacity for change and has very few or no designated landscapes or open space areas; and
- **Negligible** - Areas of landscape character that include derelict, mining, industrial land or are part of the urban fringe where there would be a reasonable capacity to embrace change or the capacity to include the development proposals. Management objectives in such areas could be focused on change, creation of landscape improvements and/or restoration to realise a higher landscape value.

Magnitude of Likely Landscape Impacts

The magnitude of a predicted landscape impact is a product of the scale, extent or degree of change that is likely to be experienced as a result of the proposed project. The magnitude takes into account whether there is a direct physical impact resulting from the loss of landscape components and/or a change that extends beyond the boundary of the proposed project that may have an effect on the landscape character of the area.

- **Very high** - Change that would be large in extent and scale with the loss of critically important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an overall change of the landscape in terms of character, value and quality;
- **High** - Change that would be more limited in extent and scale with the loss of important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an overall change of the landscape in terms of character, value and quality;
- **Medium** - Changes that are modest in extent and scale involving the loss of landscape characteristics or elements that may also involve the introduction of new uncharacteristic elements or features that would lead to changes in landscape character, and quality;
- **Low** - Changes affecting small areas of landscape character and quality, together with the loss of some less characteristic landscape elements or the addition of new features or elements;
- **Negligible** - Changes affecting small or very restricted areas of landscape character. This may include the limited loss of some elements or the addition of some new features or elements that are characteristic of the existing landscape or are hardly perceivable;
- **Neutral** - Changes that do not involve the loss of any landscape characteristics or elements and will not result in noticeable changes to the prevailing landscape character; and
- **Positive** - Changes that restore a degraded landscape or reinforce characteristic landscape elements.

Significance of Landscape Effects

The significance of the landscape impact will be the combination of the sensitivity of the landscape against the magnitude of the change. It is summarised in Table 12-1 below.

Table 12-1: Significance of Landscape and Visual effects based on Magnitude and Sensitivity[155]

MAGNITUDE	SENSITIVITY				
	Very high	**High**	**Medium**	**Low**	**Negligible**
Very high	Profound	Very significant	Significant	Moderate	Slight
High	Very significant	Significant	Moderate	Slight	Slight
Medium	Significant	Moderate	Slight	Slight	Imperceptible
Low	Moderate	Slight	Slight	Imperceptible	Imperceptible
Negligible	Slight	Slight	Imperceptible	Imperceptible	Imperceptible
Neutral	Imperceptible	Imperceptible	Imperceptible	Imperceptible	Imperceptible
Positive	Positive	Positive	Positive	Positive	Imperceptible

Sensitivity of Visual Receptors

Unlike landscape sensitivity, the sensitivity of visual receptors has an anthropocentric basis. It considers factors such as the perceived quality and values associated with the view, the landscape context of the viewer, the likely activity they are engaged in and whether this heightens their awareness of the surrounding landscape.

Visual receptors most susceptible to changes in views and visual amenity are:

- **Very high** - Residents in properties within protected landscapes and travellers on a Scenic route where awareness of views is likely to be heightened;
- **High** – Residents in properties with predominantly open views from windows, garden or curtilage. People, whether residents or visitors, who are engaged in outdoor recreation including use of public rights of way, whose attention or interest is likely to be focused on the landscape and on particular views, and those on a scenic route where the view is not specifically in the direction of the proposed development;
- **Medium** - Visitors to heritage assets, or to other attractions, where views of the surroundings are an important contributor to the experience, and communities where views contribute to the landscape setting enjoyed by residents in the area.
- **Low** - People engaged in outdoor sport or active recreation on a local scale, which does not involve or depend upon appreciation of views of the landscape; and people at their place of work whose attention may be focused on their work or activity, not their surroundings and where the setting is not important to the quality of working life, and people travelling in vehicles where their view is limited to a few minutes at any viewpoint; and
- **Negligible** - Changes affecting restricted viewpoints.

Magnitude of Visual Impact

The magnitude of a visual effect is determined on the basis of several factors: the relative numbers of viewers, the distance from the viewpoint, the visual dominance of the proposed development within a view and its effect on visual amenity, as follows:

- **Very high** - The proposal intrudes into a large proportion or critical part of the available vista and is without question the most noticeable element. A high degree of visual clutter or disharmony is also generated, strongly reducing the visual amenity of the scene;
- **High** - The proposal intrudes into a significant proportion or important part of the available vista and is one of the most noticeable elements. A considerable degree of visual clutter or disharmony is also likely to be generated, appreciably reducing the visual amenity of the scene;
- **Medium** - The proposal represents a moderate intrusion into the available vista, is a readily noticeable element and/or it may generate a degree of visual clutter or disharmony, thereby reducing the visual

[155] Adapted from Guidelines for Landscape and Visual Impact Assessment (GLVIA), 3rd edition (2013), Landscape Institute (UK)

amenity of the scene. Alternatively, it may represent a balance of higher and lower order estimates in relation to visual presence and visual amenity;

- **Low** - The proposal intrudes to a minor extent into the available vista and may not be noticed by a casual observer and/or the proposal would not have a marked effect on the visual amenity of the scene; and
- **Negligible** - The proposal would be barely discernible within the available vista and/or it would not detract from, and may even enhance, the visual amenity of the scene.

Magnitude can also be described as:

- **Neutral** - Changes that are not discernible within the available vista and have no bearing the visual amenity of the scene; and
- **Positive** - Changes that enhance the available vista by reducing visual clutter or restoring degraded features.

Visual Impact Significance

As stated above, the significance of visual impacts is a function of visual receptor sensitivity and visual impact magnitude. This relationship is expressed in the same significance matrix as used earlier in respect of landscape effects, see Table 12-1.

Impact Classification Terminology

The Impact Classification Terminology as published in the EPA guidance document[156] is shown in Figures 1-2 and 1-3 in Chapter 1. Standard definitions are provided in this glossary, which permit the evaluation and classification of the quality, significance, duration, and type of impacts associated with a proposed development on the receiving environment. The term temporary and reversible are considered interchangeable in this report. Impacts that are expected to last less than a year are considered short-term.

Each impact is described in terms of its quality, significance, extent, duration & frequency and type, where possible.

Cumulative Impact Assessment

The cumulative effect of a set of developments is the combined effect of all the developments taken together. Cumulative effects on visual amenity consist of combined visibility and sequential effects. Combined visibility occurs where the observer is able to see two or more developments from one viewpoint.

- Combined visibility may either be in combination (where several developments are within the observer's arc of vision at the same time) or in succession (where the observer has to turn to see the developments).
- Sequential effects occur when the observer has to move to another viewpoint to see different developments. For example, this could be when travelling along roads or paths. The occurrence of sequential effects may range from frequently sequential (the features appear regularly and with short time lapses between, depending on speed of travel and distance between the viewpoints) to occasionally sequential (long time lapses between appearances, because the observer is moving very slowly and / or there are large distances between the viewpoints).

Cumulative landscape effects affect the physical fabric or character of the landscape, or any special values attached to the landscape.

- Cumulative effects on the physical fabric of the landscape arise when two or more developments affect landscape components such as woodland, dykes or hedgerows. Although this may not significantly affect the landscape character, the cumulative effect on these components may be significant – for example, where the last remnants of former shelterbelts are completely removed by two or more developments.

[156]Environmental Protection Agency (EPA) (2022) Guidelines on Information to be Contained in Environmental Impact Assessment Reports (2022)

- Cumulative effects on landscape character arise from two or more developments. Housing developments introduce new features into the landscape. In this way, they can so change the landscape character that they can create a different landscape character type. That change need not be negative; some derelict or industrialised landscapes may be enhanced as a result of such a change in landscape character. The cumulative effects on landscape character may include other changes, for example trends or pressures for change over long time periods, which should form part of any consideration of a particular project.

The area in which the proposals site is located contains other built elements such as walls and therefore there is potential for cumulative effects on landscape and visual amenity.

12.3 Receiving Environment

Site Context

Kilkee is a small coastal town located on the southwestern of County Clare, at approximately 12 km west of Kilrush and approximately 47 km southwest of Ennis. Kilkee is accessed by the National Secondary Road N67 from the north and east, as part of the coastal route from Kilrush to Ennistymon, past Lahinch.

The topography of Kilkee is generally flat, gently sloping towards the sea to the northwest. Elevations vary from approximately 3 metres to 52 metres Above Ordnance Datum (AOD), with the highest point located to the west at Knockroe near the Kilkee Cliffs. The two main watercourses that flow through Kilkee town towards Moore Bay are the Victoria Stream and the Atlantic Stream.

Landscape Policy Context and Character

Kilkee is described in the County Development Plan as a 'Settled Landscape', which contains the network of farmland and villages that make up most of the County, including land uses such as agriculture, transportation, industry, commerce, tourism, recreation, leisure, education, residential, healthcare, and social infrastructure. Kilkee is surrounded by Heritage Landscape, but the town itself is not classified as such.

The proposed development site is within the Peninsular Farmland Landscape Type (LCT) and the Loop Head Peninsula Landscape Character Area (LCA). North Loop Head Peninsula extends from Loop Head at the westernmost point of Clare to George's Head less than a kilometre from Kilkee on the west coast of Clare. Loop Head LCA is relatively free from tourist related development with a few car parks and picnic areas scattered along the coast, but with a concentration of holiday development at Kilkee, the main settlement in the area. The presence of mobile home parks, amusement arcades etc in Kilkee indicate that this is a long-established coastal resort.

The key features of the landscape within this LCA are as follows:

- Flat peninsular farmland characterized by extremely distinctive ladder fields, estuaries, salt marsh and mudflats, sand, and boulder coves, shelving coastal rocks, and vertical cliffs.
- As one approaches Loop Head, the coastline becomes increasingly dramatic, with high cliffs, arches, stacks, and rocky inlets. On the southern part of the bay are generally more sheltered bays.
- The sea is always visible, and the character of the land reflects the temperament of the weather and the turbulence of the seas.
- The region is remote and has a remote, detached atmosphere, with rural, unspoiled qualities.
- The population is more densely populated along the southern peninsula, increasing again in the direction of Kilkee.
- Kilkee has retained its unique character as a 19th century bathing place. The town contains several protected structures and many distinctive buildings. A large area of the town centre is designated as an ACA (Architectural Conservation Area), recognising the historical and architectural importance of the townscape and layout of the core area.

As a coastal town, Kilkee also includes the 'Kilkee Reefs', which are designated as a Marine Special Area of Conservation (SAC), situated north of the River Shannon Estuary. These are an example of important rocky shore plant and animal communities which are only found on the western coast of Ireland.

Site of the Proposed Development – Landscape Character

The proposed development is situated in the two main watercourses of Kilkee, the Atlantic Stream and the Victoria Stream.

Atlantic Stream

The Atlantic Stream is located northeast of Kilkee, generally flowing on the periphery of town, as shown in Figure 12-1 below. When traveling downstream from southeast to northwest, the landscape character is mostly farmland, changing to a small group of residential dwellings, known as Dún an Óir Estate, where the Atlantic Drain and the Atlantic Stream join. This is followed by an extensive area of caravans and holiday homes, known as Sandpark mobile home park, before reaching an open space and Waterworld. The Atlantic Stram then flows into Moore Bay via the Atlantic Stream Outfall.

The Atlantic drain #2 to the south flows through partially developed lands, streaming adjacent to Kilkee Bay Hotel towards the north. It subsequently flows between Collin's mobile home Park and St Senan's GAA pitch, before joining the Atlantic Stream.

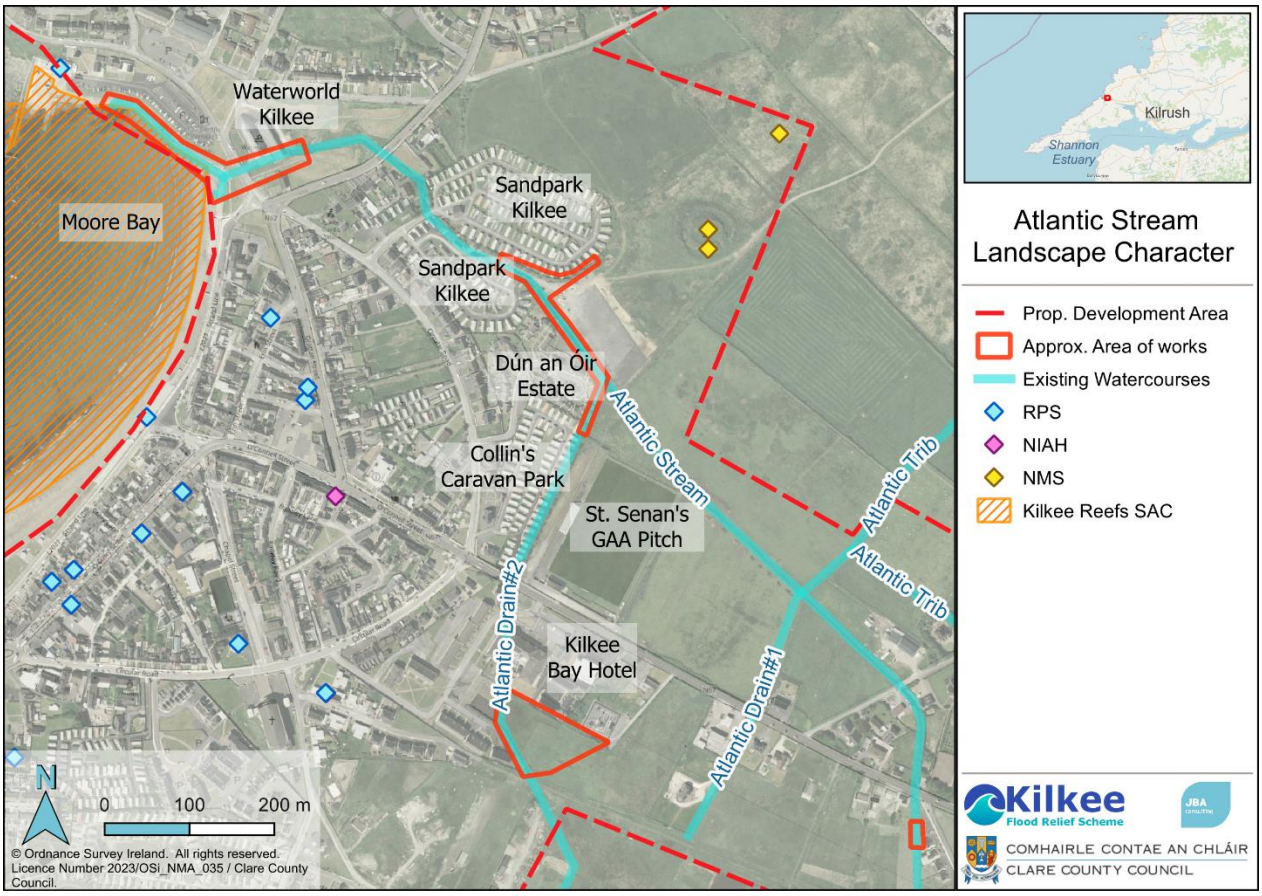

Figure 12-1: The Atlantic Stream Landscape Character.

