Natura Impact Statement

Proposed Wastewater Treatment Plant Upgrade Works, Castletroy, Co. Limerick

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1. INTRODUCTION

1.1 Background

MKO has been appointed to provide the information necessary to allow the competent authority to conduct an Article 6(3) Appropriate Assessment of the proposed upgrades of a wastewater treatment facility at Castletroy, County Limerick (Grid Ref: R 60730 58485). An Appropriate Assessment Screening Report has been prepared and is provided in Appendix 1. This Article 6(3) Appropriate Assessment Screening Report has identified the European Sites upon which the proposed development has the potential to result in significant effects and the pathways by which those effects may occur.

This Natura Impact Statement (NIS) has been prepared in accordance with the European Commission's Assessment of Plans and Projects Significantly affecting Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC (EC, 2021) and Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (EC, 2018) as well as the Department of the Environment's Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DoEHLG, 2010) and the Appropriate Assessment Screening for Development Management. Office of the Planning Regulator, Dublin 7, Ireland OPR (2021).

In addition to the guidelines referenced above, the following relevant guidance was considered in preparation of this report:

1. *1.European Communities (2000) Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission,*
2. *2.Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission,*
3. *EC (2007) Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission. European Commission.*

1.2 Statement of Authority

A baseline ecological survey was undertaken on the 6th of April 2022 by Rachel Walsh (BSc. Env) of MKO and on the 23rd of July 2020 by Claire Stephens (BSc. Env.) of MKO. This report has been prepared by Rachel Walsh (B.Sc. Env.), who has 2 years' experience in ecological consultancy. This report has been reviewed by Pat Roberts (B.Sc., MCIEEM) who has over 16 years' experience in ecological assessment.

1.3 Structure and Format of this NIS

- Section Two sets out the scope of the NIS by firstly providing a summary of the findings of the Article 6(3) Appropriate Assessment Screening Report. This clearly identifies the European Sites that have the potential to be significantly affected by the proposed development and the pathways by which they might be affected. Section Two then identifies the individual Qualifying Interests (QIs) or Special Conservation Interests (SCIs) that have the potential to be affected via the identified pathways for effect.
- Following this, in Section Three, all elements of the proposed project are fully described.
- Section Four describes the baseline environment with respect to the relevant QI/SCI of the screened in European Sites.

- Section 5 provides an assessment of the potential for adverse effects on the identified European Sites in the absence of mitigation. Mitigation to robustly block any identified pathways for impact is then prescribed.
- Section 6 provides an assessment of residual effects taking into consideration the proposed mitigation.
- In Section 7, the potential in combination effects of the proposed development on European Sites, when considered in combination with other plans and projects were assessed.
- A concluding statement is provided in Section 8.

2. CONCLUSIONS OF ARTICLE 6(3) APPROPRIATE ASSESSMENT SCREENING REPORT AND SCOPE OF ASSESSMENT

The Article 6(3) Appropriate Assessment Screening report identified the potential for the proposed development to result in significant effects on the following European Sites:

- Lower River Shannon SAC (002165)
- River Shannon and River Fergus Estuaries SPA (004077)

Each of these sites is discussed individually below in terms of the Qualifying Interests/Special Conservation Interests with the potential to be affected and the pathways by which any such effects may occur.

2.1 Lower River Shannon SAC (002165)

The individual pathways for effect that were identified in Table 3.1 of the AA Screening Report (Appendix 1) and the QIs with the potential to be affected are described below.

Detailed conservation objectives for this site (NPWS Version 1, August 2012), were reviewed for each of the QIs in the context of their respective conservation objectives as part of the assessment.

This European Site is located approximately 8m from the development site and outside of the site boundary, and no potential for direct effects on any of the QIs of the SAC was identified.

There is no potential for indirect effects on the following terrestrial QIs of this SAC. Due to the terrestrial nature of these habitats, there is no potential for hydrological effects on these QIs. No QI habitats are present within or adjacent to the development site boundary:

- 1220 Perennial vegetation of stony banks
- 1230 Vegetated sea cliffs of the Atlantic and Baltic coasts
- 6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)

According to Map 15 of the site-specific conservation objectives, Freshwater Pearl Mussel is found within a separate catchment to that which is downstream of the development, therefore no pathway for effect on this QI exists.

