Castleconnell
Flood Relief Scheme

EIAR – Volume 1 Non-Technical Summary

Final Report

November 2024

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Contract

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

Purpose

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Abbreviations

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

1 Introduction

This document provides a non-technical summary for the Environmental Impact Assessment Report (EIAR) for the proposed Castleconnell Flood Relief Scheme (FRS).

Castleconnell sits on the left bank or eastern side of the River Shannon in Co. Limerick, south of Parteen Weir and Lough Derg. The village of Castleconnell and the surrounding areas were severely flooded during the winter of 2009 due to record rainfall in the large River Shannon catchment area. Further flooding events took place in 2015, 2016 and 2020. The proposed development aims to provide flood relief in the form of formal flood defences, to minimise risks to people, the community, social amenity, environment, and landscape.

Schedule 5 of the Planning and Development Regulations 2001 (as amended, hereafter the '2001 Regulations') sets out a wide range of development categories with associated thresholds for which an EIA is required. Part 2 of Schedule 5 of the 2001 Regulations includes "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". As the proposed FRS area has an immediate contributing sub-catchment of approx. 160 hectares, the proposed development is above the threshold, and an EIAR is required.

The EIAR comprises three volumes as follows:

- Volume 1: Non-Technical Summary (this document);
- Volume 2: Environmental Impact Assessment Report; and
- Volume 3: EIAR Appendices

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 – Air Quality, Noise and Vibration, and Climate
- Chapter 7 – Population and Human Health
- Chapter 8 – Biodiversity
- Chapter 9 – Land and Soil
- Chapter 10 – Water – Surface and Groundwater
- Chapter 11 – Material Assets
- Chapter 12 – Cultural Heritage
- Chapter 13 – Landscape and Visual Impact Assessment
- Chapter 14 – Interactions
- Chapter 15 – Cumulative Effects

The EIAR has been compiled by JBA Consulting with input from a team of experienced consultants. The 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). Where relevant, individual chapters also make reference to specific guidelines which are relevant to that discipline.

Need for the Proposed Development

The scheme is being developed primarily to protect affected properties against fluvial flooding. The River Shannon is the dominant source of flood flows at Castleconnell and heavily influenced by Parteen Weir and Lough Derg. Castleconnell village and the surrounding area was badly flooded in the winter of 2009 following record rainfall over the large River Shannon catchment. Further flood events were experienced in 2015, 2016 and 2020.

Outline of the Proposed Development

An overview of the proposed development is shown in Figure 1. Generally, the FRS will comprise a series of walls and embankments along the banks of the River Shannon in Castleconnell, along with several demountable flood barriers, road raising works, and removal of vegetation and alterations of a culvert on the Cedarwood Stream, a tributary of the River Shannon in the northern part of Castleconnell.

The proposed walls and embankments will run generally from north to south, mostly between the river and the built-up area of Castleconnell. At the northern end of the scheme, new flood walls will be constructed along the boundary of two houses (Rivergrove B&B and Grange House), with minor changes to the layout of one garden to facilitate the new walls, and minor changes to drainage infrastructure. A new flood wall will also be constructed around Mall House, and along the length of the Mall Road, to the entrance of Island House.

Island House will require alterations to its entrance in the form of road raising and a demountable flood barrier. South of the entrance, the new flood wall on Mall Road will continue, with a realigned footpath inside it. At Maher's Pub, the flood wall will continue, before transitioning into an earth embankment at Meadowbrook. This will merge into a low-level flood wall, and road raising along the driveway of Stormont House.

At the entrance to Coolbane Woods, road raising will occur, and an earth embankment will be constructed along the back of the houses. A demountable flood barrier is also required at the Coolbane Woods junction. This barrier will be put in place only during flood events, meaning that this road will be closed any time the barrier is in place. An alternate route into Castleconnell from the south will be in use at these times.

The final part of the proposed development is removal of overgrown vegetation and replacement of a culvert in the Cedarwood Stream, at the northern end of Castleconnell. The Cedarwood Stream flows into the River Shannon downstream of the proposed works.

A full detailed description of the proposed development is included in Chapter 4 of the EIAR.

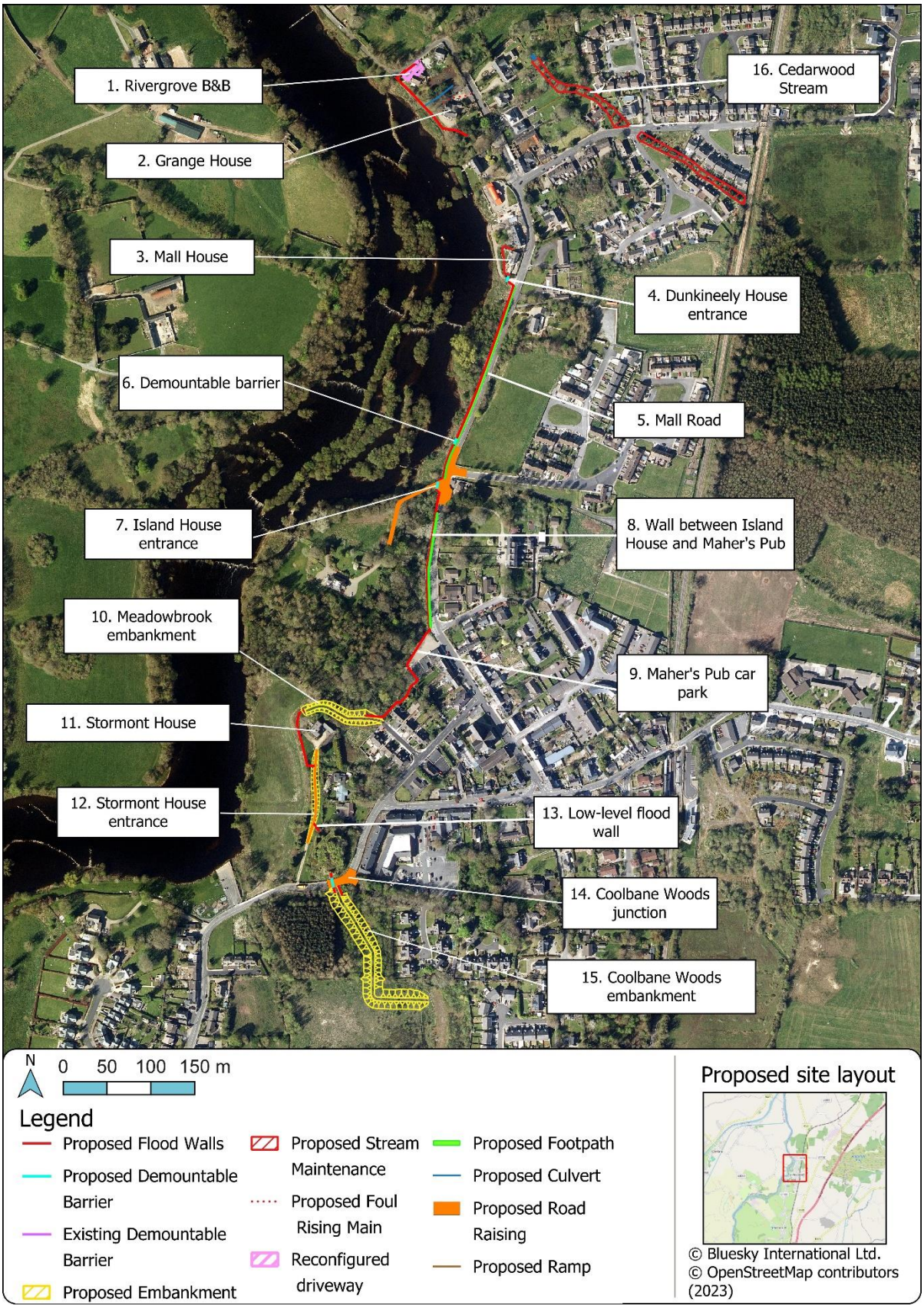

Figure 1: Overview of proposed development

2 Legislation and Planning Policy

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. The principal guiding national, regional and local documents are listed below in addition to the governing legislation:

- EU 'Floods' Directive 2007
- The Planning and Development Act 2000 (as amended)
- The National Planning Framework (NPF)
- 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
- Climate Action Plan 2023
- Mid-West Area Strategic Plan (MWASP) 2012-2030
- Shannon Catchment Flood Risk Assessment and Management Study (CFRAM)
- Regional Spatial and Economic Strategy (RSES) for the Southern Region 2020
- Limerick City and County Council Development Plan 2022-2028
- Castleconnell Local Area Plan 2023-2029

The National Planning Framework 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 and the implementation of appropriate measures to mitigate existing issues.