The rear boundaries of the existing residential dwellings at Dún an Óir Estate are directed towards the Atlantic Drain #2 and the Atlantic Stream. These are made up of concrete post and rail fences on top of a concrete wall, as shown in Figure 12-2 below. The environs include extensive grasslands to the north and northeast.

Figure 12-2: Existing rear boundary to residential dwellings adjacent to Atlantic Drain #2 and the Atlantic Stream.

The southern boundary of Kilkee Bay Hotel is directed at a greenfield site, separated by a derelict timber post and rail fence, as shown in Figure 12-3 below. The area is partially overtaken by scrub and does not seem to be used by the neighbouring residents.

Figure 12-3: Existing southern boundary of Kilkee Bay Hotel, adjacent to Atlantic Drain #2.

There are three National Monuments and three Protected Structures located less than 200 metres from the Atlantic Stream. These include two ringforts (NMS no. CL056-044 and CL056-004) and a souterrain (NMS no. CL056-044002) to the northeast, as well as the former Kilkee Railway Station (RPS no. 403) to the southwest, and the East End Boat House (RPS no. 511) and the old Courthouse (RPS no. 907) to the northwest.

Victoria Stream

The Victoria Stream, the Well Stream and Western Tributary are located southwest of Kilkee. Both the Well Stream and Western Tributary flow in a northeastern direction into the Victoria Stream. The Victoria Stream runs northbound towards Moore Bay, as shown in Figure 12-4 below.

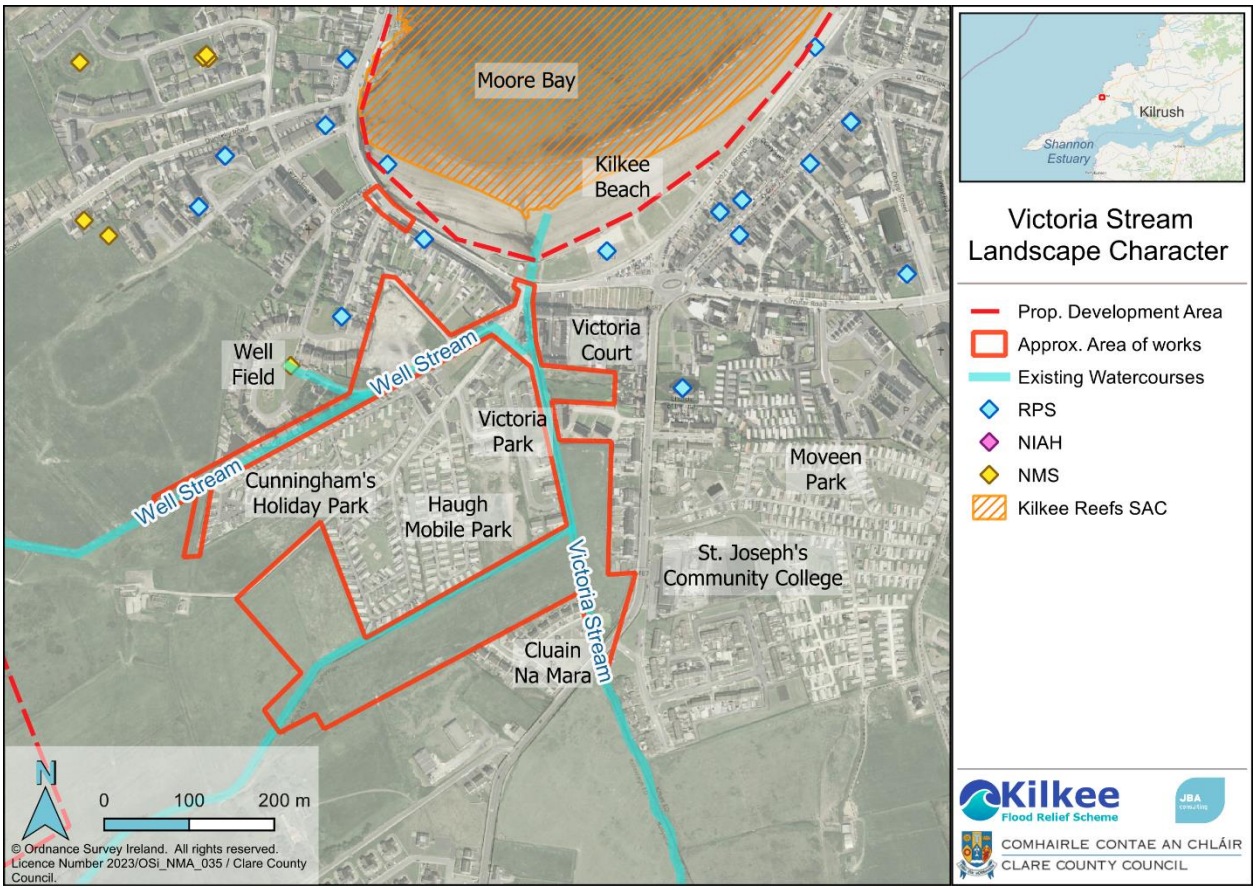

Figure 12-4: The Victoria Stream Landscape Character.

The receiving landscape of the Western Tributary is almost entirely farmland and greenfield in character. The outfall section of this stream is in a greenfield site bounded by Cunningham Holiday Park and Haugh Mobile Park to the north and separated by soil bunding as well as low walls and mesh steel fences in some sections. The Cluain na Mara residential estate is located south of the greenfield site and is screened from the surrounding lands by a tall concrete block wall, as shown in Figure 12-5 below.

Figure 12-5: Existing northern boundary of Cluain na Mara residential estate.

The landscape east of the Victoria Stream, adjacent to where the Western Tributary connects with the Victoria Stream, is also composed of a greenfield site, surrounded by residential dwellings to the east, west and north. Regional road R487 is located on the south and southeastern boundaries of the proposed development site in this location. St Joseph's Community College is located approximately 20 metres east from the existing greenfield site at its nearest point.

The existing stream itself follows an existing ditch with embankment and overgrown vegetation on both sides, as shown in Figure 12-6 below, which includes the presence of Japanese Knotweed. Existing

private boundaries adjacent to the existing ditch include tall concrete block walls, some with partial damage by the stream.

Figure 12-6: Existing the Victoria Stream ditch and overgrown vegetation.

Victoria Stream continues northbound via an open walled channel, as shown in Figure 12-7 below, before culverting at Well Road. The walls are visible from Well Road. The dwellings surrounding Well Road including the adjacent units of Victoria Court, will have limited to no visibility towards the proposed development, as the existing walls extend in sufficient height to provide screening. The outfall of the Stream is subsequently at Moore Bay.

Figure 12-7: Existing the Victoria Stream open walled channel.

The Well Stream flows from a farmland land use into a more residential and temporary accommodation use as it flows in a northeastern direction. The more urban section of the Well Stream is bounded by Cunningham's Holiday Park to the south, and residential areas to the north, including Well Field and Crescent Place. The Well Stream Tributary flows from Well Field estate for approximately 100 metres until it connects to the Well Stream channel. Both streams are open channels surrounded by embankment and vegetation, overgrown in some locations.

The local road accessing Well Field runs parallel to the existing the Well Stream, as shown in Figure 12-8 below. Boundaries adjoining neighbouring lands or dwellings include hedgerows, tree lines, residential frontage walls and fences. In some instances, there are informal accesses over the stream into side or rear gardens of the local properties.

Figure 12-8: Existing Well Stream open channel on the left of the existing local road.

There are five Protected Structures and one National Monument located less than 150 metres from the Victoria Stream and the Well Stream. These include a well (NMS no. CL056-042), a 19th century chapel (RPS no. 481) and '8 Marine Parade' (RPS no.397 / NIAH no. 20301026) to the north, a bandstand at the seafront (RPS no. 572) to the northeast, and St James's Church of Ireland to the east. The existing well is located at Well Field and is part of the existing the Well Stream Tributary. There are no Protected Structures or Monuments in proximity to the Western Tributary.

The Proposed Development also includes some road junctions along Marine Parade. The receiving landscape of these junctions is in proximity to three Protected Structures, located less than 30 metres from the proposed works. These structures include the Bandstand and Slipway (RPS no. 578) at Kilkee Beach, and '8 Marine Parade'.

Visual Amenity

There are two designated scenic routes in the CDP within Kilkee. The closest is Scenic Route 30, which runs along the coast road into Kilkee from the west, just north of where the Victoria Stream enters Moore Bay. The second is Scenic Route 33 to the northeast of Kilkee, approx. 2.5km from the centre of the town. Due to the distance and intervening topography, the proposed development is unlikely to be visible from Scenic Route 33. Neither of these scenic routes are likely to be impacted by the proposed development.

County Clare has an abundance of recreational routes both in urban and rural areas which explore some of the county's outstanding natural beauty and heritage. EuroVelo's Atlantic Coast Route includes a section starting at Kilkee and finishing in Doolin to the northeast. There is also the Loop Head Cycleway, which, circles around the northeastern portion of the peninsula, as shown in Figure 12-9 below.

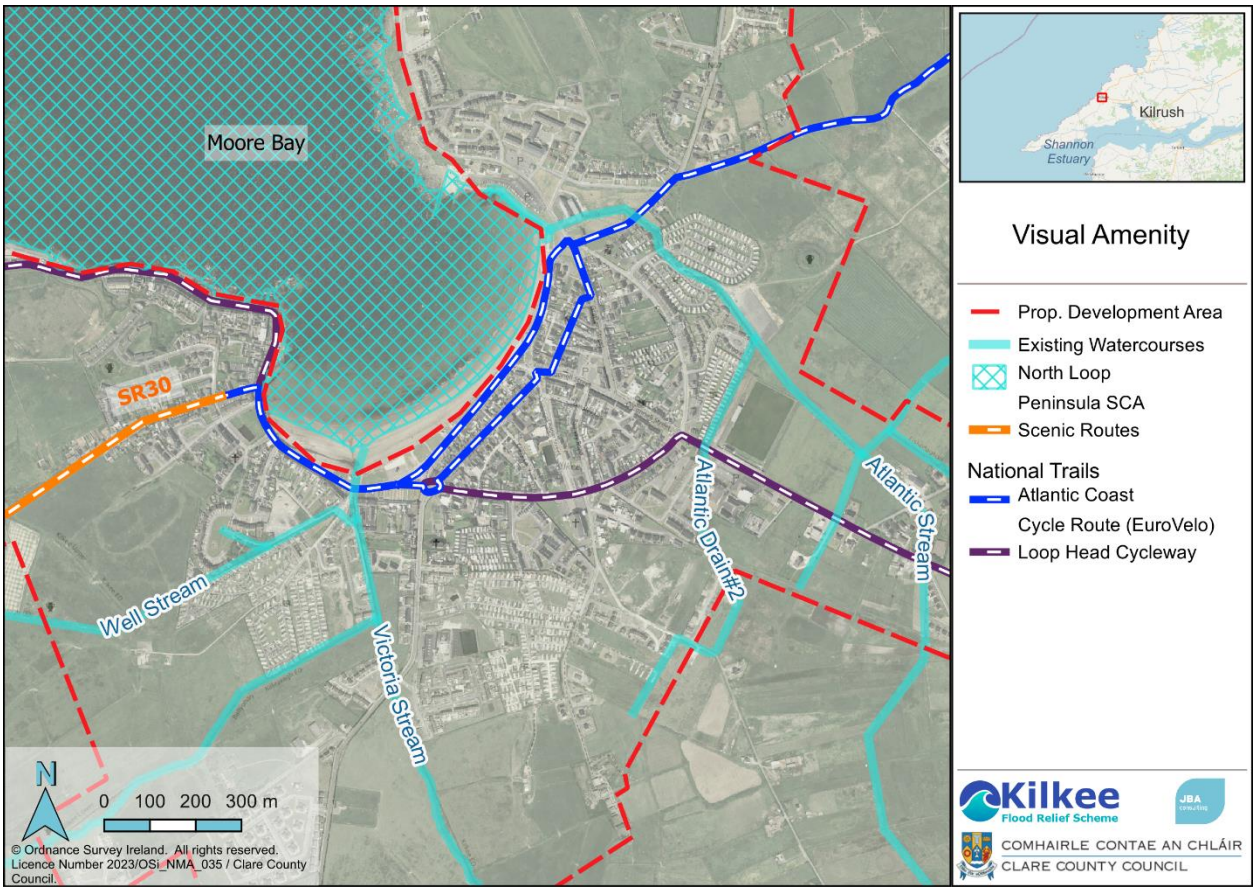

Figure 12-9: Existing Visual Amenity

The seascapes of County Clare are a crucial element of the County's history, identity, and culture. Kilkee seascape is identified as 'North Loop Head Peninsula' Seascape Character Area (SCA). Residences in the area enjoy views over the seascape, Moore Bay, and surrounding countryside. It is an objective of Clare County Council that it be demonstrated that every effort has been made to visually integrate any proposed development within the SCA. These views could be impacted during construction or operation by the construction of flood walls and embankments. Certain views are likely to be important for the tourist industry in the town.