2.1.1 Hydrological pathways

The current effluent from the WwTP is not currently having an observably negative impact on water quality. The proposed upgrades will accommodate future loadings to the Plant and ensure that the effluent is treated efficiently. The resulting effluent will remain within Environmental Quality Standards (EQS's) for surface water. There will be improved stormwater storage and treatment at the plant as a result of the upgrades. Therefore, there is no potential for significant negative effects on aquatic habitats and species as a result of operation of the development.

A potential pathway for significant effect on the SAC was identified via deterioration of surface water via drains within the WwTP, ground water pathways and flood risk during construction of the development, potentially affecting the following aquatic QIs:

- 1095 Sea Lamprey *Petromyzon marinus*
- 1096 Brook Lamprey *Lampetra planeri*
- 1099 River Lamprey *Lampetra fluviatilis*
- 1106 Atlantic Salmon *Salmo salar* (only in fresh water)
- 1110 Sandbanks which are slightly covered by sea water all the time
- 1130 Estuaries
- 1140 Mudflats and sandflats not covered by seawater at low tide
- 1150 *Coastal lagoons
- 1160 Large shallow inlets and bays
- 1170 Reefs
- 1310 *Salicornia* and other annuals colonizing mud and sand
- 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
- 1349 Bottlenose Dolphin *Tursiops truncatus*
- 1355 Otter *Lutra lutra*
- 1410 Mediterranean salt meadows (Juncetalia maritimi)
- 3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
- 91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)

2.1.2 Disturbance

Following the precautionary principle, a potential for significant effect via disturbance of otter during construction of the development was identified.

2.2 River Shannon and River Fergus Estuaries SPA (004077)

The individual pathways for effect that were identified in Table 3.1 of the AA Screening Report (Appendix 1) and the SCIs with the potential to be affected are described below.

Detailed conservation objectives for this site (NPWS Version 1, September 2012), were reviewed for each of the SCIs in the context of their respective conservation objectives as part of the assessment.

This European Site is located 3.8km from the development site and outside of the site boundary, and no potential for direct effects on any of the SCI species was identified.

The SPA is designated for several bird species of Special Conservation Interest (SCI). There is no suitable habitat for any of the SCI species within the development site, which is comprised of buildings, artificial surfaces and infrastructure, and amenity grassland. The works will be confined to modified and managed habitats within the WwTP boundary. There will be no works at the existing outfall point. The site is buffered and screened from the River Shannon by a treeline, woodland and public river walkway. Therefore, there is no potential for significant effect via ex-situ disturbance/displacement of SCI species.

2.2.1 Hydrological pathways

The SPA is located approximately 8.2km hydrologically downstream of the development site.

The current effluent from the WwTP is not currently having an observably negative impact on water quality. The proposed upgrades will accommodate future loadings to the Plant and ensure that the

effluent is treated efficiently. The resulting effluent will remain within Environmental Quality Standards (EQS's) for surface water. There will be improved stormwater storage and treatment at the plant as a result of the upgrades. Therefore, there is no potential for significant negative effects on SCIs a result of operation of the development.

Taking a precautionary approach, a potential pathway for indirect effects on the supporting habitat of all SCI species, 'Wetlands and waterbirds [A999]', was identified in the form of deterioration of water quality during construction activities. The potential for effect on all of the SCI species was individually considered. This NIS documents the potential for effects in relation to Wetlands and Waterbirds as this reflects the identified pathway for effect on all SCI species.

3. DESCRIPTION OF PROPOSED DEVELOPMENT

3.1 Site Location

The proposed development site is an existing wastewater treatment plant located in the suburb of Castletroy, County Limerick (Grid Ref: R 60761 58471). It is situated approximately 800m northwest of the University of Limerick and 4km east of Limerick City Centre.

The site is located along the south bank of the Lower River Shannon which is a Special Area of Conservation as designated under the EU Habitats Directive. The site is accessed via the regional road R445 and Plassey Park Road.

The location of the site in relation to European Sites is shown in Figure 3-1.