The plan identifies National Strategic Outcomes (NSOs) which seek to guide future development.

National Strategic Outcome 9 Sustainable Management of Water and other Environmental Resources outlines the urgency of upgrading and investing in water management and environmental resources. Strategic Outcome 9 seeks to ensure investment in water infrastructure nationally while also ensuring the protection of our watercourses. With regard to flooding and flood risk management NSO 9 seeks to *'implement the recommendations of the CFRAM programme will ensure that flood risk management policies and infrastructure are progressively implemented'.*

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. As such, the proposed development is fully supported by the National Planning Framework.

Further to this, the scheme was assessed in relation to Regional Spatial and Economic Strategy (RSES) for the Southern Region which 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.

The RSES supports measures that address climate action, as outlined in the NPF, these 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, noting that flooding is a key challenge facing cities and towns in the region.

The RSES outlines a number of policies which seek to ensure that there is investment in flood relief works, and infrastructure which will mitigate against the risk of climate change. The RSES further identifies that flood relief works are required in Castleconnell. The RSES concludes that flood risk poses a significant risk to existing settlements and future development.

It is concluded that the proposed Flood Relief Scheme is in line with the regional planning policy for the Mid-West and Southern Region.

The Limerick City and 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 Limerick City and County environs to 2028.

The proposed development aligns with the Development Plan objectives in the following ways:

- Will aide in mitigating against future climate change related flood events.
- Will help the Castleconnell environs to become climate resilient and mitigate against increase storm and rainfall events.
- Will contribute to the future mitigation of flood risk in the settlement.
- Will provide for the development of Flood Relief Schemes as identified in the CFRAM 10 Year Investment Programme.
- Will facilitate future development within the Castleconnell Environs which will contribute to the settlement developing into the future in line with the targets identified in the Plan.

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

The Castleconnell Local Area Plan (LAP) 2023-2029 sets out the plans and policies which will direct the development of Castleconnell to 2029. Having Regard to the LAP, the proposed development aligns with the Development Plan objectives in the following ways:

- Is in line with Objective IU 05 of the LAP which seeks to ensure that future flood risk in the town is mitigated in addition to supporting the development of a flood relief scheme in collaboration with the OPW.
- The works will not negatively impact on the architectural/historic and cultural integrity of the heritage assets identified.

Further to this, the proposed works fall within a number of land use zoning objectives identified within the LAP. These land use zonings are as follows:

- Open Space and Recreation
- Special Control Area
- Existing Residential
- Village Centre
- Open Space and Recreation

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 for Limerick City and County Council to meet the objectives of these land use zonings in accordance with the objectives set out in the Limerick City and County Development Plan 2022-2028, and the Castleconnell Local Area 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 Castleconnell and would, therefore, be in accordance with the proper planning and sustainable development of the area.

3 Examination of Alternatives

Prior to the preparation of the EIAR, several studies were undertaken to inform the option design and scoping of the EIAR.

The alternatives for the scheme were evaluated in the early stages in a two-stage approach. First, potential measures were screened based on hydraulic performance to ensure that only measures which provide adequate flood protection were taken forward. This stage included eight Flood Risk Management approaches, four of which were screened out due to limited flood benefit or third-party control of assets, and four were taken forward for further assessment.

The second stage assessed different options based on their applicability, economic feasibility, and their likely environmental, social, and cultural impact. The results are provided in the Options Report. The measures considered at this stage were:

- Engineered earth embankments;
- Reinforced concrete walls;
- Road raisings;
- Raising of a bridge/causeway;
- Culverting of the Cedarwood Stream;
- Pumped foul connection from Grange House to public foul sewer; and
- Demountable barriers

Three options were developed, using combinations of the above measures, for each section in the study area (North section, Central section and South section). Measures in the North and South sections were the same for all three options, differing only in the central section.

The merits of the alternative options were assessed and compared on the basis of cost, environmental and ecological impact, process and programme, and climate change adaptability. A multi-criteria analysis (MCA) was used to aid this assessment.

Based on the MCA results Option 2 emerged as the Preferred Option. Option 1 would have required extensive work on the causeway entrance to Island House, which is a Protected Structure and located within the Lower River Shannon Special Area of Conservation (SAC). Additional work inside the SAC would have been required for an embankment across Cloon Stream at Mahers Pub. Option 1 would also have resulted in the closure of the Mall Road north of Island House during flood events, which would have a negative impact on traffic and pedestrian access for the village. Option 3 would require less work inside the SAC, but would still result in the closure of Mall Road during flood events. Option 2 retains access along the Mall Road, while reducing the need for working inside the SAC along Mall Road and at Meadowbrook.

Following selection of an Emerging Preferred Option, a Scoping Report was developed, which was the first stage in the preparation of the EIAR. The Scoping Report introduced the proposed development, defined the location and extent of works, identified the key environmental issues and receptors in the vicinity, the potential impacts of the proposal, and identifies the likely environmental studies that are required to inform the full EIAR. The Scoping Report was distributed to statutory consultees as part of the consultation phase.

4 Description of Proposed Development

The proposed development is located in Castleconnell, on the left or eastern bank of the River Shannon, downstream of Lough Derg. Castleconnell stretches along the River Shannon for approx. 1.5km, with residential areas backing on to the river in places. Approximately 10,824km^2 of the Shannon catchment and associated flood flow is drained via Castleconnell village. Flood flows at Castleconnell are heavily influenced by Parteen Weir and Lough Derg which is approximately 6.5km upstream of Castleconnell Village.

The proposed development comprises the following. Numbers refer to references shown in Figure 1.

Area	Proposed Design
No. 1 Rivergrove B&B	Replacement of the existing wall to the west of Rivergrove B&B with a new reinforced concrete flood wall with sheet piled foundation. The new flood walls will be clad in stone similar to the existing walls, and will contain a short length of glass panels to maintain key views of the River Shannon.
No. 2 Grange House	Replacement of the existing wall to the west of Rivergrove B&B with a new reinforced concrete flood wall with sheet piled foundation. The new flood walls will be clad in stone similar to the existing walls, and will contain a short length of glass panels to maintain key views of the River Shannon. Minor changes to the alignment of the Cedarwood Stream as it passes through the garden of Grange House.
No. 3 Mall House	Replacement of the existing walls to the north, west and south of Mall House with a new reinforced concrete flood wall.
No. 4 Dunkineely House entrance	Northern wing wall and hedge to the main entrance of Dunkineely House to be removed and demountable flood barriers to be provided in the existing vehicular entrance plus one proposed pedestrian entrance.
No. 5 Mall Road (north)	Existing stone wall on the west side of Mall Road will be demolished, and a new reinforced concrete flood wall will be constructed approx. 1m set back from the existing wall, outside the SAC and alluvial woodland. This will require a slight narrowing of the road carriageway and the movement of the existing footbath also approx. 1m.
No. 6 Mall Road demountable	A demountable barrier will be constructed in the main fisherman access point through the Mall wall, known locally as Broderick's slip.
No. 7 Island House	The Mall Road junction at the entrance to Island House and Scanlon Park will be raised with a ramp, along with the driveway to Island House. A demountable flood barrier will also be provided at the entrance to Island House to provide additional flood protection. Sluice gates on the causeway to Island House will be removed to allow flow through the Cloon Stream, which separates Cloon Island from Castleconnell.
No. 8 Mall Road (south)	Replacement of the existing stone wall along the west side of Mall Road with a new reinforced concrete flood wall, on the same alignment as the existing wall.
No. 9 Maher's Pub	New reinforced concrete flood wall along the edge of the Maher's Pub car park, to end at the northern boundary of No. 7 Meadowbrook Estate.
No. 10 Meadowbrook	Construction of a flood embankment along the rear of Meadowbrook Estate, from No. 7 Meadowbrook to tie in with a new flood wall at Stormont House.
Nos. 11, 12 and 13 Stormont House	A low-level flood wall will be constructed along the west of Stormont House, inside the existing castellated boundary wall (11). Ground levels along the driveway to the house will also be raised (12), and a short low-level flood wall will be constructed to tie in with the rock at the Castle (13).
Nos. 14 and 15 Coolbane Woods	Road raising at the junction to Coolbane Woods, with a demountable flood barrier provided across the road to provide additional flood protection. Flood embankment to be constructed along the southern boundary of the Coolbane Woods entrance road and along the rear of Nos. 1-4 Coolbane Woods, tying into higher ground to the south.
No. 16 Cedarwood Stream	Removal of overgrown vegetation from the Cedarwood Stream. Annual inspection and maintenance will take place thereafter to manage future vegetation that may impact conveyance. Replacement of an existing circular culvert at Coole House with a large rectangular culvert.