12.4 Characteristics of the Proposed Development

Overview

The full description of the Proposed Development is provided in Chapter 4 of the EIAR.

The two main watercourses considered in the proposed development are the Atlantic Stream and the Victoria Stream. The flood defences are a combination of new and improved walls, embankments, and channels. New elements such as headwalls, a U-channel, a debris screen, and an improved outfall are also proposed. The new defence walls are proposed to be finished with the same material and finish as the existing on site. The proposed embankments will be allowed to naturally vegetate with herbaceous plants. Trees will not be allowed within a minimum distance of two metres from the base of the embankment as this would compromise their structural integrity.

12.5 Predicted Impact

Context of Predicted Impacts

As described in the methodology, the impacts to the landscape and visual amenity have been assessed based on the sensitivity of the receptor and magnitude of change. This assessment as part of an EIAR is focused on potential significant impacts, and secondarily on impacts of lower significance.

Receptor groups were identified during the initial desktop investigation using aerial imagery and confirmed on site during the site visit. Receptors were grouped in terms of function, i.e., residential buildings, community buildings, town centre, tourism, etc., location and expected significance of impact. See Figure 12-10 overleaf for the Visual Receptor Plan which shows the identified receptor groups. These receptor groups are discussed below with an assessment of the effects on their visual amenity.

Eight (8 No.) verified photomontages have been produced showing the expected visual change to specific views as a result of the proposed development In photomontages where the proposed development is not clearly discernible, an additional image is included where a wireline represents the outline of the extent of proposed defences. This provides a sense of the degree of screening and magnitude of change to these views as a result of the proposed development. The compendium of photomontages is presented in Appendix G as a series of images under the title *Verified Photomontages and CGI's*.

Impact Duration was considered permanent if a receptor had a distinct alteration to the horizon line or if views of a structure would continue to remain visible. During assessment, the landscape was also considered in the context of permanency. For example, retained mature trees were considered permanent, with management and evolution. Naturally colonising vegetation will become a permanent softening feature in embankments and ponds within the short- to medium-term establishing period.

Type of Impact was considered positive only if the proposals contribute to the character of the locality and would not be detrimental to the landscape or visual amenity. A negative Type of Impact might occur if for example, the proposals diluted the character or perception of Kilkee or had a detrimental impact on views of Moore Bay.

Do-Nothing Scenario

Under the do-nothing scenario the landscape character and visual amenity of the area would be unchanged, and Kilkee would continue to be susceptible to flooding. During flood events, public open spaces and residential areas would continue to flood, resulting in periodic negative impacts on landscape and visual amenity during flood events.

Receptor Descriptions

Landscape Receptors

Kilkee is a gently sloping coastal town and a main settlement of North Loop Head Peninsula LCA. Kilkee includes a concentration of holiday developments in the area, surrounded by extensive farmland characterized by extremely distinctive ladder fields, with a sense of a rural detached atmosphere of unspoiled qualities.

The town, with its retained unique character as a 19th Century bathing attraction, contains several protected structures, relatively grouped in proximity to Moore Bay. Where the settlement character is substituted by farmland in Kilkee's environs, several National Monuments are present, such as structures, ringforts and standing stones.

The proposed development is generally sited away from protected structures (RPS) and national monuments (NMS), separated by at least 100 metres. Five structures north of the Well Stream and north of the reprofiling works of the road junctions at Marine Parade are located under 100 metres, at a range from approximately 35m to 95m, RPS no. 481 (Church at Geraldine Place), NMS no. CL056-042 (St Senan's Well), RPS no. 397 (8 Marine Parade), RPS no. 578 (Slipway) and RPS no. 572 (Bandstand).

The Kilkee Reefs Special Area of Conservation (SAC) is an important element in the landscape and seascape. The proposed development is centred on the existing streams of Kilkee but has the potential to impact this SAC and water quality. Potential impacts on this SAC are described in Chapter 7 of the EIAR.

The receiving landscape of the existing Atlantic and the Victoria Stream at Kilkee is urban and includes different stream defences according to location and land use. The existing streams flow through ditches, channels, and culverts.

Visual Receptors

Receptor groups were identified during the initial desktop investigation using aerial imagery and verified on site during the site visit. Receptors were grouped in terms of function, i.e., residential buildings, community buildings, etc., and location. Visual amenity is primarily on a local or household scale, with residences in the area comprising short distance views, enclosed to each specific housing estate. Some

residences have long ranging views of scenic quality towards Moore Bay and North Loop Peninsula SCA; however, these are generally facing away from the proposed development.

Recreational and scenic routes within Kilkee include Scenic Route 30, EuroVelo's Atlantic Coast Route, and Loop Head Cycleway, as identified in the CDP, with the latter two containing a portion subject to the proposed development works.

The Visual Receptor Plan in Figure 12-10 below shows the identified receptor groups. These receptor groups are discussed in detail below and summarised in Table 12-3, with an assessment of the effects on their visual amenity.

Predicted Impact Assessment

Landscape Impact Assessment

The location of the proposed development, within Kilkee town and urban fringe, is expected to limit its potential for impacts on landscape character. The proposed defences such as walls, channels and embankments are placed in areas which already contain similar built features. Existing pedestrian and vehicular connections within Kilkee and over the existing streams will be retained. The proposed development will provide flood protection to existing channels; open areas of floodplain will continue to flood but in a more controlled manner, ensuring this aspect of landscape character in the area remains unchanged once the scheme is operational. This will also ensure that existing open spaces in the area around Kilkee remain as such, as they will not be zoned for development if they sit in a flood zone.

The landscape of the Atlantic Stream is not deemed sensitive, with no designated or protected landscapes located near the existing watercourse. The nearest designated monuments (Souterrain – NMS no. CL056-044002 and Ringfort – NMS no. CL056-044-) are located approximately 138m from the proposed development at its closest point. The proposed works are very localised and therefore, it is unlikely that the proposed development will have any impacts on these monuments due to distance. The landscape sensitivity is deemed *Low*.

The Atlantic Stream proposals include construction two new culvert inlet manholes, two new embankments, an increase in wall height, a screen upgrade and a revised outfall to Moore Bay and upgrades to the existing overflow chamber. These are small scale proposals, strategically sited to provide localised interventions. The magnitude of change is likely to be *negligible*, with the main impacts occurring during construction due to the transportation of materials and localised works. The operational phase will include new low height embankments and a small increase in wall height located on rear boundaries of residential and temporary accommodation developments.

The proposed trash screen upgrade is sited in a semi-public open space, northeast of Waterworld. It was noted during a site visit that this open space is used by the local community in a transient manner. The proposed works for the Atlantic Stream outfall are localised to the existing outfall location, with a small height increase to the existing manhole cover. Additional works will be carried out to repair the existing drainage system in this location. This will cause a temporary disruption to the existing steps north of Kilkee beach but will have the same appearance and finish once completed. The sensitivity of the receiving landscape of the Atlantic Stream outfall is high due to the proximity to the Kilkee Reefs SAC. The magnitude of change from the proposed development is low to medium during construction and negligible during operation.

The predicted landscape impact of the proposed development at the Atlantic Stream would be on balance temporary, negative, slight during construction and long-term, negative, imperceptible during operational phase, due to the small scale and strategic siting of the proposed works.

Proposals to the Victoria Stream are divided between the Well Stream and Tributary, Victoria Court, the Victoria Stream, and Western Tributary. The receiving landscape is relatively urban, with sections located in greenfield sites and town edges.

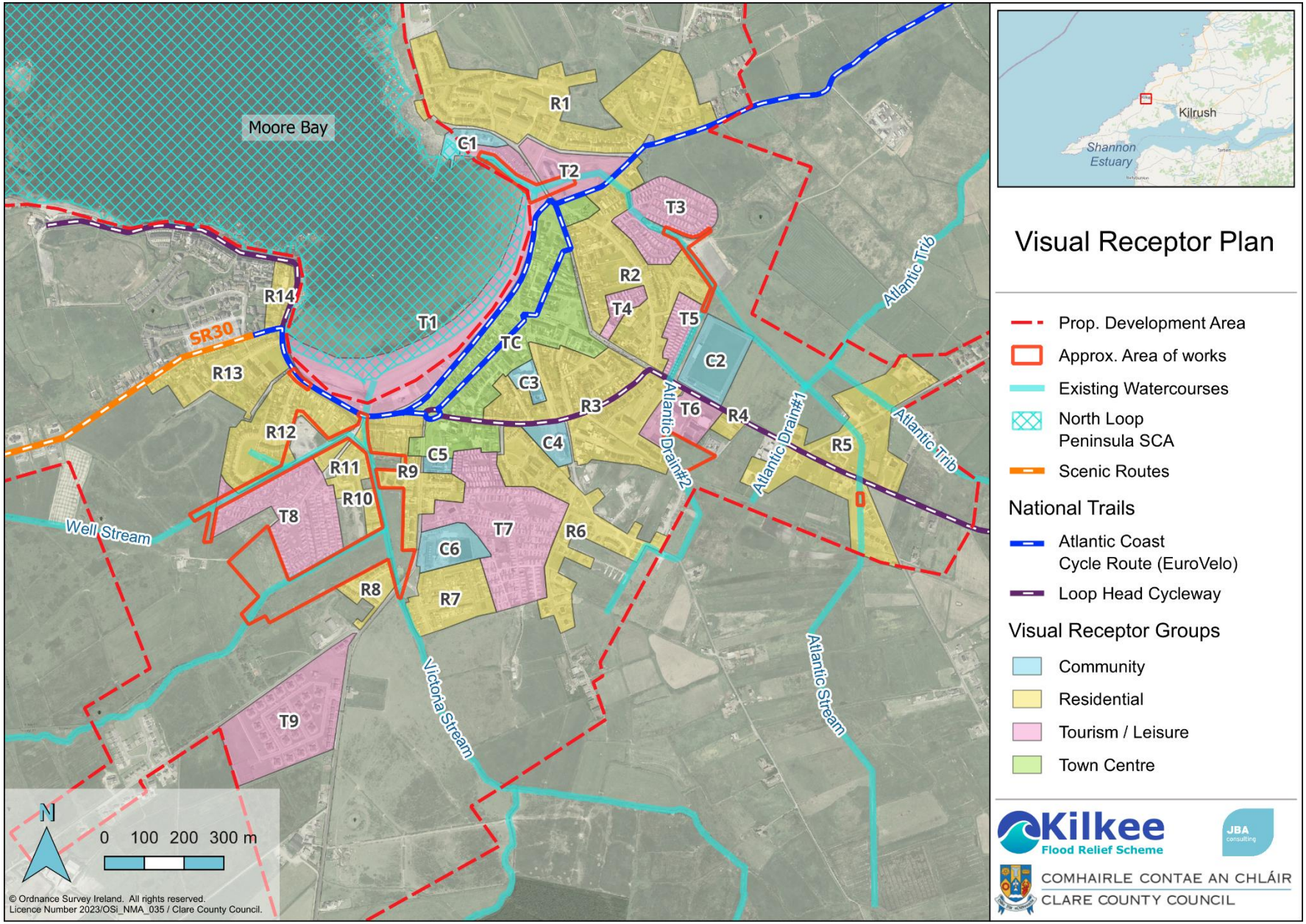

Figure 12-10: Visual Receptor Plan

The Well Stream includes a new embankment at the transition point between farmland and residential / holiday parks, a new U-channel replacing the existing channel, new underground storage at the Clare County Council compound, a new Well Road culvert and the addition of sluice valves. These elements are not new to the landscape and will not impact the landscape character in this location. The landscape of the Well Stream is of *Low* sensitivity, with few designated monuments in a landscape character that exhibits the capacity for change.

The proposed development is sited parallel to Well Road and is unlikely to impact St Senan's Well (NMS no. CL056-042) or the Church at Geraldine Place (RPS no. 481). Proposals vary in height, but the character of the stream will not change location or width. The change from a ditch to a concrete U-channel will include higher defensive flood walls. There is a private residential dwelling that has installed a concrete passage between its rear garden and Well Road. This informal access will be lost as part of the proposed development. Some existing evergreen trees will be felled and others relocated to allow for temporary vehicle access during construction. Indicative landscape proposals were made available for the Western Tributary field and Victoria Stream field at the time of the writing of this report. Further landscape proposals and details of proposed planting should be made available at the detailed design stage. Other proposals such as the sluice valves and the culvert will only be perceived during construction and will be indiscernible during the operational phase. The magnitude of change is *Low* to *Medium,* with the proposed development sited in the same alignment as the existing the Well Stream. The landscape effects for the Well Stream will be on balance **temporary, negative, slight** during construction and **long-term, negative, slight** during operational phase. It is unlikely that the existing well and church will be impacted by the proposed development, due to distance, location and different defence measures, such as walls, fences, dwellings and vegetation.