3.2 Characteristics of the Proposed Development

3.2.1 Description of the project

3.2.1.1 Existing Situation

Castletroy Wastewater Treatment Plant (WwTP) has been providing wastewater treatment to the area since the 1990s. Irish Water, in partnership with Limerick City and County council, have identified that an upgrade to the WwTP is vital to support existing and future development in the area. The WwTP is currently operating at the limitations of its design capacity. An upgrade is required to ensure that it continues to meet the EPA licence requirements. There is currently no provision of stormwater storage, therefore excess flows from heavy rainfall events are discharged directly to the Lower River Shannon. The current wastewater discharge licence (WWDL) allows the plant to serve a population equivalent (PE) of 45,000. The current operations at the Plant cater to a PE of 39,000. The current WwTP provides the following treatment:

- Main Pump Station and Preliminary treatment: management of stormwater flows, removal of inorganic solids (grit and screenings).
- Primary Treatment: removal of gross organic solids.
- Secondary treatment - removal of suspended and dissolved pollutants using a secondary conventional aeration, activated sludge system.
- Nutrient removal – ammonia removal and chemical dosing to promote Phosphorous removal in the secondary clarifiers.
- Sludge treatment – gravity thickening and sludge de-watering using a belt press before removal to offsite sludge processing.
- Outfall to the River Shannon - combined storm and treated effluent outfall.

The existing discharge point from the Plant includes three outfall pipes which exit the final effluent pumping station within the WwTP site. These outfall pipes extend approximately 75m into the main river channel and each is fitted with 2 no. diffuser heads. The diffuser heads have 4 no. legs to disperse discharge and enhance mixing with the river flow.

During normal weather conditions the final effluent consists of treated discharge from the WwTP process (SWO1). However, during storm and heavy rainfall conditions it may be mixed with screened stormwater from the inlet works (SWO4) and possibly unscreened emergency overflows (EOs).

The EPA issued a wastewater discharge licence (WWDL) for the agglomeration of Castletroy and its environs on the 22nd April 2009. The WWDL was issued under Regulation 28(1) of the Waste Water Discharge (Authorisation) Regulations 2007. The licence register number is D0019-01 and the Licensee was Limerick County Council. The discharge location is the River Shannon (WFD Code: IE_SH_25_3904).

Emission limit values (ELVs) are specified in the WWDL. They determine the maximum allowable concentrations of waste components/pollutants that can be discharged in the final effluent without adversely affecting the receiving aquatic environment. ELVs assigned to Castletroy WwTP are listed below.

BOD – 25mg/L
COD – 125mg/L
Suspended Solids – 35mg/L
Ammonia (as N) – 5mg/L
Ortho-phosphate (as P) – 1mg/L
Total Phosphorous (as P) – 2mg/L
pH – 6.0 to 9.0

3.2.1.2 Planned Works

Irish Water intend to carry out upgrades at the existing Castletroy Wastewater Treatment Plant. The planning application is for upgrade of an existing Secondary Extended Aeration Activated Sludge Plant to cater for the 10-year growth projections 77,500 PE, including IDA Load, and to allow for future phase 2 works expansion to 81,100 PE. The proposed works are as follows:

1. *Retain existing inlet pump station, including foul and storm pumps*
2. *Retain the existing inlet screens and grit removal system*
3. *Installation of 1 no. new c. 3,750 m^3 Stormwater Storage Tank and Return Pump Station required for 77,500 PE with capacity for Phase 2 expansion to 81,100 PE*
4. *Relocation of the existing Salsnes filter unit and installation of additional Salsnes filter units to cater for 77,500 PE with capacity for Phase 2 expansion to 81,100 PE*
5. *Installation of a new Salsnes filter Primary Sludge Holding/Mixing Tank*
6. *New Salsnes filter Lift Pump Station directly after the Inlet Works*
7. *Upgrade the existing 500mm inlet pipe work to oxidation tanks to allow design flows to be delivered to the tanks*
8. *Retain the 2 no. existing Oxidation Tanks and raise the Top Water Level in the tanks by 300mm*
9. *Installation of a system of textile curtains housed in a removable IFAS frame in the oxidation tanks*
10. *Retain the existing air blowers and install additional units including a new control panel*
11. *Provision of IFAS frame lifting cranes*
12. *Retain the existing 3 no. existing FSTs as this will be sufficient for IFAS system*
13. *Retain the existing Return Activated Sludge (RAS) Pump Station however replace the existing RAS pumps and upgrade the existing 250mm RAS pipework.*
14. *Replace existing chemical dosing system*
15. *Retain existing Picket Fence Thickeners (PFTs) and repair*
16. *Replace existing sludge dewatering equipment to provide for additional capacity required for 10-year design loads with capacity for Phase 2 expansion to 81,100 PE*