Construction of the proposed development will take place over c. 18-24 months. Construction will progress in a general north to south sequence. Depending on seasonal conditions, construction within Stormont House and Coolbane Woods can proceed in parallel with works to the north. Vegetation clearance works, where required, will need to take place outside of the bird breeding season (March to August inclusive).

Following construction, each proposed measure will have its own bespoke management plan. Regular inspections of the embankments will take place, together with investigations of their performance after each flood event.

Responsibility for erection of the demountable flood barriers ahead of a flood event will remain with Limerick City & County Council and/or nominated contractors. Flood trigger levels have been devised for each demountable flood barrier, based on detailed modelling of water levels in the River Shannon and flood scenarios in Castleconnell. When the relevant trigger level is reached, the nominated crew will install the demountable barriers and put road diversion signs in place.

A routine inspection and maintenance plan will be developed whereby Limerick City & County Council and/or nominated maintenance contractors will inspect and install the demountable barriers once per year to examine them for any defects and to ensure that staff are trained and familiar with the installation process. The Cedarwood Stream will be regularly inspected from the railway to the culvert replacement any maintenance to manage overgrowth that may affect conveyance in the channel will be carried.

5 Consultation

Public and statutory consultation are a requirement of projects undergoing EIAR. Statutory consultees include government bodies, regulatory bodies, non-governmental organisations and other who have an interest or responsibility in some respect to a part of the development. These consultees were identified in the Scoping stage of the EIAR. The second avenue is to consult with the public including local residents and business owners who may be impacted by the development or any member of the public who wants to provide input.

Statutory and non-statutory consultees were issued the EIAR Scoping Report via email 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. Responses were received from the following:

- Department of Housing, Local Government and Heritage – Development Applications Unit (DAU);
- Uisce Éireann;
- Transport Infrastructure Ireland; and
- National Environmental Health Service Environment and Climate Change Network Support Unit.

Responses were considered in the preparation of the EIAR and were passed onto the design team where amendments to the design were required.

To date there have been four public consultation days on the Castleconnell FRS:

- Initial Public Consultation Event held in June 2020, during the Covid-19 pandemic. Due to the pandemic restrictions, the event took place online and via a brochure and questionnaire drop to properties in the study area;
- Emerging Options Public Participation Day on 21st September 2022, in Castle Oaks Hotel, Castleconnell. Feedback was sought from the public on the work carried out to date and the emerging options at that point. A total of 63 attendees were recorded on the sign-in sheet; and
- Preferred Option Public Consultation Day on 6th September 2023, in Castle Oaks Hotel, Castleconnell. Public opinion on the preferred option was sought and how this would be implemented in reality. Nine representatives from the project team were present throughout the day, and 33 attendees were recorded on the sign-in sheet.

Additional consultation meetings took place between members of the EIAR team and certain consultees, in order to ensure that environmental issues were fully assessed.

A meeting with the National Parks and Wildlife Services' Regional Ecologist for the area took place on the 20th July 2022 where the project's ecological sensitivities and survey efforts were discussed at length, as well as the proposed FRS design. This was followed with further discussion at the Public Consultation Day on 6th September 2023, and a letter dated 2nd February 2024, which summed up observations and recommendations made by NPWS.

A meeting took place with the National Monuments Service and the Built Heritage Policy Team of the Department of Housing, Local Government and Heritage on 16th January 2024. The purpose of this meeting was to discuss the cultural heritage assessment and proposed mitigation measures. Following this meeting, additional cultural heritage testing and mitigation measures were developed and carried out, and the opinion of a Conservation Engineer on various aspects of the scheme was sought.

Finally, an informal consultation took place with Inland Fisheries Ireland (IFI) on 4th December 2023 on the proposed scheme design. Measures for the protection and enhancement for fish, in particular the overall design and construction mitigation, were considered acceptable by IFI.

6 Construction Impacts

AONA Environmental Consulting Ltd. was commissioned to assess the construction impacts (air quality and dust, noise and vibration, and climate impact) of the Castleconnell Flood Relief Scheme (FRS), Castleconnell, Co. Limerick during the Construction Phase.

Air Quality and Dust Impact Assessment

The air quality and dust impact assessment has been prepared to assess the potential air quality impact of the FRS on the sensitive receptors in the vicinity of the proposed FRS.

The construction activities of the proposed FRS have been examined to identify those that have the potential to give rise to dust and air pollutant emissions and a suitable construction impact assessment has been undertaken. As appropriate, Construction Phase mitigation measures have been outlined.

The air quality impact assessment was undertaken with reference to Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) & CAFE Directive 2008/50/EC. 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 FRS has been assessed in accordance with 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.

There are four EPA air quality stations in Limerick. The closest national ambient air quality monitoring stations are Station 39: Peoples Park and Station 85: Henry Street, which are both located approximately 10.32 Km south-west of the proposed FRS. Monitoring results are available for NO_2, O_3, PM_{10}. and $PM_{2.5}$. This data indicates 'Good' air quality in the area.

An assessment of the potential impact on air quality during construction has been undertaken. Approximately 41 sensitive receptors have been noted within 20m of the proposed construction works. Works are proposed c.1m from Lower River Shannon SAC boundary along Mall Road. Using the IAQM methodology for the assessment of impacts from construction activities, the following is indicated;

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

In accordance with the IAQM Guidance, the highest risk category measures have been applied in the determination of appropriate mitigation measures. Therefore, appropriate recommended construction phase dust mitigation measures, in terms of dust soiling, human health, and ecological impacts, have been recommended. During the construction phase of the project, with the proposed mitigation measures in place, the residual impact to dust soiling, human health, and ecology will be negligible. There will be no air quality and dust impact during the operational phase.

Noise Impact Assessment

The noise impact assessment has been prepared to assess the potential noise and vibration impact of the proposed FRS on the nearest residential properties and noise sensitive receptors in the vicinity of the proposed FRS.

The construction activities of the proposed FRS have been examined to identify those that have the potential to give rise to noise and vibration and a suitable construction impact assessment has been undertaken. As appropriate, Construction Phase mitigation measures have been outlined.

The noise impact assessment and evaluation of the noise impact arising from the proposed FRS involved the completion of a baseline noise survey at sensitive receiver locations in proximity to the specific areas of the proposed FRS in accordance with suitable guideline methodology. This established the current baseline conditions. The baseline noise measurement data indicates that Castleconnell is a quiet village with passing traffic on the surrounding road network the dominant noise source.

The results of the baseline noise monitoring data indicate that the noise levels at the sensitive receivers in the area of the proposed FRS are broadly in accordance with the World Health Organisation (WHO) *Guidelines for Community Noise*, recommended daytime levels of 50 – 55 dB(A) for outdoor living areas.