The proposed development at Victoria Court includes repairs to the existing channel wall, the reconstruction of boundary walls as flood walls, new sluice valves and a new embankment at the greenfield site between Victoria Court and Victoria Crescent. There are no sensitive designations in this location, with no protected structures or monuments within or in the immediate vicinity of Victoria Court. The nearest protected structures are located in other streets, such as Carrigaholt Road or Kilkee Beach, and do not serve the landscape in this location. The landscape sensitivity is *Low.*

The landscape character of Victoria Court is entirely residential, with exception to the existing greenfield site, and will not change with the proposed development. The magnitude of change is this location is deemed *Negligible*. The proposed development comprises small-scaled changes in this location using similar materials and finishes. The proposed embankment to the greenfield site is not new in this field but will increase in height to improve flood defences. The landscape impact for Victoria Court will be on balance **temporary, negative, slight** during construction, due to removal and transportation of existing materials and the erection of new boundaries and embankment. Certain elements such as the restoration of damaged walls and the erection of a soft proposal such as the new embankment, can be considered a positive intervention, however, on balance, the impact will be **long-term, negative imperceptible** *to* **neutral** during operational phase.

The receiving landscape of the proposed development at the Victoria Stream and Western Tributary is similar in character, with gently sloping greenfield sites. Each proposed development area is surrounded by residential estates and mobile home parks and do not include any designated landscape or monuments. The sensitivity of the landscape in this location is deemed *negligible.*

The proposals in these areas include new embankments, diverted open channels, new marginal, wildflower meadow and native tree planting, leaky dams, new culvert, and reconstructed boundary walls. The existing open channel will therefore become obsolete and will be backfilled in its current location. The soft proposals in these fields will enhance the landscape and provide flood defences to the built environs of the Victoria Stream and Western Tributary. The landscape impact of these streams will be **temporary, negative, imperceptible** to **slight** during construction, but **long-term, positive** during the operational phase.

The reprofiling of the road junctions at Marine Parade are localised interventions to the road itself. The three protected structures in proximity to this proposed development area, RPS no. 397 (8 Marine Parade), RPS no. 578 (Slipway) and RPS no. 572 (Bandstand), are unlikely to be impacted by the proposed change in levels due to these structures not being located on the road or immediately adjacent to it. Landscape sensitivity is deemed *low* to *medium* and magnitude of change *negligible*. Access to these

structures might be temporarily compromised during construction works, but the landscape character will not change as the proposed development is transforming the existing junctions into slightly raised junctions. Landscape effects of the proposed development in this location will be **temporary, negative, slight** to **moderate** during construction, and **long-term, negative, imperceptible** during operational phase.

Predicted impacts are summarised in Table 12-2 below, divided into each location and take into account each specific proposed development design and context.

Table 12-2: Landscape Impact Assessment Summary

Proposed Development Area	Sensitivity	Magnitude of change	Predicted impact and duration	
			Construction	Operation
Atlantic Stream – Meadow View Court	Negligible to Low	Negligible	*Temporary, negative, imperceptible to slight*	*Long-term, Negative, Imperceptible*
Atlantic Stream – Kilkee Bay Hotel	Negligible to Low	Negligible	*Temporary, negative, imperceptible to slight*	*Long-term, Negative, Imperceptible*
Atlantic Stream – Dún an Óir estate	Negligible to Low	Negligible	*Temporary, negative, imperceptible to slight*	*Long-term, Negative, Imperceptible*
Atlantic Stream – Sandpark mobile park	Low	Negligible	*Temporary, negative, imperceptible to slight*	*Long-term, Negative, Imperceptible*
Atlantic Stream – Waterworld	Low	Negligible	*Temporary, negative, imperceptible to slight*	*Long-term, Negative, Imperceptible*
Atlantic Stream Outfall	Medium	Negligible	*Temporary, negative, slight to moderate*	*Long-term, Negative, Imperceptible*
Well Stream & Well Tributary	Low	Low to Medium	*Temporary, negative, slight*	*Long-term, Negative, Slight*
Victoria Court	Low	Negligible	*Temporary, negative, slight*	*Long-term, Neutral to Imperceptible*
Victoria Stream	Negligible	Positive	*Temporary, negative, imperceptible to slight*	*Long-term, Positive*
Western Tributary	Negligible	Positive	*Temporary, negative, imperceptible to slight*	*Long-term, Positive*
Reprofiling of the road junctions at Marine Parade	Low to Medium	Negligible	*Temporary, negative, slight to moderate*	*Long-term, Negative, Imperceptible*

According to the methodology and taking into account the proposed design, the overall impact to the landscape is expected to be **temporary, negative, imperceptible to slight** during construction and **long-term negative, imperceptible** during the operational stage. Areas such as the Victoria Stream and Western Tributary are expected to have a *long-term, positive* impact due to the enhancement of the landscape as part of the flood defence measures.

Visual Impact Assessment

Visual receptors identified during desktop study and site investigation, shown in Figure 12-10 above, are summarised in Table 12-3 below, in terms of distance from the proposed development, sensitivity and magnitude of change of the visual amenity, as well as the predicted impact and duration during construction and operational phases.

The visual impact assessment has considered the entire proposal development for visual receptors in scenic routes and SCA, due to views changing along each route or area. However, the closest proposed development area has been considered for residential, town centre, tourism, and community receptor groups, as the proposed development is likely to not be perceived in distances higher than 300m due to scale and the intervening buildings and vegetation.

Table 12-3: Visual Receptor Summary

Receptor No.	Distance from proposed development	Sensitivity	Magnitude of change	Predicted impact and duration	
				Construction	Operation
SCA	0	High	Negligible	*Temporary, negative, slight to moderate.*	*Permanent, negative, imperceptible*

SR30	133m	High	Negligible	*Temporary, negative, slight.*	*Permanent, positive*
EuroVelo	0	High	Negligible	*Temporary, negative, slight*	*Permanent, imperceptible*
LH Cycleway	0	High	Negligible	*Temporary, negative, slight*	*Permanent, imperceptible*
R1	100m	High	Negligible	*Temporary, negative, slight*	*Permanent, imperceptible*
R2	0m	High	Low	*Temporary, negative, moderate*	*Permanent, negative, slight*
R3	7m	High	Low	*Temporary, negative, slight*	*Permanent, neutral / positive*
R4	100m	High	Negligible	*Temporary, negative, imperceptible to slight*	*Permanent, neutral*
R5	120m	High	Negligible	*Temporary, negative, imperceptible to slight*	*Permanent, negative, imperceptible*
R6	180m	High	Negligible	*Temporary, imperceptible*	*Permanent, neutral*
R7	50m	High	Positive	*Temporary, negative, slight*	*Permanent, positive*
R8	0m	High	Positive	*Temporary, negative, slight*	*Permanent, positive*
R9	0m	High	Negligible and Low to Medium	*Temporary, negative, slight to moderate*	*Permanent, negative, imperceptible to slight*
R10	5m	High	Positive and Low to Medium	*Temporary, negative, slight to moderate*	*Permanent, positive and locally negative, slight*
R11	0m	High	Low	*Temporary, negative, slight*	*Permanent, negative, slight*
R12	0m	High	Negligible to Low	*Temporary, negative, slight*	*Permanent, negative, imperceptible to slight*
R13	75m	High	Negligible	*Temporary, negative, slight*	*Permanent, imperceptible*
R14	110m	High	Negligible to neutral	*Temporary, negative, imperceptible to slight*	*Permanent, imperceptible to neutral*
TC	70m	High	Negligible	*Temporary, negative, imperceptible to slight*	*Permanent, imperceptible to neutral*
C1	40m	Medium	Negligible	*Temporary, negative, slight*	*Permanent, imperceptible to neutral*
C2	50m	Low	Negligible	*Temporary, negative, slight*	*Permanent, imperceptible*
C3	270m	Low	Neutral	*Temporary, neutral*	*Permanent, neutral*
C4	260m	High	Neutral	*Temporary, neutral*	*Permanent, neutral*
C5	135 to 140m	High	Neutral	*Temporary, neutral*	*Permanent, neutral*
C6	36m	Low	Positive	*Temporary, negative, slight*	*Permanent, positive*
T1	0m	High	Negligible	*Temporary, negative, slight*	*Permanent, imperceptible*
T2	0m	Medium	Negligible	*Temporary, negative, slight to moderate*	*Permanent, imperceptible*
T3	3m	Medium	Negligible to Low	*Temporary, negative, slight*	*Permanent, imperceptible, and Permanent, positive*
T4	150m	Medium	Neutral	*Temporary, neutral*	*Permanent, neutral*
T5	5m	Medium	Negligible	*Temporary, negative, imperceptible to slight*	*Permanent, imperceptible*
T6	6m	Medium	Positive	*Temporary, negative, slight*	*Permanent, positive*
T7	60m	Medium	Neutral	*Temporary, neutral*	*Permanent, neutral*
T8	5m	Medium	Negligible and Positive	*Temporary, negative, slight*	*Permanent, imperceptible, and Permanent, positive*
T9	140m	Medium	Positive	*Temporary, negative, imperceptible to slight*	*Permanent, positive*

SCA (North Loop Peninsula SCA) – Distance from nearest flood defence measure = 0m

This SCA includes all visual receptors enjoying scenic views to and from the sea, for example, commuters along the coastline, receptors at the beach, residences, etc. The seascape at Moore Bay comprises uninterrupted open views of scenic quality in most directions. Moore Bay coasts at a higher elevation than Kilkee Beach, which provides views between the eastern and western coasts.

Sensitivity – Receptors would be residents at home, people travelling along roads, scenic and active travel routes, receptors at Kilkee Beach, visitors to Kilkee resorts, etc. Sensitivity is *High.*

Magnitude – Views are directed towards the sea and Moore Bay and generally away from the proposed development. Elements such as the Atlantic Stream Outfall and the reprofiling of the road junctions at

Marine Parade are within or in close proximity to the SCA and therefore are likely to perceived by receptors. These proposals comprise a small scaled and short height increase of the existing outfall cover and road level at the existing junctions. The repair of the drainage system under the existing steps will have visual effects during construction only. The proposed development will not impact the existing long ranging views. The magnitude of change is *negligible*.

Effect – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **slight** to **moderate** during construction, and **permanent**, **negative**, **imperceptible** during operation.

SR30 (Scenic Route 30, as identified in the CDP) – Distance from nearest flood defence measure = 133m

The designated Scenic Route 30 runs along regional road R487, from the junction at Carrounaveehaun along the coast road to Kilkee. Views encompass a lot of the coastal scenic quality, as well as the rural and open field aesthetic of the country in this location. The scenic route end point is sited at Dunlicky Road, within a residential setting.

Sensitivity – Receptors would be people travelling along this route to enjoy scenic views of the coast, sea, and rural landscapes. Sensitivity is *High.*

Magnitude – Views are directed at the sea and rural landscape and generally away from the proposed development. Due to the end point of the scenic route finishing at Dunlicky road, new embankments at the Well Stream and Western Tributary may be perceived from the Scenic Route. However, the proposed embankments will be low height and vegetated, and diminished by distance (located approximately 340 metres away from scenic route) and road field boundary vegetation. The embankments will be an additional soft element in the landscape and will help screen existing buildings from view. The proposed flood measures, including the ones sited the nearest to the existing scenic route, such as the reprofiling of the road junctions at Marine Parade, will not be visible from the entire extent of this recreational route. The magnitude of change is *Negligible*.

Effect - In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **slight** during construction, and **permanent**, **positive** during operation.

EuroVelo (Atlantic Coast Cycle Route EuroVelo) - Distance from nearest flood defence measure = 0m

EuroVelo is a Cycle dedicated route along the Atlantic Coast, crossing Kilkee via Milltown Road, N67 national road, Strand Line, O'Curry Street, past Marine Parade towards Dunlicky Road where it joins Scenic Route 30. Views are directed to the coast and sea. Where the route crosses rural areas, these include open long ranging views of scenic quality.

Sensitivity – Receptors include people travelling and commuting along this route to enjoy scenic views of the coast, sea, and rural landscapes. Sensitivity is *High.*

Magnitude – Views are directed at the sea and rural landscape and generally away from the proposed development. The proposed reprofiling of the road junctions at Marine Parade coincides with a section of the existing EuroVelo route. The proposed works are ground or underground level only and will not alter the views from this receptor. The proposed trash screen, outfall and repair works of the Atlantic Stream, and some of the works at the Victoria Stream and the Well Stream are located less than 100m from the existing cycle route. These elements and the proposed U-channel at the Well Stream are likely to be visible from this receptor, however, views are directed towards Moore Bay and away from the proposed development. Proposals will not intrude on the available vistas. The magnitude of change is *Negligible*.

Effects - In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **slight** during construction, and **permanent**, **imperceptible** during operation.

LH Cycleway (Loop Head Cycleway) - Distance from nearest flood defence measure = 0m

The Loop Head Cycleway circles around the northeastern portion of the peninsula, starting at the Cliff Walk, northwest of Kilkee town. It has two entrance routes into Kilkee via Dunlicky Road to the northeast and O'Connell Streat to the southeast. It crosses Kilkee town via Circular Road and Marine Parade. Views

are directed towards the coast and sea. Where the route crosses rural areas, these include open long ranging views of scenic quality.

Sensitivity - Receptors include people travelling and commuting along this route to enjoy scenic views of the coast, sea, and rural landscapes. Sensitivity is *High.*

Magnitude – Some of this route coincides with Scenic Route 30 and Atlantic Coast Cycle Route EuroVelo. Therefore, this route will be within the same distance of the proposed works at Marine Parade, the Well Stream, and the Victoria Stream. Due to its portion along O'Connell Street and Circular Road, it also comes in proximity of the proposed development area at Kilkee Bay Hotel and Dún an Óir estate (circa 115m and 190m respectively). No proposal will intrude on the available vistas due to proposed works occurring on existing built and soft boundaries. The magnitude of change is *Negligible*.

Effects - In accordance with the methodology, the significance of visual effects would be **temporary***,* **negative***,* **slight** during construction, and **permanent***,* **imperceptible** during operation.