All works will be within the existing WwTP boundary and there will be no works carried out at the outfall. There will be no instream works required.

The proposed layout drawing of the development is provided as Figure 3-2.

3.2.1.2.1 Stormwater Storage Tank

The new stormwater storage tank will store stormwater until rainfall levels subside and it can be pumped into the plant for full treatment. Construction will involve:

- Rectangular twin cell tank with 3,750m^3 volume (minimum).
- 45m (length) x 20m (breath) x 4.2m (depth).
- Storm return pumping station up to 1DWF to full treatment.

The new stormwater tank will reduce spills and will help to meet Recreational Water Standards, as detailed further in Section 3.2.3.1.3 below.

3.2.1.2.2 Primary Treatment

Primary Filtration – Additional grit traps and new primary treatment filters will increase the removal of suspended solids and BOD.

- Installation of primary treatment filters within a footprint of 218m^2.
- Construct a building to house filters, control panels, associated equipment and instrumentation.

3.2.1.2.3 Secondary Treatment Aeration System

Aeration tanks retrofitted with Integrated Fixed-Film Activated Sludge (IFAS) technology will provide additional treatment capacity. This element will increase capacity for ammonia removal.

- Install a system of textile curtains housed in a removable Integrated Fixed-Film Activated Sludge (IFAS) frame.
- 36 no. IFAS frames integrated into the existing structure
- Replace existing air diffusers which will be near end of life and install additional diffusers.
- Modify existing road to facilitate crane set-up area.
- Retain the existing air blowers and install additional units.

3.2.1.2.4 Secondary Clarifiers

Install tube settlers or baffles on the 2 no. 20m diameter picket fence thickeners (PFT's) to increase their hydraulic capacity.

- A new scum pumping station to transfer scum directly to the sludge treatment process.
- Install additional chemical dosing tank to increase storage capacity.

3.2.1.2.5 Sludge Treatment

Existing sludge treatment involves 2 no. picket fence thickeners (PFTs) of 7.1m diameter, 195m^3 volume and 12m diameter, 470m^3 volume. Dewatering equipment includes a belt press installed in 1992 and a centrifuge which is not currently operational. The following is proposed:

- Construct a new 12m diameter picket fence thickener.
- Repurpose the 7.1m diameter tank for mixing primary and secondary sludge to improve sludge quality.
- Upgrade and replace the sludge dewatering equipment.

3.2.1.3 Surface Water System

Increased hardstanding areas and infrastructure will increase surface water run-off from the site during operation. However, as shown on Figure 3-2, additional surface water created will be directed through to a surface water attenuation storm cell, measuring 22.4m x 13m in surface area, in the north of the site via a hydrocarbon interceptor. A flood compensation storage area measuring 28m^3 will also be provided within the site.

3.2.2 Existing Impacts on Water Quality

The existing discharge point from the WwTP includes three outfall pipes which exit the final effluent inspection chamber. These outfall pipes extend approximately 75m into the main river channel and each is fitted with 2 no. diffuser heads. The diffuser heads have 4 no. legs to disperse discharge and enhance mixing with the river flow.

During normal weather conditions the final effluent consists of treated discharge from the WwTP process (SW-1). Due to the lack stormwater storage on site, screened stormwater from the inlet works (SW-4), and an upstream unscreened emergency overflow (EO), flow directly to the final effluent chamber, where they are mixed with treated effluent before discharging to the Lower River Shannon.