There is the potential for temporary and intermittent increases in noise levels during the Construction Phase of the proposed FRS at the nearest residential properties. The worst-case construction noise levels at specific locations in proximity to the expected main areas of construction activity have been predicted using the methods of predicting construction noise levels set out in BS 5228-1:2009+A1:2014. The construction practices that have the potential to produce intermittent and temporary noise impacts include site clearance & excavation, infilling / levelling, wall removal & construction, general construction and road and pathway construction. The recommended daytime construction noise limit of 65 dB $L_{Aeq,12\ Hour}$ will be achieved at the nearest residential properties. The construction noise impacts will be short-term and will not be significant. Also, the nature of the proposed works and its duration meant that noise sensitive receivers will not be exposed to continuous construction noise impact during the construction period. Appropriate construction mitigation measures have been outlined and once implemented, the residual impacts from the construction period will not be significant.

Construction vibration impacts have the potential to occur if piling works are undertaken in very close proximity to sensitive receivers. Piling works are proposed at the flood walls at Rivergrove B&B and Grange House, and at the flood wall adjacent to No. 7 Meadowbrook Estate. During piling, a vibration monitor with triaxial geophone shall be placed 3 - 5 meters from the piling location. 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.

There are a number of demountable flood defences, for which vehicles will be required to deploy these demountables and which may involve JCB or teleporter vehicles to transport pallets or erect defences. Similar applies to mobilising temporary sump pumps, road closure signage, etc. However, potential noise impacts from the short-term and infrequent use of such vehicles and pumps during periodic flood events is not possible to predict or quantify accurately. Therefore, the potential noise impacts during operational phase can be expected to be short-term and insignificant. Therefore, there will be no operational noise impact. The proposed FRS will not generate additional traffic movements and therefore, will not result in a significant traffic noise impact.

Climate Impact Assessment

The climate impact assessment has been prepared to assess the potential impact of increased carbon emissions due to the proposed FRS.

The construction activities of the proposed FRS have been examined to identify those that have the potential to give rise to increased carbon emissions and a construction impact assessment has been undertaken.

The assessment and evaluation of the potential climate impact arising from the proposed FRS was based on reference to the relevant Transport Infrastructure Ireland (TII) Publications and TII Carbon Tool. In accordance with the TII Guidelines, the climate impact assessment included a Greenhouse Gas (GHG) Assessment Process to quantify available GHG data using the TII Carbon Assessment Tool. A Climate Change Risk (CCR) Assessment Process has been undertaken elsewhere in the EIAR in the form of detailed flood risk assessment.

During the construction phase of the proposed FRS, GHG emissions will potentially be generated by site preparation works, excavation, infilling works, construction activities, energy usage, etc. The Total Greenhouse Gas Emissions due to the construction phase of the proposed Castleconnell Flood Relief Scheme as predicted using the TII Carbon Tool have been compared to the 2021 Annual Carbon Emissions of 69,448.1 kt CO_2 equivalent. The proposed Castleconnell Flood Relief Scheme will account for 0.00119% of annual CO_2 emissions. This represents a negligible impact.

During the operational phase for the proposed FRS in Castleconnell, no significant climate impacts will result from carbon emissions. The proposed development will provide tangible benefits in terms of reduced flood impacts, and a reduction in financial loss and disruption. Potential emissions from the short-term and infrequent use of vehicles and pumps during periodic flood events is not possible to quantify accurately and will be miniscule. Therefore, the potential climate impacts in terms of carbon emissions (tCO_{2e}) during operational phase have not been considered for the proposed Castleconnell Flood Relief Scheme and are expected to be insignificant.

7 Population and Human Health

This chapter assessed impacts to population and human health including residential dwellings and people living in Castleconnell, as well as a number of businesses, schools, childcare facilities, medical facilities, social, community, and recreational facilities.

Information on Castleconnell was gathered from the Central Statistics Office (CSO), including their 2022 and 2016 Census data, as well as from the Limerick Development Plan 2022-2028, Castleconnell Local Area Plan 2023-2029.

Castleconnell is situated approximately 10 kilometres northeast of Limerick City, between the M7 motorway and the River Shannon. Castleconnell is regarded as one of the critical areas for tourism and for related activities such as fishing, boating, sailing, and riverside walks in the county. According to the Limerick Development Plan 2022-2028, the population of the Castleconnell area is projected to increase by 28% by 2028, from the Census 2016 base of 2,107. There is sufficient land zoned for residential use in Castleconnell to accommodate this increase.

The areas around Castleconnell village are primarily in use as agricultural pasture. The proposed development will protect existing residential properties, along with certain parts of village infrastructure such as the Mall Road, from flood events up to the 1% annual exceedance probability (AEP).

The proposed development is expected to have the greatest impact to population and human health during the construction phase of the project. These impacts are predicted to be secondary impacts as a result of disruptions to traffic, noise, air quality, and visual amenity. These impacts are addressed in their respective chapters of the EIAR.

There will be temporary slight negative impacts to residential amenity lasting only for the duration of the construction phase. Mitigation measures will include a Construction Environmental Management Plan (CEMP), which will limit the effects on human beings with regards to traffic, noise, air, dust, access, and visual amenity. The residual impact of the construction phase with proposed mitigation measures in place is predicted to be temporary, imperceptible, negative.

When the FRS is operational, the effect on population and human health will be long-term positive, due to the greater protection from flooding. Temporary and intermittent impacts are expected during periods of flooding where demountable flood barriers will be in place resulting in disruption and road diversions. The operation of these barriers will result in an intermittent slight negative impact. As they will only be in place during a flood event, and are needed for the FRS to provide the required scheme standard of protection, the negative impact associated with their operation will be outweighed by the positive impact of the scheme as a whole.

8 Biodiversity

The chapter concerning biodiversity assessed impacts to potential sensitive receptors in Castleconnell. The proposed works are located directly adjacent to the Lower River Shannon SAC and 10.5km upstream of the River Shannon and River Fergus Estuaries SPA and 12.4km downstream of Lough Derg (Shannon) SPA.

Note that impact assessment and mitigation to protect the Qualifying Interests (QIs) of the Lower River Shannon SAC and Cormorant and Black headed Gull of nearby SPAs are detailed in the separate Natura Impact Statement (NIS), and should be read in conjunction with this report. The qualifying interests of the Lower River Shannon SAC within the zone of influence and present in Castleconnell include: Alluvial forests [91E0], Brook Lamprey (*Lampetra planeri*) [1096], River Lamprey (*Lampetra fluviatilis*) [1099], Sea Lamprey (*Petromyzon marinus*) [1095], Atlantic Salmon (*Salmo salar*) [1106] and Otter (*Lutra lutra*) [1355]. Adverse impacts from the construction of the scheme are likely to these QIs. QIs from the River Shannon and River Fergus Estuaries SPA and Lough Derg (Shannon) SPA include Cormorant and Black-headed Gull which may use the river next to the proposed FRS as supporting habitat. No adverse impact to these QI birds is anticipated from disturbance, due to the large receiving environment around the River Shannon that will not be disturbed by the works. These qualifying interests have been discussed further in the Natura Impact Statement.

Other habitats and species present within the scheme area include multiple Grey Heron nests, other birds including Grey Wagtail, Kingfisher, Mallard, Mute Swan, Birds of Prey, and potential Bat roosts in trees to be felled. Local rivers and streams will be impacted during construction resulting in water quality and disturbance impacts to fish species such as Brown Trout, Eel, Flounder. Annex I habitat Tall-herb fen (6430) (not a QI of SAC) is present adjacent to the proposed scheme and may be impacted during construction. Other habitats that will be impacted include Wet grassland habitat, ditches, treelines, indicudal trees, and emerging Alluvial Forest habitat located at Coolbane Woods. 3rd Schedule Invasive species Giant hogweed and Zebra Mussel is present adjacent to much of the scheme.