R1 (Residential cluster at Ocean View, Byrne's Cove, Mount Charles Terrace, and Trident Holiday Homes) - Distance from nearest flood defence measure = 100m

This group of residential dwellings and holiday homes, north of Kilkee town and east of Moore Bay, includes one to two-storey detached houses, terraced housing, and semi-detached dwellings. These residential and holiday estates sit on a hill, sloping towards Moore Bay. In general, views, when available, are directed towards Moore Bay. In locations where housing is denser, views are screened by adjacent buildings or walls.

Sensitivity – Receptors would be residents at home and visitors in holiday homes. Sensitivity is *High*.

Magnitude – The majority of dwellings and holiday homes in this receptor group have the principal views facing towards Moore Bay. Houses located along the N67 are directed towards the road itself, and away from the proposed development and from Moore Bay. Some existing views are likely to include the Atlantic Stream outfall and new trash screen, as well as the reprofiling works at Marine Parade. The proposed works are small in scale and at a sufficient distance to be discernible in the available scenic views. The magnitude of change is *negligible.*

Effects – The proposal will be barely discernible within the available vista and will not detract from the views of Moore Bay. In accordance with the methodology, the significance of visual effects would be **temporary***,* **negative***,* **slight** during construction, and **permanent***,* **imperceptible** during operation.

R2 (Residential cluster at Circular Road, Dún an Óir estate and Grattan Street) – Distance from the nearest flood defence measure – 0m

This residential cluster includes one to two storey semi-detached and detached houses, and is located east of Moore Bay, as well as east and south of the Atlantic Stream. Existing dwellings generally face Grattan Street and Circular Road, or residential estates, such as Dún an Óir estate. The proposed boundary wall increase is located on the rear boundary of some dwellings at Dún an Óir estate. Other nearby proposals include the new embankment 44m north, adjacent to the Sandpark mobile park.

Sensitivity – Receptors would be residents at home. Sensitivity is *High*.

Magnitude – Views are directed away from the proposed development. The proposed rear boundary wall increase is likely to only be perceived by the receptors of the existing one storey dwellings where the works are sited. The available secondary views from the rear garden are towards farmland to the south. These will not be lost with the wall increase, as the top level of the existing wall and fence boundary will remain the same. The ratio between wall and fence will change but the treatment and finishes will remain unchanged from the existing boundary. The magnitude of change is *low*.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary***,* **negative***,* **slight** during construction, and **permanent***,* **imperceptible** during operation.

R3 (Residential cluster at Smith's Gardens, Railway Road, Chapel Street and Corry Lane) – Distance from the nearest flood defence measure – 7m

This relatively dense residential area is located southeast of the town centre and includes a mix of one to two storey detached, semi-detached and terrace housing, as well as some retail, commercial and community units. This receptor group also includes two protected structures, RPS no. 574 (Parochial House) and RPS no. 403 (former Kilkee Railway Station). It's unlikely that these will be impacted by the proposed development due to distance and screening by the surrounding buildings.

Sensitivity – Receptors would be residents at home. Sensitivity is *High*.

Magnitude – The proposed development area closest to this receptor group is the proposed embankment adjacent to Kilkee Bay Hotel. Due to the small scale and remote location of this proposal, it is likely that it will only be viewed by the receptors immediately adjacent to the proposed works. This includes receptors from Kilkee Bay Apartments. The proposed embankment will be constructed on a greenfield site that is overgrown with scrub. Once the embankment is built and revegetated, the greenfield site will look very similar to the existing landscape. The magnitude of change is *negligible.*

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **slight** during construction, and **permanent**, **imperceptible** during operation.

R4 (Two one-storey bungalows in Kilrush Road) – Distance from the nearest flood defence measure – 100m

This receptor group comprises two standalone bungalows located in Kilrush Road. Their main views are towards farmland and St Senan's GAA Club to the north. These dwellings are framed by the Kilkee Bay Hotel to the west, Kilkee 38kV Substation to the south, and a greenfield site to the east.

Sensitivity – Receptors would be residents at home. Sensitivity is *High*.

Magnitude – This receptor group is located approximately 100m from the proposed embankment south of Kilkee Bay Hotel, however, these works are not within the dwelling's direct views. Furthermore, the new embankment will be screened by the existing substation to the south. The proposed increase of the wall height at the rear boundary of Dún an Óir estate is within view of these receptors, however, it will be partially screened by the St Senan's GAA Club and distance of no less than 270m. Due to the proposed wall finish matching the existing, potential effects will only take place during construction. Magnitude of change is *negligible*.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **imperceptible** to **slight** during construction, and **permanent**, **neutral** during operation.

R5 (Residential group east of Kilkee) – Distance from the nearest flood defence measure – 2m

This receptor group is located on the eastern fringe of Kilkee town, on Kilrush Road, and generally includes one to two storey detached houses, some of which are derelict.

Sensitivity – Receptors would be residents at home. Sensitivity is *High*.

Magnitude – This receptor group is located further east on Kilrush Road from receptor group R4, by at least 70 metres, and separated by a service station. These receptors are closest to the new manhole and the raised covers. Given the low level of the proposed measures in the proximity of this receptor, the change in this receptor group's views is expected to be changed at a negligible to neutral level as front of houses are generally facing the main or secondary roads, and away from the proposed development. There is one standalone two storey dwelling south of the service station, with indirect views to the proposed embankment south of Kilkee Bay Hotel. Views from the back of house will be towards a greenfield site, with the addition of a low height embankment. Other dwellings, in the north section of this group, will have indirect views to the wall height increase at Dún an Óir estate, screened by the intervening distance and boundary vegetation. The magnitude of change is *negligible*.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **imperceptible** to **slight** during construction, and **permanent**, **imperceptible** during operation.

R6 (Residential cluster to the south of Circular Road) – Distance from the nearest flood defence measure – 180m

This receptor group includes groups of houses in different settings and context, located between St Senan's Church (Kilkee Parish) and Moveen holiday park. It is also sited within a transition between urban and farmland to the east. It includes residential areas and estates such as Gord An Clochair, The Cloister and Moonin. The proposed development area located closest to this receptor group is the proposed embankment south of Kilkee Bay Hotel, which is located 180m to the north.

Sensitivity – Receptors would be residents at home. Sensitivity is *High*.

Magnitude – This receptor group includes different residential clusters. Areas such as Gord An Clochair and The Cloister are screened by the surrounding buildings and structures. Moonin is partially facing a greenfield site to the north, in the direction of the proposed development, however, it is likely to be screened by residential dwellings at Gurrane and Kilkee Bay and further mitigated by distance. The magnitude of change is *negligible*.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **imperceptible** during construction, and **permanent**, **neutral** during operation.

R7 (Marion Estate) – Distance from the nearest flood defence measure – 50m

This receptor group includes one to two storey semi-detached and terraced residential receptors at Marion Estate, located off Carrigaholt Road, south of St Joseph's Community College. The nearest flood defence measures are on the Victoria Stream sited 50m northwest from the closest receptor.

Sensitivity – Receptors would be residents at home. Sensitivity is *High*.

Magnitude – Receptors with main views facing Carrigaholt Road will likely have visibility towards the southern section of the proposed development works at the Victoria Stream. The existing greenfield is composed of grassland and overgrown scrub vegetation. The proposed development in this area includes a new embankment and landscape enhancement with new native trees and a wildflower meadow. The magnitude of change is *positive*.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **slight** during construction, and **permanent**, **positive** during operation.

R8 (Cluain Na Mara residential estate) – Distance from the nearest flood defence measure – 0m.

This receptor group is composed of one to two storey semi-detached dwellings, located immediately south of the Western Tributary, and west of the Victoria Stream. Main views are towards the south, east and west and away from the proposed development. Cluain Na Mara and the neighbouring greenfield sites are separated by tall concrete block walls.

This receptor has been selected as a viewpoint (VP07) for a visual impact assessment using a verified photomontage.

Sensitivity – Receptors would be residents at home. Sensitivity is *High*.

Magnitude – Main views are directed away from the proposed development. Some indirect views from the rear façade of dwellings will face the greenfield sites. These will not change in character and will be enhanced with ponds, leaky dams, and new native and wildflower planting. The magnitude of change is *positive*.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **slight** during construction, and **permanent**, **positive** during operation.

R9 (Victoria Court, Victoria Crescent, and St Patrick's Terrace residential estates) – Distance from the nearest flood defence measure – 0m

This receptor group includes different residential estates composed of one to two-storey detached and terraced dwellings. Main views are towards Marine Parade and Well Road from Victoria Court, towards Victoria Crescent itself from Victoria Crescent, and towards Carrigaholt Road and St Patrick's Terrace itself from St Patrick's Terrace. Views are generally facing away from the proposed development areas, apart from the Victoria Court dwellings facing Well Road and Marine Parade.

This receptor has been selected as a viewpoint (VP09) for a visual impact assessment using a verified photomontage. The visual impact in Well Road from a neighbouring receptor is captured in VP05 which will inform visual effects from this receptor.

Sensitivity – Receptors would be residents at home. Sensitivity is *High*.

Magnitude – Some of the receptors with views facing away from the development have rear boundary walls separating from greenfield sites where the proposed development is sited, such as Vitoria Stream. Existing receptors at Victoria Court facing Marine Parade have direct views towards the reprofiling road works occurring along junctions at Marine Parade. The dwellings facing Well Road are located in proximity to the culvert works and subsequently the new U-channel. The magnitude of change is *negligible* for the works at Marine Parade and *low to medium* at Well Road.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, *slight to moderate* during construction, and **permanent**, **negative**, **imperceptible** *to* **slight** during operation.

R10 (Victoria Park residential dwellings) – Distance from the nearest flood defence measure – 5m

Victoria Park is located west of the Victoria Stream and receptor group R9, and north of the Western Tributary. The residential estate is accessed by Victoria Park off Well Road. There is a secondary road headed south but is gated once it reached the southern section of Victoria Park. The estate is composed of mainly two-storey semi-detached dwellings or duplex units facing towards the main road of the estate. This is generally in an eastern or western direction, away from the proposed development or screened by adjacent units. The southernmost unit is located immediately north of the existing Western Tributary, but its main façade is facing north, away from the proposed works, and bounded by a tall wall. This receptor group is in proximity to the proposed development areas at Well Road, the Victoria Stream, and Western Tributary.

This receptor has been selected as a viewpoint (VP14) for a visual impact assessment using a verified photomontage. The visual impact in Well Road from a neighbouring receptor is captured in VP05 which will inform visual effects from this receptor.

Sensitivity – Receptors would be residents at home. Sensitivity is *High*.

Magnitude – The character of the landscape at Western Tributary and the Victoria Stream will not change but will be enhanced with landscape and flood relief measures in this location. The northernmost dwellings of this receptor group are located in proximity to the proposed works at Well Road, with main views facing the proposed development. The magnitude of change is *positive* for receptors near Western Tributary and the Victoria Stream, but *low to medium* for receptors with views directed at the Well Stream.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **slight** *to* **moderate** during construction, and mainly **permanent**, **positive** during operation with a localised **permanent**, **negative**, **slight**.

R11 (Residential dwellings at Well Road) – Distance from the nearest flood defence measure – 0m

This receptor at Well Road includes 3no. one-storey dwelling located west of the Well Road junction, and south of the existing the Well Stream. Main views are divided between east and west. The southern dwelling is directed towards the greenfield site to the east, which appears to be accessible from all dwellings. The middle and northern units' main entrance and views is via the Cunningham Holiday Park access road to the west. The northern dwelling has a secondary access gate to the north, via an informal access point over the Well Stream.

This receptor has been selected as viewpoints (VP04 and VP05) for a visual impact assessment using verified photomontages.

Sensitivity – Receptors would be residents at home. Sensitivity is *High*.

Magnitude – This receptor cluster is located immediately adjacent to the proposed development at the Well Stream. The proposed works include a new raised concrete U-channel along the Well Stream that will be screened from these receptors through existing tree and shrub vegetation in the greenfield site and high boundary walls. The proposals at the Well Stream have the potential to allow for revegetation that is

expected to reduce the visual impacts. Visual effects are not directly in front of the direct views but may be visible from the front façade of these dwellings. The magnitude of change is *negligible to low.*

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **slight** during construction, and **permanent**, **negative**, **slight** during operation.

R12 (Marine Parade, Geraldine Place, Albert Place, Well Field, Well Road residential estates and clusters) – Distance from the nearest flood defence measure – 0m

This receptor includes one to two-storey dwellings along Marine Parade, Geraldine Place, Albert Place and Well Field, as well as 3no. units at Well Road junction. It is likely that receptors at Geraldine Place and Albert Place will not be impacted by the proposed development, as their main views are towards the respective roads. Receptors at Marine Place face Kilkee Beach and will have visibility to the reprofiling works at Marine Place. Well Field is located in proximity to the proposed works at the Well Stream and the 3no. dwellings at Well Road are immediately adjacent to the proposed culvert works at the Well Stream.

There are three protected structures within this receptor group, NMS no. CL056-042 (Well in Well Field), RPS no. 481 (Church at Geraldine Place) and RPS no. 397 (8 Marine Parade).

This receptor group has been selected as viewpoints (VP03 and VP05) for a visual impact assessment using verified photomontages.

Sensitivity – Receptors would be residents at home. Sensitivity is *High*.

Magnitude – It is likely that the reprofiling works at Marine Parade will be visible from the residential receptors in this location and from RPS no. 397, but it will not impact the visual amenity of Kilkee Beach and Moore Bay. The proposed development is unlikely to be visible from the other protected structures. The proposed development works at Marine Parade and the Well Stream are not likely to be visible from Geraldine Place or the Well Stream. The loss of trees at the end of the Well Stream tributary to allow for temporary vehicle access may be visible in the distance but will not change the character of views from this receptor group. The proposals at the Well Stream have the potential to allow for revegetation that is expected to reduce the visual impacts. The magnitude of change is *medium* during construction and *low* in the operational phase.

Effects – In accordance with the methodology, the significance of visual effects would be *temporary,* **negative**, **moderate** during construction, and **permanent**, **negative**, **imperceptible** *to* **slight** during operation.

R13 (West End, Wellington Square, Merton Square, Merton Close and Dunlicky Road residential estates and clusters) – Distance from the nearest flood defence measure – 75m

This receptor group includes one to three storey dwellings and apartment buildings along West End, Wellington Square, Merton Square, Merton Close and Dunlicky Road. Receptors at Wellington Square are located within 75 to 100 metres of the proposed reprofiling works at Marine Parade. Receptors at Merton Square and Dunlicky Road are fully screened from the proposed development. Some dwellings from Merton Close may have visibility to the proposed embankment at the Well Stream. There are four protected structures within this receptor group, RPS no. 411 (West End House), RPS no. 404 (Rose Lodge), RPS no. 400 (Bayview House) and NMS no. CL56-040001 (burial ground). There is also a megalithic structure (NMS no. CL056-040002) 33 metres south of the burial ground, but this does not seem to include a formal access to the public. Protected structures in this receptor group are not directed to the proposed development. The national monuments located east of Merton Close are directed towards Dunlicky Road or are not a formal visitor attraction.

This receptor has been selected as different viewpoints (VP01 and VP02) for a visual impact assessment using verified photomontages.

Sensitivity – Receptors would be residents at home. Sensitivity is *High*.

Magnitude – Dwellings at Wellington Square immediately adjacent to West End, including RPS no. 411, are facing south, in the direction of the proposed reprofiling works at Marine Parade. This will only include the easternmost dwellings, as views to the proposed development from the units to the west are screened by neighbouring buildings. The proposed reprofiling works include ground level interventions and will not impact on the visual amenity in this location. Dwellings at Merton Close face the estate itself but may

include glimpses to the south of the proposed embankment of the Well Stream. The embankment will not affect the landscape character in this location and will marry into the existing landscape. The magnitude of change is *negligible.*

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **slight** during construction, and **permanent**, **imperceptible** during operation.

R14 (West End - North) – Distance from the nearest flood defence measure – 110m

This receptor group includes the one to three-storey dwellings along the northern section of West End facing Moore Bay. The main views from this receptor group are directed towards Moore Bay and away from the nearest proposed development area at Marine Parade. The proposed reprofiling works at Marine Parade and the repair works at the Atlantic Stream outfall may be visible from this location, but most likely during construction. The proposed development in these locations will include the same character and finishes as the existing landscape. The existing protected structures within this receptor group, RPS no. 407 (pair of houses, West End), RPS no. 396 (3 Clifden Terrace), RPS no. 409 (Sykes House), and RPS no. 402 (Clifton), are included in this assessment as residential receptors.

Sensitivity – Receptors would be residents at home. Sensitivity is *High*.

Magnitude – The proposed reprofiling works at Marine Parade and the repair works at the Atlantic Stream outfall will be within view during the construction works but will be mitigated by distance. During the operational phase, the Marine Parade junctions will have similar finishes and a small level change, and the outfall area of the Atlantic Stream will appear the same as the existing. The magnitude of change is *negligible to neutral.*

Effects – In accordance with the methodology, the significance of visual effects will be **temporary**, **negative**, **imperceptible** *to* **slight** during construction, and **permanent**, **imperceptible** *to* **neutral** during operation.

TC (Town Centre) – Distance from the nearest flood defence measure – 60m

The Kilkee town centre is located along the southeast edge of Kilkee beach, and it includes residential dwellings, retail, and commercial units. This receptor group extends through Strand Line, with key views towards Moore Bay, as well as O'Curry Street, O'Connell Street, Ballaley Lane and all associated secondary roads, where main views face the street itself. Views towards Moore Bay may catch glimpses of the proposed works at the Atlantic Stream Outfall and at Marine Parade.

There are several protected structures included in this receptor group, however, these buildings are located away from Strand Line, with views directed away from the proposed development. It is unlikely for these structures to have views towards the proposed development.

Sensitivity – Receptors would be residents at home, shop users and visitors. Sensitivity is *High*.

Magnitude – The receptors at Strand Line have scenic views towards Moore Bay. It is likely that the proposed development at Marine Parade and the Atlantic Stream outfall will be visible from this location, however, these include angled views to the east and west and are not likely to impact the available vistas. The proposed development areas include minor changes in the landscape and are more likely to be perceived during construction. The magnitude of change is *negligible.*

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **imperceptible** *to* **slight** during construction, and **permanent**, **imperceptible** *to* **neutral** during operation.

C1 (East End Boathouse, Pier, and Kilkee Coast Guard Station) – Distance from the nearest flood defence measure – 40m

The Boathouse (RPS no. 511) and Kilkee Coast Guard Station are located on the eastern edge of Kilkee Beach. Wide angle views of scenic quality are available from this location; however, this receptor group is focused on views in a professional manner (e.g. fishing and coastal safety).

Sensitivity – Receptors would be visitors and fishermen of the boathouse and professionals at the Coast Guard. Sensitivity is *Medium*.

Magnitude – The proposed the Atlantic Stream outfall works are located 40 metres east from this receptor group at its nearest point. Views of these works would be angled and will not impact the available vistas. The outfall repair works, and the new raised outfall cover will be indiscernible in views during operation. The proposed reprofiling works at Marine Parade are located over 650 metres southwest and are unlikely to be visible from this receptor. The magnitude of change is *negligible*.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **slight** during construction, and **permanent**, **imperceptible** *to* **neutral** during operation.

C2 (St. Senan's GAA Club) – Distance from the nearest flood defence measure – 50m

This receptor is located on Kilrush Road, on the eastern edge of Kilkee. It is bounded by Collin's mobile home Park to the west, farmland to the north and east and Kilkee Bay Hotel to the south. The proposed wall height increase at the Atlantic Stream is located 50 metres to the northwest. The existing GAA club is a recreational amenity views are focused to sports activities.

This receptor has been selected as a viewpoint (VP12) for a visual impact assessment using a verified photomontage.

Sensitivity – Receptors would be people using the GAA club for recreational activities. Sensitivity is *Low*.

Magnitude – The proposed development works include a wall increase to the existing Dún An Óir boundary. The final top height of the wall and fenced boundary will remain the same once constructed. The magnitude of change is *negligible*.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **slight** during construction, and **permanent**, **imperceptible** during operation.

C3 (Scoil Réalt na Mara National School) – Distance from the nearest flood defence measure – 270m

This receptor is located on Chapel Street, in a residential setting. Views are directed internally and focused on the school activities or secondly towards Chapel Street. The nearest proposed development area is located on Marine Parade but will not be visible from this location due to dense screening from the neighbouring buildings.

Sensitivity – Receptors would be students and staff at the school. Sensitivity is *Low*.

Magnitude – The proposed development will not be visible from this receptor. The magnitude of change is *neutral*.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **neutral** during construction, and **permanent**, **neutral** during operation.

C4 (St Senan's Church (Kilkee Parish)) – Distance from the nearest flood defence measure – 260m

This receptor is located on Circular Road, and it includes the Kilkee Parish and surrounding green space. The church is within a residential and build landscape character. The proposed development area nearest to the church is the proposed embankment adjacent to Kilkee Bay Hotel. The proposed flood defence measure will be fully screened by the neighbouring buildings.

Sensitivity – Receptors would be people going to church. Sensitivity is *High*.

Magnitude – The proposed development will not be visible from this receptor. The magnitude of change is *neutral*.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **neutral** during construction, and **permanent**, **neutral** during operation.

C5 (Saint James Church of Ireland) – Distance from the nearest flood defence measure – 135 to 140m

This receptor is located on Carrigaholt Road within a mixed setting of residential, holiday homes and town centre use. Main views are directed to Carrigaholt Road to the west. There are two proposed development area located within 200 metres of the existing road, the reprofiling works at Marine Parade approximately 135m to the northwest, and the proposed flood defence measures at the Victoria Stream approximately

140m to the west. The proposed flood defence measure will be fully screened by the neighbouring buildings.

Sensitivity – Receptors would be people going to church. Sensitivity is *High*.

Magnitude – The proposed development will not be visible from this receptor. The magnitude of change is *neutral*.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **neutral** during construction, and **permanent**, **neutral** during operation.

C6 (St. Joseph's Community College) – Distance from the nearest flood defence measure – 36m

This receptor is located on Church Street, in a residential and temporary accommodation setting. Views are directed internally and focused on the school activities or secondly towards Church Street. The nearest proposed development area is located on the greenfield site west of the school, where flood defence measures for the Victoria Stream are proposed. Secondary views from the school to Church Street include views to an access point to the existing field to the west. The field includes grassland and overgrown scrub.

This receptor has been selected as a viewpoint (VP8) for a visual impact assessment using a verified photomontage.

Sensitivity – Receptors would be students and staff at the school. Sensitivity is *Low*.

Magnitude – Key views are localised to the school itself. Secondary views from the school entrance are directed at the greenfield site to the east, which will be enhanced with a new embankment and landscape treatment as part of the flood defence measures. The magnitude of change is *positive.*

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **slight** during construction, and **permanent**, **positive** during operation.

T1 (Kilkee Beach and car park) – Distance from the nearest flood defence measure – 0m

Kilkee Beach is an important attraction in Kilkee and brings many visitors per year. Access is provided from all directions and there is a public car park available to the east. The beach is also an important visual and ecological amenity, and part of the Kilkee SCA and SAC. There are three protected structures within this receptor group, RPS no. 578 (Slipway), RPS no. 578 (Bandstand) and RPS no. 576 (Seawall and promenade at Strand Line). These structures are mostly utilitarian except for the bandstand that is potentially used for town events as well. The proposed development areas included within or in proximity of this receptor group include the Atlantic Stream outfall and Marine Parade works. Existing views from the beach are mainly directed at the beach itself or towards Moore Bay.

This receptor has been selected as a viewpoint (VP10) for a visual impact assessment using a verified photomontage.

Sensitivity – Receptors would be visitors to the beach in a recreational or visual capacity. Sensitivity is *High*.

Magnitude – The proposed development at the reprofiling works at Marine Parade is in the opposite direction of Kilkee Beach and will therefore not affect the available vistas. The proposed development at the Atlantic Stream outfall includes localised small-scaled interventions that will only be perceived during construction. The magnitude of change is *negligible*.

Effects – The repair works, and the outfall cover height increase at the Atlantic Stream outfall will be indiscernible during operational but will be visible during construction, especially from the public car park. In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **slight** during construction, and **permanent**, **imperceptible** during operation.

T2 (Waterworld and open space) – Distance from the nearest flood defence measure – 0m

This receptor group includes the Waterworld building, a recreational building with water related activities, and the open space located southeast of the building. Views from the building are internally focused on the water activities. The building also includes a window façade that provides long ranging views to Moore

Bay. The open space is partially screened from views to Moore Bay by the existing Waterworld building. People visit these amenities in a temporary manner.

The proposed trash screen at the Atlantic Stream is located within this receptor group, and the outfall works are located approximately 46 metres to the west.

This receptor has been selected as a viewpoint (VP11) for a visual impact assessment using a verified photomontage.

Sensitivity – Receptors would be visitors to the Waterworld and open space. Sensitivity is *Medium*.

Magnitude – The proposed development in this location includes ground level and below ground level interventions that will be perceived mostly during construction. The proposed trash screen will be installed to the Atlantic Stream level, which is mostly below the adjacent ground levels. This may be visible from receptors in the open space when in proximity to the screen but will not impact vistas to Moore Bay from other locations. The magnitude of change is *negligible.*

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **slight** *to* **moderate** during construction, and **permanent**, **imperceptible** during operation.

T3 (Sandpark Kilkee) – Distance from the nearest flood defence measure – 3m

This receptor is located east of Kilkee, on the fringe of town. The mobile home park is divided into two groups, separated by the Atlantic Stream. Sandpark mobile park is surrounded by farmland to the north and east and residential clusters to the west and south. The proposed embankment at the Atlantic Stream is located on the southeast boundary of the northern section of Sandpark. Views are directed towards the mobile home park itself.

Sensitivity – Receptors would be visitors and users of the holiday park. Sensitivity is *Medium*.

Magnitude – The proposed embankment will be perceived by the caravans located along the same boundary, but it will not screen views from this receptor. The boundary comprises existing vegetation that would be enhanced by the new embankment with regenerated planting. The wall height changes at the Dún An Óir estate boundary may be visible from this receptor but it will not alter the character of views. The magnitude of change is *negligible to low*.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **slight** *to* **moderate** during construction, and **permanent**, **imperceptible** for the proposed wall increase and **permanent**, **positive** for the new embankment during operation.

T4 (Caravan Park on Circular Road) – Distance from the nearest flood defence measure – 150m

This receptor is enclosed in a residential setting, located on the eastern section of Circular Road. The proposed development area located nearest to this receptor includes the boundary and embankment works at the Atlantic Stream. This will be fully screened from view from the mobile home park.

Sensitivity – Receptors would be visitors and users of the holiday park. Sensitivity is *Medium*.

Magnitude – The proposed development will not be visible from this receptor. The magnitude of change is *neutral*.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **neutral** during construction, and **permanent**, **neutral** during operation.

T5 (Collin's mobile home Park) – Distance from the nearest flood defence measure – 5m

This receptor is located on the northeastern edge of Kilkee Town, enclosed by residential dwellings from all directions, except for the Atlantic Stream and St Senan's GAA Club to the east. Views are directed towards the mobile home park itself. The proposed wall height increase at Dún An Óir estate is located northeast of this receptor.