Impacts have been identified on ecological features of international, national and local level are posed during construction and relate to potential disturbance on the Annex 1 habitats and species:

- Alluvial forests (91E0) and Tall-herb habitats (6430) may be physically impacted from construction adjacent to this habitat.
- Water dependent habitats and species (Alluvial Forests, Tall-herb, Salmon, Lamprey, Otter, other fish species) of the SAC could be impacted by potential pollution of surface waters caused by runoff from excavated soil and accidental spillage of diesel and oil.
- Juvenile Lamprey species could be impacted during construction of flood defence walls at Rivergrove which will require works within the river Shannon
- Heronry located behind Mahers pub will be avoided (tree to be retained) however birds could be disturbed during nesting season.
- Wintering birds from River Shannon and River Fergus Estuaries SPA could be disturbed by construction.
- Removal of approximately 86 individual trees, 4 tree groups, and 1 hedgerow, and 5840m² of wooded areas to facilitate the construction of the Scheme, will result in loss of habitat for local fauna including birds and bats.
- Physical disturbance to possible bat roost in Beech trees at Grange House.
- Wet grassland area in flood plain of the Shannon (and in boundary of SAC) may be temporarily impacted.
- Replacement of two culverts on Cedarwood stream may impact to fish species within this stream.
- Spread of 3rd Schedule species Giant Hogweed and Zebra Mussel.

Operation Impacts include:

- Permanent loss of Alluvial woodland (no. 3) at Coolbane Woods
- Removal of approximately 86 individual trees, 4 tree groups, and 1 hedgerow, and 5840m² of wooded areas to facilitate the construction of the Scheme

- Spread of 3rd Schedule species Giant Hogweed and Zebra Mussell.

Positive impacts have also been assessed and this includes:

- Improved water quality expected to be slightly improved from redirect of foul water at Grange House
- Replacement of culverts on Cedarwood will allow natural bed level to be reinstated resulting in an improvement of natural sediment transportation regimes through the stream.
- Removal of sluices on Cloon Island causeway will allow fish to enter stream from upstream year-round

Mitigation through design has resulted in the avoidance of Alluvial Forests within the SAC boundary and no loss of this Annex I habitat will occur within the SAC boundary. Mitigation measures to protect other woodland habitat and trees during construction have been proposed. A Heronry located in a cedar tree containing 5 heron nests has also been avoided through design, and the nests will be protected by restricting construction to outside Heron breeding season (February-August). Measures have been included to protect Annex I Tall Herb Fen [6430] at Rivergrove, where machinery is required to enter the riparian area and a temporary stone platform. Additionally, any fish, particularly Lamprey, will be translocated from this riparian area before works begin, as well as at the outfall of the Cedarwood Stream. Measures to protect wet grassland habitat in the SAC boundary (and flood plain) at Stormont House, general measures to protect nesting birds, and measures to protect bats have been included. Biosecurity measures have been detailed to prevent spread of 3rd Schedule invasive species. Water quality control measures are detailed to protect all water courses from release of sediment and pollutants during construction. New culverts on the Cedarwood Stream will be designed to improve fish passage. Throughout the construction process, a suitably qualified Ecological Clerk of Works will oversee the implementation of the mitigation measures where required.

For operation of the FRS, measures include remedial tree planting for loss of induvial trees and tree groups, compensation planting for loss of Woodland 3 at Coolbane Woods, post-construction monitoring of Annex I habitats Alluvial Forests (91E0) and Tall herb swamp (6430), and monitoring spread of 3rd Schedule Invasive species.

In conclusion, it is expected that with mitigation measures in place there will be moderate residual impact to loss of emerging alluvial forest habitat situated outside of the SAC, and slight residual impact from loss of individual trees, but no other negative impacts are anticipated. Positive impacts include increased fish passage on the Cedarwood and Cloon Stream, and slight increase in good water quality. Therefore, the proposed Castleconnell FRS will not have a significant effect on the ecological features identified.

9 Land and Soil

The potential effects on land, soil, and geology during the construction and operational phases of the proposed development have been assessed in this chapter. This assessment is based on a desktop study, site visits, and site investigations conducted by Priority Geotechnical Ltd. The assessment methodology adheres to the EPA (2022) Guidelines and follows the guidance set out in the Institute of Geologists of Ireland (IGI) Guidelines for the Preparation of Soils, Geology, and Hydrogeology Chapters of Environmental Impact Statements (2013).

The desktop study and ground investigation revealed that Castleconnell is underlain by a wide vein of limestones which comprise massive, unbedded lime-mudstones formed during the early or mid-Carboniferous period. The vein curves west and south and underlies all areas where defences are proposed.

Subsoils are dominated by limestone till over the western half of Castleconnell, and sandstone till over the eastern half. Results from the site investigation show that till thickness across the area is on average ~4.3m. Estuarine and lake silts were found to be between 0.8 – 1.5m thick and areas of peaty subsoil were between 1.4 – 2.0m thick.

Land use in Castleconnell is predominantly residential, with over 20 residential estates arranged around the tightly concentrated town centre. To accommodate the target population growth, several parcels of land have been zoned for new residential developments in the Castleconnell LAP (2023-2029).

Agricultural land use has declined in terms of area since the previous LAP, while enterprise and employment and education and community facilities have increased. Open space and recreation saw the largest increase from 22.39ha in 2013 to 74.121ha in 2023. The open spaces and walkways along the River Shannon are considered exceptional recreational facilities.

During construction and operation, several activities have potential for effects on land, soil, and geology at the site. These are associated with the establishment and operation of site compounds, including storage of potential pollutants such as fuels and oils, the excavation of topsoil and subsoils, import of material for the construction of embankments, and export of excavated material off-site. Without mitigation measures in place, the potential effects range from moderate to imperceptible/neutral.

Mitigation measures, including the preparation of a Construction Environmental Management Plan (CEMP) which encompasses a Soil Management Programme, are outlined in Chapter 9 of the EIAR main report. These measures cover:

- Safe storage of soil stockpiles, oils, and fuels;
- Prevention of spills and leaks; and
- Safe pouring of concrete

The mitigation measures also outline that the contractor must carry out a waste characterization of soil material to be taken off site for disposal, which will include a waste acceptance criteria (WAC) analysis and measurement of asbestos levels.

Once operational, the proposed embankments will have silt fences in place until the soil on the banks has stabilized, and grass has taken root. This is to mitigate sediment flush during rain events.

During construction, with the proposed mitigation measures in place, the residual impact to land and soils will be reduced to short-term, imperceptible, neutral. The design of the scheme has been such that there are no predicted effects on land and soils during the operational phase.

10 Water – Surface and Groundwater

The potential effects on surface water and groundwater during the construction and operational phases of the proposed development are assessed in this chapter. This assessment is based on a desktop study, a site visit, and a review of the proposed development details. The assessment methodology adheres to the EPA's 2022 Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.

The existing environment at the site was noted during the site walkover and desktop studies. The proposed site lies on the eastern banks of the Lower River Shannon. Several small streams which are tributaries of the River Shannon flow within the area.

Water services infrastructure such as the Clareville Water Works, the intake for the Limerick Water Resource Zone, is approx. 2.5km downstream of the site and so is a key receptor. Castleconnell Pumping Station is in the scheme area and acts as a secondary discharge point for Castletroy Wastewater Treatment Plan, while emergency overflows and storm water overflows also discharge from the same point.

Castleconnell groundwater body underlies the site. Permeability of the subsoils in the area is moderate, while the aquifer in the area is regionally important. Groundwater vulnerability is primarily moderate in areas where defences are proposed.

Construction activities have the potential to negatively affect surface waterbodies via increased silt and sediment runoff, groundwater pumping, instream works and accidental spills and leaks from chemicals such as hydrocarbons and lubricants. These pollutants could reach the River Shannon and its tributaries via overland drainage or surface water drainage. Changes to runoff and flow pathways could also occur due to excavation activities during construction. Impacts to hydromorphology are largely not expected to occur, due to the lack of instream works and expected minimal changes in downstream flow.

Construction works will be carried out in accordance with the CEMP. The CEMP will include standard best practice guidance for the protection of water quality, and specific mitigation measures such as the control, treatment and monitoring of surface water runoff, and pollution prevention measures, such as bunding, spill management and inspection procedures.