Sensitivity – Receptors would be visitors and users of the holiday park. Sensitivity is *Medium*.

Magnitude – The proposed development includes the increase of the wall height at the residential estate to the northeast and will include the same finish as the existing wall. The top of height of this boundary will not change. The magnitude of change is *negligible*.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **imperceptible** *to* **slight** during construction, and **permanent**, **imperceptible** during operation.

T6 (Kilkee Bay Hotel) – Distance from the nearest flood defence measure – 6m

This receptor includes temporary accommodation and recreation receptors, including Kilkee Bay Hotel and Kilkee Swimgym. It is located south of Kilrush Road and St Senan's GAA Club. It is surrounded by residential areas to the west, as well as two dwellings and a substation to the east. The proposed embankment at the greenfield site south of Kilkee Bay Hotel is part of the proposed flood defence measures. The existing greenfield site is overgrown with scrub vegetation and is separated by the receptors in this group by a derelict timber rail fence. The proposed development will help formalise the boundary of this green area as part of the flood defences. Key views are from the front façade of the buildings to the north, and away from the proposed development. Secondary views will be to the south towards the proposed embankment.

This receptor has been selected as a viewpoint (VP13) for a visual impact assessment using a verified photomontage.

Sensitivity – Receptors would be visitors and users of the temporary and recreational amenities. Sensitivity is *Medium*.

Magnitude – The proposed development will include an enhancement to the existing boundary of the greenfield site as part of the flood defence measures. The magnitude of change of the secondary views from this receptor is *positive*.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **slight** during construction, and **permanent**, **positive** during operation.

T7 (Moveen mobile home Park) – Distance from the nearest flood defence measure – 60m

This receptor is sited on the south of Kilkee, and is enclosed by residential, community and commercial amenities to the north, east and west. Extensive farmland is located to the south and partially enclosed by fences and walls. Views are directed towards the mobile home park itself. The proposed development area at the Victoria Stream is located 60 metres to the west but will be fully screened from view from the mobile home park.

Sensitivity – Receptors would be visitors and users of the holiday park. Sensitivity is *Medium*.

Magnitude – The proposed development will not be visible from this receptor. The magnitude of change is *neutral*.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **neutral** during construction, and **permanent**, **neutral** during operation.

T8 (Cunningham's Holiday Park) – Distance from the nearest flood defence measure – 5m

This receptor is located south of the Well Stream, north of the Western Tributary and west of residential groups at Well Road and Victoria Park. The western boundary is farmland in its entirety. The mobile home park is separated from the neighbouring lands by a steel mesh fence and low concrete wall to the west and south, and a high concrete block wall to the north. The proposed development at the Well Stream is located immediately north, and the proposed works at the Western Tributary are directly south and west of the mobile home park. Views are directed towards the mobile home park itself.

Sensitivity – Receptors would be visitors and users of the holiday park. Sensitivity is *Medium*.

Magnitude – The proposed U-channel and sluice valves at the Well Road will likely be screened from view due to the high concrete block wall to the northern boundary of the mobile home park. The proposed embankment is likely to be visible from the east but is likely to enhance the western boundary of the mobile home park with the farmland. The proposed flood defence measures at the Western tributary

include landscape enhancement proposals. The magnitude of change is *negligible* to the northern boundary and *positive* for western and southern boundaries.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **slight** during construction, and **permanent**, **imperceptible**, and **permanent**, **positive** during operation.

T9 (Moore Bay Holiday Homes) – Distance from the nearest flood defence measure – 140m

This receptor is located on the southwest outskirts of Kilkee, west of R487 regional road and south of The Brooks. The holiday homes include a grid of semi-detached two-storey dwellings. Due to these receptors functioning as holiday homes, receptors in this location are deemed temporary, as they would not experience views permanently. Dwellings within the estate are directed towards the east or south, whereas units along the boundary are facing the road or boundary itself. Therefore, dwellings along the northern boundary with The Brooks are directed towards the proposed development at The Western Tributary. The northern edge of The Brook includes some overgrown vegetation which partially screens the proposed development from view. The proposed development at the Western Tributary includes landscape enhancement proposals as part of the flood defence measures, such as new native tree planting and wildflower meadows.

This receptor has been selected as a viewpoint (VP06) for a visual impact assessment using a verified photomontage.

Sensitivity – Receptors would be visitors and users of the holiday park. Sensitivity is *Medium*.

Magnitude – Views to the proposed development from the north are partially screened by road edge vegetation. Views to the flood defence measures are mitigated by distance but are enhanced by the landscape enhancement proposals. The magnitude of change is *positive*.

Effects – In accordance with the methodology, the significance of visual effects would be **temporary**, **negative**, **imperceptible** *to* **slight** during construction, and **permanent**, **positive** during operation.

12.6 Mitigation Measures and Residual Impacts

No significant impacts to the landscape and visual amenity were identified, therefore no mitigation measures are proposed for the proposed development. The residual impacts remain as per the initial assessment.

13 Interactions

13.1 General

The EIA Directive (2014/52/EU) requires a description of:

'the interaction between any of the foregoing aspects'

Interactions can occur when a predicted impact causes interaction or dependency with other environmental aspects. This section discusses the interactions between aspects and assesses them as positive, negative, or neutral.

The interactions of environmental effects were considered throughout the EIA process for the proposed development and adjustments were made to the design of the layout to mitigate impacts arising from these interactions. In Table 13-1, interactions between certain environmental aspects are marked with a 'Y' and discussed in the text below.

Table 13-1: Interactions between environmental aspects

	Air Quality and Dust	Climate	Noise and Vibration	Population and Human Health	Biodiversity	Land and Soil	Water	Cultural Heritage
Population and Human Health	**Y**		**Y**					
Biodiversity	**Y**							
Land and Soil	**Y**	**Y**			**Y**			
Water	**Y**			**Y**	**Y**	**Y**		
Material Assets	**Y**			**Y**		**Y**	**Y**	
Cultural Heritage	**Y**							
LVIA	**Y**			**Y**	**Y**			**Y**

13.2 Air Quality and Dust – Biodiversity

During construction works, the potential for dust generation and emissions, or impacts on air quality could lead to indirect effects on biodiversity on site or in the surrounding areas. The Biodiversity chapter considered this potential and that mitigation measures outlined in Chapter 6 Construction Impacts would be put in place. No residual impacts on biodiversity are expected to occur due to air quality and dust impacts.

13.3 Air Quality and Dust – Land and Soil

The movement and excavation of soils during construction could lead to increases in dust generation and movement. This has been considered in the air quality and dust chapter, and the impact of works to land and soil will not lead to a significant interaction with air quality and dust.

13.4 Air Quality and Dust – Population and Human Health

Significant quantities of dust or impacts to air quality could lead to negative effects for population and human health in Kilkee. There are no significant negative interactions expected, as the effect from air quality and dust as outlined in the Construction Impacts chapter will be negligible.

13.5 Air Quality and Dust – Water

Earthworks during the construction phase could give rise to impacts on water quality due to dust impacts. The Water chapter considered this potential and found that impacts due to dust are not expected to be significant.

13.6 Air Quality and Dust – Material Assets

Air quality and dust impacts wre noted as a potential interaction with material assets, however the Material Assets chapter did not regard this as a potential impact pathway. Interactions between these factors are therefore not expected to occur.

13.7 Air Quality and Dust – Cultural Heritage

Air quality and dust impacts were noted as a potential interaction with cultural heritage, however the Cultural Heritage chapter did not regard this as a potential impact pathway. Interactions between these factors are therefore not expected to occur.

13.8 Air Quality and Dust – Landscape and Visual Impact

Large depositions of dust could have a negative impact on landscape or visual amenity for receptors in Kilkee. This is not expected to occur due to the predicted impact of dust being negligible, and mitigation measures outlined in the Construction Impacts chapter.

13.9 Population and Human Health – Noise and Vibration

Excessive noise or vibration during construction could interact negatively with population and human health in Kilkee or the surrounding area. Mitigation measures outlined in the Construction Impacts chapter will ensure that the impact of noise and vibration on population and human health will not be significant.

13.10 Population and Human Health – Water

Impacts to water quality could negatively interact with population and human health, due to either impacts to drinking water, or the quality of bathing water in Kilkee Bay.

13.11 Population and Human Health – Material Assets

Impacts to material assets, in particular to utilities or roads, traffic, and transport, could lead to interactions with population and human health if significant or allowed to go on for a long time. This is unlikely to occur given the nature of the proposed works and likely short length of disruptions to utilities. Impacts on population and human health due to material assets impacts are likely to be slight and temporary.

13.12 Population and Human Health – Landscape and Visual

Impacts to visual amenity and landscape assets could negatively impact the opportunities and quality of recreation including tourism which is an important industry in Kilkee. The proposed development can temporarily slightly impact these assets. In the long-term the reduced risk to flooding and improved quality of water that outflows in to the Bay is expected to have a positive impact to these recreational opportunities.

13.13 Land and Soil – Water

Soils and geology share direct links with groundwater and surface water. Soil quality and characteristics such as granularity, pore space, moisture content and texture have effects on the rate of groundwater recharge, infiltration, percolation, transmissivity, and run-off. Similarly, surface water run-off can affect soil quality and condition through deposition or withdrawal of chemicals, suspended solids, and nutrients. With

the mitigation measures outlined in the Land and Soils and Water chapters, the potential impact through interaction between these factors will be short-term, slight, negative.

13.14 Land and Soil – Biodiversity

Interactions between soils, geology, and biodiversity can occur through surface, groundwater, and air pathways. The proximity of the Kilkee Reefs SAC poses a significant risk for the entry of contaminants via surface water run-off, dewatered groundwater, and soil erosion. Introduction of contaminants and suspended solids could lead to habitat degradation of the reefs and have a negative impact on the sediment community complexes present throughout the SAC. With the implementation of appropriate mitigation measures as outlined in the Land and Soils and Biodiversity chapters, the potential effects from interactions would be short-term, imperceptible, negative.

13.15 Land and Soil – Material Assets

A significant proportion of proposed flood relief measures are proposed in urban areas adjacent to houses, holiday homes or along roads. The temporary use of public roads and private lands will be required during the construction phase. Access to private properties will require appropriate liaison with owners. Diversions, temporary disruptions and increased traffic volume are anticipated given the truck movements required for the movement of materials.

A new storm water sewer is proposed for the Well Stream system. The sewer is not a combined sewer and should not contribute to combined sewer overflow contamination or flooding. The sewer will be diverted to the existing outfalls.

It is likely that there will be interaction with utility networks such as ESB substations and networks, underground and overhead electric cables and masts, sewer networks, and streetlights which fall within the footprint of works proposed across the proposed development area. Without mitigation, the resulting interaction effects could be short-term, significant, negative. Through the implementation of appropriate mitigation measures these effects will be short-term, imperceptible, neutral.

13.16 Land and Soil – Climate

Works where excavation of soil is proposed occur in areas of seasonal waterlogging and peat. Anaerobic conditions in soils can lead to an increase in carbon dioxide. Excavation of material across the scheme area will release sequestered carbon increasing greenhouse gas levels in the air. These effects are further discussed in the Climate section of the Construction Impacts chapter. The interaction of these effects will be long-term, imperceptible, not significant.

13.17 Water – Biodiversity

The Victoria and Atlantic streams flow into the Kilkee Reefs SAC, which is a valuable habitat for a number of significant and protected species. Impacts on waterbodies could affect the SAC or aquatic habitats and species. The main potential impacts identified in the Biodiversity chapter include accidental sediment release or pollution due to spills or leaks. Mitigation measures included in the Water chapter and the Biodiversity chapter will ensure that no significant interactive effects occur.

13.18 Material Assets – Water

Construction vehicles moving on site during the construction phase could result in hydrocarbons entering the surface water drainage system, leading to effects downstream. This is mitigated against by measures included in the Water chapter for the prevention of pollution or increased sedimentation. The mitigation measures are also included in a preliminary Construction Environmental Management Plan (CEMP), which outlines the site compound location (away from any drains) and require all vehicles to be maintained frequently and to carry spill kits at all times. Without mitigation in place, this could lead to a temporary significant negative effect. However, with the measures outlined in this chapter and the Water chapter, the interaction between these will be temporary, imperceptible, neutral.

13.19 Landscape and Visual – Cultural Heritage

The ACA in Kilkee contributes to the context that makes Kilkee distinctive. In the same way it offers to the atractivenes of the local visual amenity. Any deterioration of the key features of the ACA will interact with the landscape and visual qualities. The proposed development is not expected to significantly impact these elements.

13.20 Landscape and Visual – Biodiversity

Landscape provides the context for habitats and species. Woodlands and taller vegetation also determines the extents and distance of allowed views.The potential loss of vegetation will also affect the visual amenity around the proposed development. Any inegative impact affecting these two sections is expected to be slight and very localised due to the limited level of impact to the existing vegetation and habitats. In the long term, the habitat enhancement is expected to improve the landscape character of Kilkee.

14 Cumulative Impacts

This chapter provides a summary of the potential cumulative effects assessed throughout this EIAR. The cumulative effects of the proposed development in combination with other relevant existing, planned and permitted projects have been assessed to determine whether these would give rise to significant effects on the environment.

Any predicted cumulative effects arising from the proposed development in combination with other existing, planned and permitted projects are set out in the various chapters throughout this EIAR. Figure 14-1 and Table 14-1 below provide summary details of the projects/developments that have the potential to impact resources, traffic, or the local area, and so could have potential cumulative effects with the proposed flood relief scheme.

Only those projects whose duration of permission overlaps with the likely construction period of the proposed development (i.e. 2025 onwards) are included. Small developments such as house extensions and alterations, or the construction of a single dwelling or structure, have been excluded as the likely effects of such developments will not be significant, except where they are taking place adjacent to or in close proximity to the proposed defences.

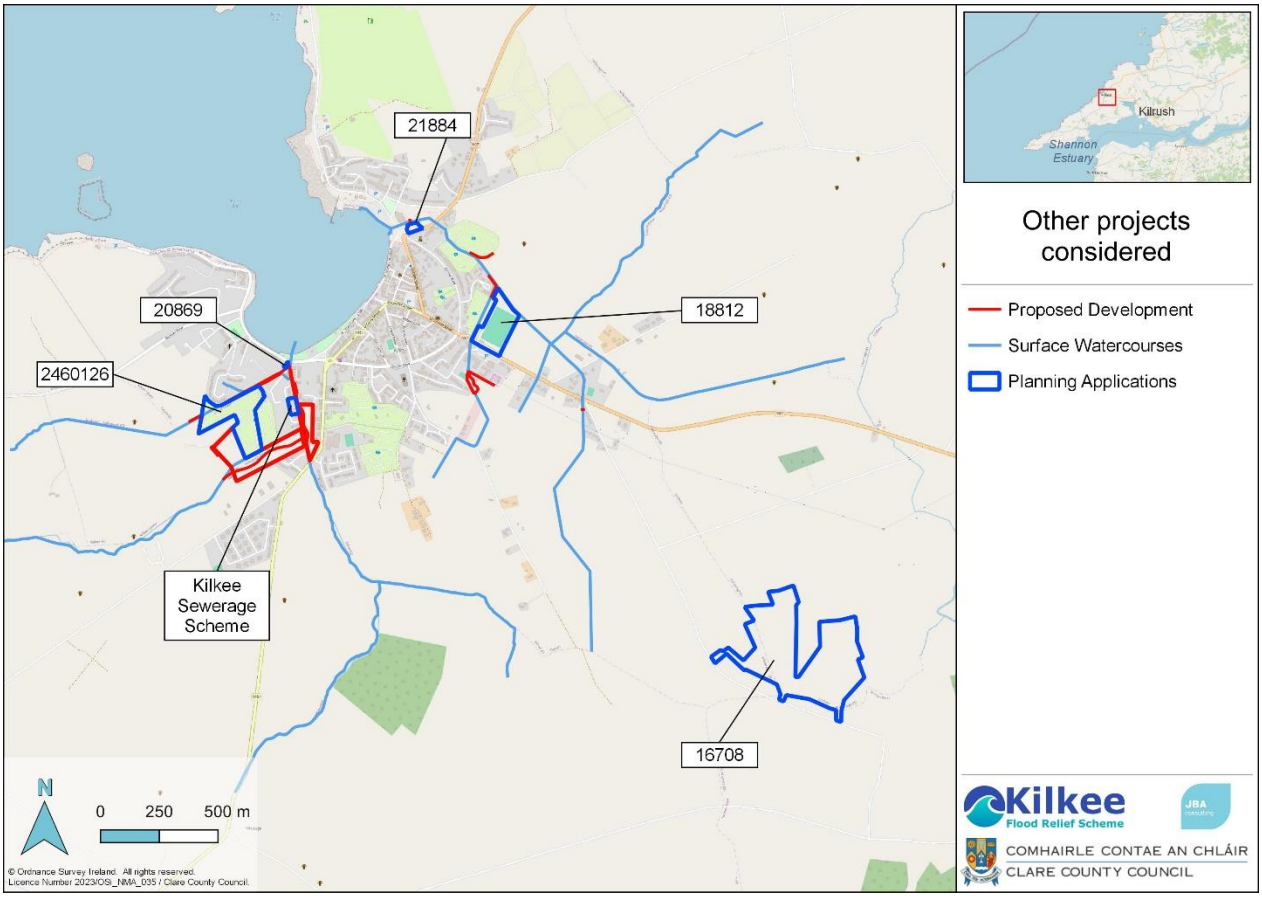

Figure 14-1: Other projects considered

Table 14-1: List of projects considered for Cumulative Effects

Project name/ Reg. Ref.	Location	Description	Status
2460002 - Kilkee Sewerage Scheme	Victoria Park, Kilkee, Co. Clare	UE is progressing the design stage of a project to install a new wastewater treatment plant in Kilkee and end the discharge of raw sewage to the marine environment. This project is currently at design stage and, following completion of site selection and land acquisition as well as a successful planning stage, Uisce Éireann expects to commence works in 2024 on this project.	Construction expected to commence in 2024
16708	Dough Lisdeen, Termon West, Kilkee	for the development of a solar photovoltaic panel array consisting of up to 37,800 m^2 of solar panels on ground mounted steel frames, 2 No. electricity control cabins, inverter units, underground cable and ducts, hardstanding area, boundary security fence, site entrance, access track, CCTV and all associated site services and works. Permission is sought for a period of 10 years.	Permission granted 30/03/2017 Expires 29/03/2027
18812	Kilrush Road, Dough, Kilkee	to construct an extension to the existing clubhouse building to consist of a new main entrance, referees room, gym and storage facilities, along with all associated site works	Permission granted 18/01/2019 Expires 17/01/2024
20869	Well Road, Marine Parade, West End Kilkee	to build an extension to existing ground floor bedroom at the North Eastern side of existing dwelling house and for planning PERMISSION for change of design of the porch previously granted under planning permission P18/504 to the South Eastern side of existing dwelling house with all necessary ancillary works	Permission granted 23/03/2021
21884	Kilkee Sub Aqua Club, Pound Street, Kilkee Co Clare	for the following development: 1. PERMISSION to demolish existing Dive Centre Building and close up existing entrance; 2 PERMISION to construct new Dive Centre Building consisting of 2 No. Rib Storage areas, changing area, toilets office and briefing room; 3. PERMISSION for new vehicular entrance, internal road, footpaths and parking spaces and ancillary site works, including connection to public sewer / services	Permission granted 19/11/2021 Expires 18/11/2026
2460126	Well Road, Kilkee Lower, Kilkee Co Clare	for the following development: (a) to demolish the existing disused toilet block and administration building; (b) to construct two no. semi-detached houses to cater for manager's accommodation and caretakers accommodation; (c) to extend the existing electrical outbuilding in the Southern park (park A) to provide recycling and electrical facilities; (d) to extend the existing electrical outbuilding in the Northern park (park B) to provide recycling and electrical facilities; (e) all associated site works and services.	Permission granted 14/05/2024

14.1 Air Quality and Dust

In relation to the in-combination construction and/or operational impact of the proposed Kilkee Flood Relief Scheme, with other proposed schemes planned in the area, the list of schemes in Table 14-1 have been reviewed. None of these schemes will result in any significant additional construction and/or operational Air Quality & Dust impact.

In section 6.1.4 Mitigation Measures above it states:

- If applicable, hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.

One of the projects in Table 14-1 has been noted as having potential to impact air quality in the area. :

- Planning Ref 21884, for development at Kilkee Sub Aqua Club, Pound Street, Kilkee, Co. Clare. This proposed development is close to the proposed Atlantic Stream outfall works and the site compound to be located at the rear of Waterworld. It is uncertain at this time if the proposed development has

been completed. If the construction period of this development is to overlap with the proposed FRS, there is a potential to impact of air quality in the area. This development could be considered a medium/high risk site, therefore regular liaison meetings should be held to ensure plans are co-ordinated and dust and particulate matter emissions are minimised.

14.2 Climate

No potential cumulative impacts were identified with regard to climate.

14.3 Noise and Vibration

No potential cumulative impacts were identified with regard to noise and vibration.

14.4 Population and Human Health

If the construction periods of the developments in Table 14-1 are to overlap with the proposed development, there is a potential to impact on population and human health through disruptions Kilkee. These effects will be temporary while the construction phase progresses, and will not be significant given the size and nature of the proposed development and others in the area.

Once operational, the proposed FRS, when considered cumulatively with the above developments, will have a positive impact on population and human health.

14.5 Biodiversity

Two main projects were identified with the potential for cumulative impacts on biodiversity.

14.5.1 Planning Ref. 21884

The new water sports facility in Kilkee is near the works on the Atlantic Stream. The facility will link into the existing water drainage network. There may be an overlap in disturbance between the construction phases of both projects. However, the new water sports facility has screened out impact on birds within the NIS, as has this project, given the distance to the SPAs and lack of bird activity in the works area. Locally important non-QI populations are similarly unlikely to be impacted, even if both projects occur simultaneously, as both projects are occurring in a similar footprint within a busy urban town, where birds within the zone of disturbance impact are already tolerant of disturbance from recreational walkers on the beach, dogs, boats and noise from the town itself. As such, no cumulative impact is anticipated from the two projects.

Planning Ref. 2460002 Kilkee Sewerage Scheme

The WWTP and new pumping station is likely to have positive impact on the local water quality within Kilkee, and a reduction in nutrient output to Kilkee Reefs SAC. Operationally, there is little potential for cumulative impact.

An overlap in the construction works between the new pumping station and the works on the Victoria Stream may result in additional pressure on the Victoria Stream, including where it is pumped out to Intrinsic Bay. Moreover, the existing plant in Victoria Park will maintain a storm overflow into the Victoria stream. The redevelopment of the site will upgrade the outfall pipe. This work and discharge point may have a cumulative impact.

With this in consideration and the fact that that the proposed development will potentially impact the QIs or conservation objectives of Kilkee Reefs SAC, it can be stated that in the absence of mitigation for this proposed development, there is some potential for cumulative impacts to occur with other local projects.

The new WWTP planning documents were presented to Clare County Council in January 2024; the development will involve two sites, one out of town upstream of the Well stream works. The second site will consist of the construction of a new Foul Pumping Station at the existing plant in Victoria Park, with the construction of an emergency storage tank; surge kiosk; washwater kiosk; odour control building; control panel kiosk; standby generator; foul pumping station; petrol interceptor; potable water / break tank kiosk; gantry's for pump and cleaning system removal; installation of underground internal site pipework including surface water drainage and petrol interceptor; ESB building and Panel Room; 2.4m high wire

mesh security boundary fence; replacement of existing chain-link fence; safety bollards; new signage; an access gate; temporary construction access including the demolition and reinstatement of a boundary wall at the existing Victoria PS site; temporary works area; permanent access off Victoria Park; and all hard and soft landscaping including screen planting.

The new WWTP will use the same existing outfall pipe into Intrinsic Bay. Disturbance impacts on the stream and associated habitats during the construction works are not considered to be significant, even if both projects happen simultaneously, as no habitats or species highly sensitive to disturbance are present, and comprehensive mitigation measures are in place. Detailed water quality protection measures are in place during the construction of this project. The water quality being discharged should be improved as it will have been treated prior to discharge, and improved water quality in the Victoria Stream will be result from this scheme once operation. As such, The WWTP works and management are independent from the FRS and therefore are not considered in detail here.

14.6 Land and Soil

The largest development falling within 5km of the proposed development is a solar farm at a site southeast of Kilkee (Ref. 16708). The farm will consist of up to 37,800m^2 of solar panels on ground mounted steel frames, underground cables and ducts, 2 no. Electricity control cabins, hardstanding area and all other associated ancillary and site works. The construction period for each development is likely to overlap, however, due to the distance from Kilkee town cumulative impacts are not anticipated to be significant.

The construction phase of the Kilkee Sewerage Scheme is expected to commence in 2024. The chosen site falls along the Victoria Stream adjacent to the proposed storage area and Carrigaholt Road Field. This will result in additional construction traffic and materials in a confined area. Liaison between the appointed contractors will be required to mitigate any significant cumulative effects arising from the coincidental construction periods. Significant cumulative effects on soils and geology are not anticipated.

Permission has been granted for several other small residential and commercial extensions within the town. Due to the size and nature of these developments they are not expected to result in significant cumulative effects on soils and geology. Overall, ensuring relevant legislation and proposed mitigation measures are adhered to and implemented, the cumulative effects associated with developments in the area are long-term with an imperceptible impact on land, soils, and geology.

14.7 Water

Other than the Kilkee Sewerage Scheme, no cumulative impacts are likely for Water, due to the size and nature of other developments in the area.

Uisce Éireann is progressing the design stage of a project to install a new wastewater treatment plant in Kilkee and end the discharge of raw sewage to the marine environment. The project will bring several benefits to Kilkee such as improved water quality in the receiving waters at Intrinsic Bay, in compliance with national and EU regulations relating to the treatment of wastewater. In addition, there will be an improvement regarding protection of recreational swimming, fishing, boating and sightseeing waters.

Future steps of the project will include a new Wastewater Treatment Plant, an upgraded pumping station, and a new rising main to transfer treated wastewater to existing outfall. Additionally, the existing Victoria pumping station will undergo major modernization works, including the installation of new pumps and related equipment. The cumulative impact of the proposed development and the proposed Sewerage Scheme will likely be positive, due to the associated benefits likely to result from the improved management of foul water in Kilkee and receiving waters.

14.8 Material Assets

The list of projects outlined in Table 14-1 has been consulted; no significant negative impacts on Material Assets are expected.

The Kilkee Sewerage Scheme is expected to improve the treatment of foul water in Kilkee. When complete, there will be a positive cumulative impact with the proposed FRS.

If projects listed above go ahead at the same time as the proposed development, there could be a cumulative impact on roads due to increased construction traffic. However, given the size of the proposed development and the other developments in the area, no significant cumulative effect is expected.

14.9 Cultural Heritage

No potential cumulative impacts were identified with regard to cultural heritage.

14.10 Landscape and Visual Impact

During construction there is the possibility of increased movement of plant in terms of numbers as well as duration of disturbance that have the potential to reduce the visual amenity. These impacts are expected to be slight negative and temporary in duration. No potential negative cumulative impacts were identified with regard to landscape and visual in the operational phase.

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