During construction, with the proposed mitigation measures in place, the residual impact to surface water and groundwater bodies will be reduced to temporary, slight negative to imperceptible.

During the operation phase of the project, the residual impact will be long-term and slight, with a neutral impact on quality of surface and groundwater bodies.

11 Material Assets

The potential effects on material assets during the construction and operational phases of the proposed development are assessed in this chapter. The material assets include roads, traffic, transport, built services (utilities), and waste management. The assessment methodology adheres to the EPA's Guidelines. The assessment is based on a desktop study. Test trenching will be carried out on site by utility companies to accurately locate services in proximity to the proposed works sites.

Site Compounds

During construction there will be a main site compound in the field along the eastern side of the Mall Road. In addition, there will be several secondary compounds including north of Rivergrove B&B on the road, between Stormont House and Meadowbrook in a greenfield area, and in the greenfield site southwest of Coolbane Woods.

During construction, there is a risk of flooding in the compound areas. This could release potentially polluting materials and substances stored there, leading to indirect negative impacts on water, biodiversity, and human health. To mitigate this risk, best practices will be implemented for managing the compounds and the materials stored within them. Additionally, a flood alert system will be incorporated.

During construction with the proposed mitigation measures in place, the residual impacts due to site compounds will be temporary imperceptible negative.

Roads, Traffic, and Transport

The existing infrastructure in the Castleconnell area includes;

- M7 Motorway, approximately 1.6 km to the east of the proposed FRS border;
- R445, approximately 1.4 km east from the proposed FRS border;
- R25; and
- Railway station which connects the town to Limerick City to the south, and to Dublin via Nenagh, Roscrea, and Ballybrophy.

During construction, which is predicted to take approximately 18-24 months, it is estimated that HGV vehicle movements in the area will be at a frequency of circa 12-19 vehicles per hour during the busiest period of construction. Impacts are predicted from the HGV movements and temporary road closures. Roads affected include parts of Mall Road and Worlds End Road. Pedestrian access along Mall Road will be maintained. Temporary disruptions are expected to some private accesses; in Rivergrove B&B, Dunkineely House, Stormont House, and Island House.

Construction works will be carried out in accordance with a Construction Traffic Management Plan (CTMP) that will be prepared by the appointed contractor to mitigate impacts. The CTMP will adhere to traffic regulation, permitting and licensing, environmental regulation, health and safety standards, local authority requirements emergency response plan and public consultation. Mitigation measures to reduce impacts from road closures and access disturbance will include appropriate phasing of construction and private access facilitation.

During construction, with the proposed mitigation measures in place, the residual impact to Road, Traffic and Transport will be temporary, slight negative.

During the operational phase, no impacts on roads, traffic and transport are expected outside of flood events. During flood events, demountable flood barriers will be erected at the Coolbane Woods junction and the entrance to Island House (for events greater than the 1 in 10-year event), the entrance to Dunkineely House (for events greater than the 2-year event), and at the fisherman's entrance on Mall Road (for events greater than the 2-year event). Before this occurs, advance notice will be given to the affected property owners (in the case of Dunkineely House and Island House) and to residents of Castleconnell and the wider

area in general (for Coolbane Woods junction and the fisherman's access). An alternative route will be in place for the Coolbane Woods junction, via Belmont Road, R445, R525, and Station Road. Advance notice of this closure will be given, and signage will be erected highlighting the alternative route to be taken. During flood events, the impact on roads, traffic and transport will be intermittent, temporary, slight negative due to these limited closures.

Utilities

The existing utilities present and serving Castleconnell, in proximity with the works are:

- Gas Networks Ireland (GNI) medium pressure distribution pipelines;
- ESB low voltage overhead lines;
- ESB medium voltage underground cable routes;
- Watermains
- Overhead Telephone Cables;
- Eircom cable ducts;
- Water services infrastructure;
- Castletroy Wastewater Treatment Plant (WWTP); and
- Castleconnell pumping station at Scanlon Park

During construction temporary disruption to utilities is predicted due to diversions and upgrades that will be required. Impacts to electrical and water services infrastructure, excluding temporary disruptions within the immediate works areas, are not predicted. However, indirect impacts to water infrastructure could occur downstream at the Clareville Water Works and Castletroy WWTP.

To mitigate impacts on utilities during construction, any disruption of services will be agreed with the relevant service providers and will be communicated in advance to the relevant property owners.

With the mitigation measures in place, residual impacts during construction will be reduced to temporary slight negative. No operational impacts are expected on utilities.

Waste management

This section assessed the amount of waste expected to be generated by the construction works of the proposed development. It is estimated by the design team that approx. 990m^3 of materials from demolition and 21,300 m^3 of excavated material will be generated. The waste generated will be removed from the site and sent to an appropriate licenced waste deposit and soil recovery facility.

A Resource Waste Management Plan (RWMP) will be produced by the appointed contractor to help manage, reduce, and dispose of waste generated during construction phase. All construction waste will be segregated and removed to an approved location. A key waste reduction strategy will be reuse of material where feasible.

With the CEMP and RWMP in place the residual impacts on waste during the construction phase will be temporary, slight negative. No operational impacts on waste are expected.

12 Cultural Heritage

An assessment of potential impacts to cultural heritage from the proposed FRS was undertaken by Courtney Deery Heritage Consultancy Ltd. The assessment was based on a desk-study, with a detailed documentary and cartographical review. This was supported by a site inspection.

There are six recorded archaeological monuments (RMP / SMR sites) within 100m of the proposed flood relief measures and these were assessed for impact from the proposed FRS. They comprise Castle Connell (RMP LI001-003) and the church of a former friary and associated monuments (RMP LI001-004001/2/3; SMR LI001-004004/5).

Parts of the proposed flood relief measures will fall inside the Zone of Notification (ZoN) for Castle Connell (RMP LI001-003), and it is possible that features related to this Anglo-Norman fortification will survive beneath the surface. There may also be a survival of earlier features related to the pre-Norman fortification which existed on this site, and later structures which are depicted in an 18th century etching of the site. The castle itself will not be impacted, but low level flood walls will tie into the rock outcrop on which it is constructed on the north and south. One of these walls will be concealed with soil on both sides. Excavations will be required along the proposed flood walls with a potential impact to subsurface features.

Flood relief measures will also fall within the ZoN of the 13th century friary and probable Early Christian foundation on Cloon Island (RMP LI001-004001). While the church itself will not be impacted, there is the potential that the works proposed in this area could reveal subsurface features related to the ecclesiastical site. Other recorded monuments in proximity to this area are a cross-inscribed stone, a cross-slab, a holy well and a cross (LI001-004002/2/3/4); these sites will not be impacted.

In addition to the recorded monuments, seven discrete areas of archaeological potential (AP1-AP7) have been identified where flood relief measures are proposed. These relate predominantly to the archaeological potential associated with riverine environments, but other features such as townland boundaries, former structures etc. are also evident within some of these sites. Ground reduction works have the potential to impact these sites.

Castleconnell has an Architectural Conservation Area (ACA) which is divided into three distinct character areas of which two, ‘Spa-well and Worldsend’ and ‘Village Core’ are within the areas where flood relief measures are proposed. These measures are proposed adjacent to the River Shannon and along the Mall Road and Chapel Hill. This has the potential to impact the prized views of the river enjoyed by riverside properties. Another common characteristic of the ACA is the presence of historic stone walls along the roads, river and property boundaries. The replacement of some of these walls also has the potential to impact the ACA.

There are 23 protected structures and one NIAH only site within 100m of the proposed flood relief measures and these were assessed for impact from the proposed FRS. One undesignated built heritage site was also identified (Stormont House – BH1). Potential negative effects were noted at seven of these sites, comprising Glenbrook (RPS 1070), Coole (RPS 1074), Grange House (RPS 1075), Island House (RPS 1085), Island View House (RPS 1086), the causeway to Island House (RPS 5056), Mall House (NIAH 21807034) and Stormont House (BH1). These effects arise primarily from changes to setting from the replacement of existing stone walls and river walls with flood walls. In the case of Grange House, this includes impacts to views of the river and alterations to the grounds. At Glenbrook, the impact relates to the widening of Cedarwood Stream in this location which necessitates the removal of stone lining the watercourse, and at Coole a modern culvert with decorative stone parapets will be removed. The only case where alterations to a protected structure itself is proposed is at the causeway to Island House (RPS 5056). It is proposed to raise the surface of the deck, install a decorative steel parapet / handrail, remove existing sluice gates and to repoint existing masonry joints.

Fifteen undesignated cultural heritage features (CH1-CH15) were identified at or adjacent to the proposed flood relief measures, many of which are associated with protected structures or other sites. These comprise eleven stone walls which form river walls or boundary walls along the roadside (CH1-CH2, CH4-CH8, CH10-

CH13), the Cedarwood Stream culverts at Grange House and Coole (CH3, CH14), and a line of limestone kerbstones (CH9) and a large fragment of Castle Connell (RMP LI001-003) (CH15). These features contribute to the character of the ACA and to the properties along the riverside. It is proposed to replace some of the walls with flood walls which will be clad on one or both sides. It is also proposed to replace the Cedarwood Stream culverts.

The construction phase will involve earth moving activities including excavations for the construction of flood walls, a stream diversion and instream works at Cedarwood Stream, the relocation of services, and topsoil removal for the embankments, provision of a construction compound and temporary roads. There will be no instream works within the River Shannon.

All earth moving activities will be subject to archaeological monitoring under licence from the National Monuments Service of the Department of Housing, Local Government and Heritage. Programming will allow for appropriate monitoring and any subsequent mitigation required. This could be in the form of preservation in-situ or full archaeological excavation (preservation by record).

Where new flood walls are proposed, wall cladding will be of the same or similar stone. Where possible, the stone from existing walls which are to be demolished will be used for cladding. Otherwise, local stone will be used. This measure will ensure that the impact to the setting and character of the ACAs, protected structures and built heritage of Castleconnell is eliminated or much reduced. A methodology for the new walls has been devised by a conservation engineer in consultation with the NBHS. The limestone kerbstones on the Mall Road (CH9) will be reinstated within the new footpath.

It is proposed to raise the driveway and to install glass panels in the proposed flood wall at Rivergrove B&B and Grange House in order to maintain views of the river from these properties. This will mitigate against impact to setting, particularly in the case of Grange House which is a protected structure, and which was designed with prized views of the river.

The removal of the culvert (CH14) to the rear of Coole (RPS 1074) to be replaced by a larger box culvert is mitigated by the reinstatement of the stream crossing. The new culvert should include stone parapets to maintain the aesthetic appeal of the existing culvert which, though not old, contributes to the setting of Coole, a protected structure. Where possible, some measure of reinstatement should also be considered in the design along the stream widening to the rear of Glenbrook (RPS 1070). Stone will be reused where possible.

A public realm plan will be devised in advance of the construction phase which will ensure effective integration of the flood relief works into the historic townscape and river setting in a manner that seeks to contribute positively to the riverfront taking into consideration the historic and riverine heritage of the scheme area.

In addition to mitigation measures, the overall effect of the proposed FRS will be a reduction in flood extents, which will have a positive effect on cultural heritage receptors. At present, sites such as Grange House (RPS 1075), Mall House (NIAH 21807034), the grounds of and causeway to Island House (RPS 1085, 5056), Island View House (RPS 1086) and the grounds to Stormont House (BH1) are vulnerable to flood events, as are the river walls and flood walls outlined above. Other protected structures within the ACA are also currently vulnerable to flood events. The flooding of these sites can cause a degradation to these cultural heritage receptors and their setting. The protection of these cultural heritage assets from flood events serves as a mitigating factor to potential construction phase effects and effects to setting.

All recommendations are subject to approval from the National Monuments Service of the Department of Housing, Local Government and Heritage, and the local authority.

13 Landscape and Visual Impact

The potential impact of the proposed development on landscape and visual amenity was assessed in this chapter. A set of photomontages was prepared which contributes to the assessment carried out in this chapter. A Zone of Theoretical Visibility (ZTV) map was produced using GIS, proposed heights of structures, and a Digital Terrain Model (DTM).

The LVIA chapter examines the potential effects of the proposed development on views from receptors within the Zone of Theoretical Visibility including residential properties and nearby open spaces, in terms of visual intrusion and visual obstruction. It also examines the impact on landscape character areas from the permanent physical changes to the site brought about by the development. The chapter was prepared with reference to the EPA's 2022 Guidelines, the 2013 Guidelines for Landscape and Visual Impact Assessment (GLVIA) from the Landscape Institute (UK), and the Limerick Development Plan 2022-2028 Landscape Character Assessment. Additionally, Ordnance Survey Ireland historical maps were used to help identify past land uses, landscape components and historic landscape evolution. The potential impacts have been assessed based on landscape character sensitivity, magnitude of the likely impacts and significance of landscape effects.

The River Shannon corridor has a strong influence on the landscape character of the scheme area. The proposed development is situated in the Shannon Coastal Zone Landscape Character Area encompassing a large portion of northern Limerick and is delimited on the side by the Shannon Estuary, with rising grounds that lead to the agricultural zone and hills to the east. Within this territory there is the O'Briensbridge village which is an Architectural Conservation Area (ACA). The surrounding landscape is relatively enclosed with mature vegetation lining the roads and the River Shannon itself in most places.

Regarding the visual amenity there are no designated protected views within the proposed development area with the closest one approximately 3.3 km distant. The visual amenity is primarily local or household scale, with residences in the area enjoying views over the River Shannon and riparian vegetation. Views of the river are also possible along the Mall Road.

For the assessment of visual impacts of the proposed development, a ZTV map was created. This map helped with understanding the areas where the development could be seen within the surrounding landscape.

The location of the proposed development within Castleconnell limits its potential impact on landscape character. The proposed defences are to be placed in already built-up areas. Existing visual connections to the River Shannon and its riparian zone will be retained. Slight visual impacts are expected due to vegetation removal along the Cedarwood Stream and limited tree removal on areas along the River Shannon to facilitate construction of walls. These impacts are expected to be slight, short-term to temporary negative during the construction phase. Imperceptible to neutral impacts on landscape are expected once operational.

For the visual impact assessment receptor groups were identified in terms of function, such as residential, community, commercial, etc., and were assessed for sensitivity considering distance from the proposed development. For most receptor groups, the impacts expected are slight, negligible, neutral or imperceptible in both construction and operational phases. Permanent moderate negative impacts are expected at Rivergrove B&B and Grange House due to the removal of large beech trees in their garden.

There are no significant landscape nor visual impacts expected during construction. However, to mitigate any minor visual disturbance during construction, inobtrusive barriers (hoarding) around the construction sites are recommended. These barriers will have windows facing the River Shannon where suitable, allowing people outside the site to see through to the river while reducing the visibility of construction equipment and activities. This approach aims to maintain a visual connection to the river while keeping the construction less noticeable. This will ensure that residual impacts during operation are reduced to negligible to imperceptible.

14 Interactions

Interactions occur when a predicted impact causes interaction or dependency with other environmental aspects. This section assessed the interactions as positive, negative, or neutral. The interactions of environmental effects were considered throughout the EIA process for the proposed development. Where an interaction was identified it was marked with a 'Y' (i.e. Yes) as shown in Table 14-1 below and was considered for assessment. Necessary adjustments were made to the design of the layout to mitigate impacts arising from these interactions.

Table 14-1 Summary of environmental impacts interactions

	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**		**Y**	
Water	**Y**			**Y**	**Y**	**Y**		
Material Assets				**Y**		**Y**	**Y**	
Cultural Heritage								
LVIA	**Y**				**Y**			**Y**

In terms of residual impact resulting from interactions, with implementation of mitigation measures in place, these interactions are not expected to be significant.

The assessment of the interaction of these effects was assessed to be temporary, with a slight negative to negligible impact during construction.

15 Cumulative Impact

This chapter assessed the potential cumulative effects of the proposed development in combination with other relevant existing, planned and permitted projects. These were assessed to determine whether they would give rise to significant effects on the environment.

The projects assessed included larger projects in the area with permission durations that overlap the likely construction period of the proposed development. Smaller projects such as house extensions and alterations have been excluded as they are unlikely to have significant impacts, even cumulatively with the proposed FRS. The projects considered are listed below and shown in Figure 2:.

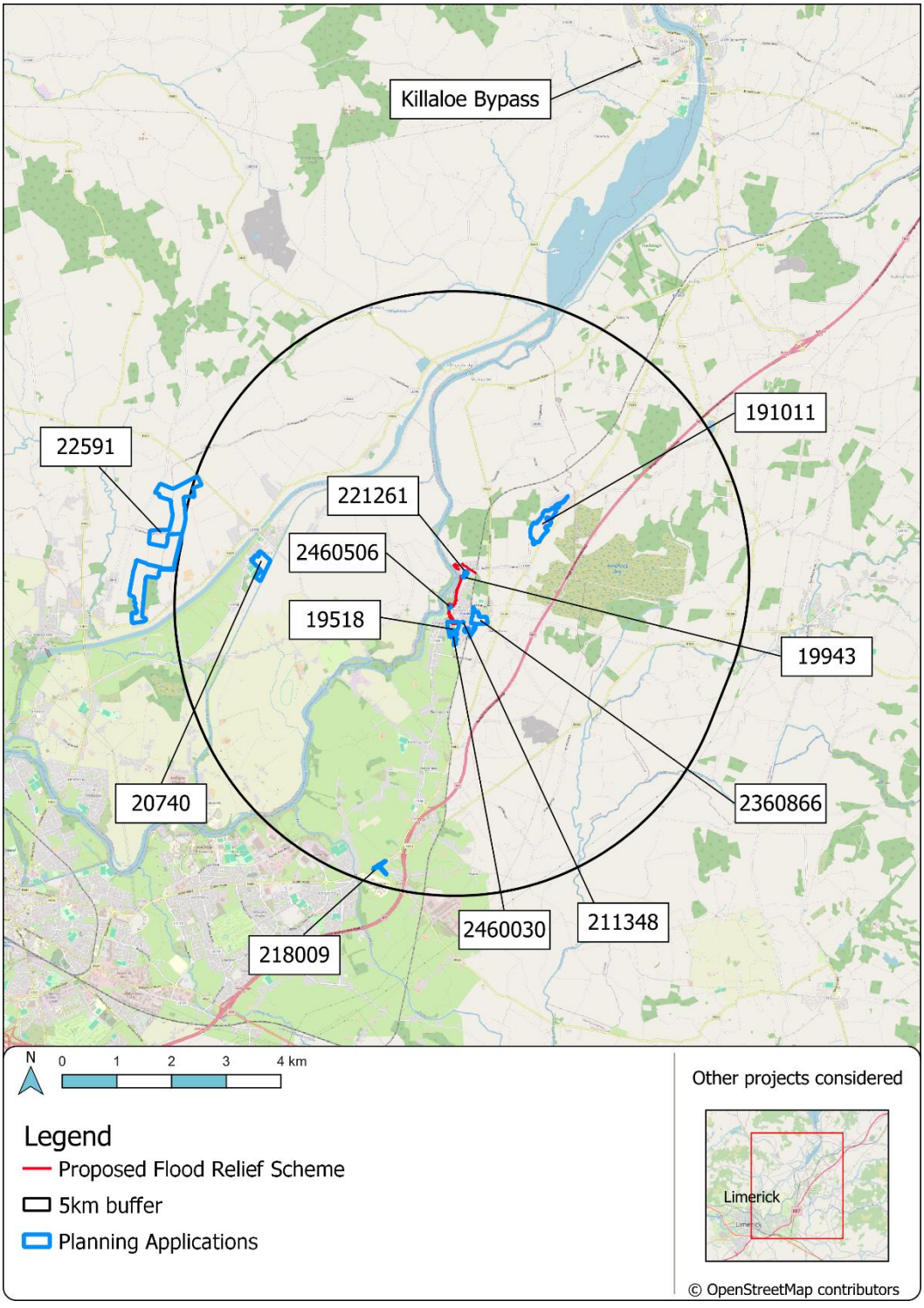

Figure 2: Projects considered for cumulative effects assessment

- Killaloe Bypass/Shannon Bridge Crossing/R494 Upgrade
- Planning file Ref. 191011- Restoration of the combined quarries in Gooig
- Planning file Ref. 19518 - Provision of 52 dwellings in Coolbane Woods
- Planning file Ref. 19943 - Construction of driveway and entrance to Parochial House, the Mall, Castleconnell
- Planning file Ref. 20740 - Construction of 70 dwellinghouses in Clonlara
- Planning file Ref. 211348 - "The Lodge" new single storey dwelling, Coolbawn Castleconnell
- Planning file Ref. 218009 - Cappamore Road (R506) & Dublin Road (R445) Junction works, Garraunykee & Woodstown, Co. Limerick.
- Planning file Ref. 221261 - The Commons Cloon & Commons Castleconnell detached dwelling house
- Planning file Ref. 22591 - Solar array at Ballyglass, Coolderry, Dromintobin North, Reanabrone and Oakfield (townlands) Ardnacrusha, Co Clare
- Planning file Ref. 2360866 - Coolbawn Estate extension, Meadows, Castleconnell
- Planning file Ref. 2460030 - Provision of 7 dwellings in Coolbane Castleconnell
- Planning file Ref. 2460506 – demolition of derelict coach house and construction of replacement guest accommodation at Stormont House, Castleconnell.

Potential impacts have been identified for some of the projects. The magnitude of these impacts is assessed below.

Air Quality and Dust

Regarding the cumulative impacts of the above projects with the proposed development during construction, no significant additional impacts are expected. However, the mitigation measures propose regular liaison meetings with other high risk construction sites. The aim of these is to ensure that plans are coordinated, and dust and particulate matter are minimised.

Planning Ref. 191011 is one of the developments considered as high risk due to the nature of the works. Regular liaison meetings should be held if the construction periods overlap.

Population and Human Health

If the construction periods of these projects overlap with the proposed development, it is expected that cumulative impacts associated with widespread construction works, disruption and diversion around the village and surroundings could occur. However, these impacts in Castleconnell will not be significant due to the size and nature of the projects involved. Furthermore, the operational phase of the proposed Flood Relief Scheme cumulatively with other projects will have positive impacts on Population and Human Health.

Biodiversity

During work for the construction of Killaloe Bypass, which is situated upstream Castleconnell, there is a potential for impacts to water quality and aquatic habitat in proximity and downstream the bridge. With mitigation measures in place, as well as several factors such as dilution of pollution due to distance and limited water movement between the two projects due to Parteen Weir, cumulative impacts are not expected.

The restoration of quarries in Gooig (Planning Ref. 191011) would require importation of uncontaminated soils and stones and works associated with them to restore the site for agricultural use. As part of the permission process the developers have submitted a Natura Impact Statement, which aims to provide information about potential impact on Naura 2000 sites. No pathways between this development and the proposed scheme were identified and therefore no cumulative impacts are expected.

The construction of a solar array at Ballyglass (Planning file Ref. 22591) will overlap with the construction of the proposed scheme. However no significant cumulative impacts are anticipated.

Several small developments (Planning Refs. 19943, 211348, and 221261) are located adjacent to the scheme and Lower Shannon Special Area of Conservation (SAC), therefore their cumulative impacts were

considered. As these developments require minimal works it was determined that no cumulative impacts are likely to occur.

Material Assets

The restoration of the combined quarries in Gooig (Planning file Ref. 191011) would require a significant number of trucks due to the large volume of material to be removed. However, given the location of the aggregate reserve, trucks exiting the site will not need to pass through Castleconnell. Therefore, no cumulative impacts associated with material assets are expected.

Landscape and Visual Amenity

It is possible that several projects construction phases will take place simultaneously with the proposed development. This can result in temporary slight negative cumulative effects. Cumulative operational impacts are expected to be negligible.

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