3.2.2.1 WFD Waterbody Status

The EPA GIS Application (EPA Maps) and Catchments.ie were reviewed in order to establish a baseline on existing receiving water quality (accessed 21/10/2022). The outfall point for effluent discharge from Castletroy WwTP is located in the Shannon River (Lower), European Code IE_SH_25S012600. **Error! Reference source not found.** below provides a summary of WFD Waterbody S tatus attributes for the Lower River Shannon (Lower) (EPA Code: 25S01) and main tributaries upstream of the Castletroy WwTP site.

Results from surveys carried out between 2013 and 2018, class the reach as 'moderate' WFD water quality status. It was also assigned a WFD risk score 1a in 2008, which indicates the waterbody is at risk of not achieving 'good' status.

Biological Q values upstream of the WwTP are also an indicator of receiving water quality. Most recent Q values were recorded 2021. Results for upstream monitoring points in the Shannon , Mulkear and Blackwater rivers range from 'poor' to 'good' ecological status. It has also been noted the Shannon Estuary (Limerick Dock) begins approximately 3km downstream of the outfall point where the river changes into a transitional waterbody with 'good' water quality status.

Table 3-1 Lower River Shannon WFD Waterbody Status Attributes

WFD Waterbody Status	
River Waterbody Code	IE_SH_25S012600
Protected Area	Yes
WFD Risk (3rd cycle)	Under review
WFD Status (2016-2021)	Moderate
Sub catchment	Shannon [Lower]_SC_090

Pressures	No Significant Pressures identified
Q-Values	
9.4km u/s, Shannon (Lower), RS25S012500	Q3, Poor (2021)
4.9km u/s, Mulkear (Limerick), RS25M040590	Q4 Good (2021)
3.6km u/s, Blackwater (Clare), RS25B060250	Q3-4, Moderate(2021)

3.2.2.2 Water Quality Monitoring Data

Further analysis of baseline water quality was carried out by JB Barry & Partner Ltd and is summarised below.

Ambient Chemistry Monitoring data was obtained from catchments.ie (accessed 10/08/2022) for the following monitoring stations (Plate 3-1):

Upstream of Castletroy WwTP - RS25S012561 'WDLE 21 Shannon BR in UL u/s Castletroy STP'

Downstream of Castletory WwTP - 'RS25S012570 'D/S Castletroy UWWTP WDLE22'

Results for the EQS parameters BOD, Ortho-P and Ammonia were analysed.

Plate 3-1 EPA Water-monitoring stations.

3.2.2.3 EQS Compliance

A preliminary assessment of sample results was carried out to establish the baseline water quality upstream (u/s), and downstream (d/s) of the WwTP. The assessment also considers the physiochemical status of the water with regard to corresponding EQS values. High status EQS values are listed for reference in Table 3-2.

Table 3-2 High Status EQS Values

Parameter	BOD (mg/l)	Ortho-P (mg/l)	Ammonia (mg/l)
EQS (High/Mean)	1.3	0.025	0.04
EQS (High/95%ile)	2.2	0.045	0.09

Both mean and 95%ile concentrations of BOD, ammonia and ortho-phosphate were calculated for a three-year period: January 2019 to November 2021. U/s and d/s results for both categories are listed in Table 3-3. It can be seen that changes are insignificant between u/s and d/s concentrations for all parameters. The 95%ile results for ammonia show the greatest change, at .01 mg/l or an increase of 18% in the d/s concentration, but it is still safely within the 95%ile EQS range. The 95%ile ortho-phosphate concentration is higher u/s.

Table 3-3 Upstream and downstream monitoring results

Baseline Water Quality Monitoring Results (2019-2022)			
Baseline Upstream	**BOD (mg/l)**	**Ortho-P (mg/l)**	**Ammonia (mg/l)**
Mean Conc.	1.05	0.016	0.022
95%ile Conc.	1	0.039	0.043
Baseline Downstream			
Mean Conc.	1.06	0.018	0.023
95%ile Conc.	1	0.037	0.053

All sample results for measured concentrations are of WFD High Water Quality Status. This indicates the existing WwTP is not having any significant long-term effect on the receiving water quality and confirms the WwTP is operating safely within the allowable ELVs.

3.2.2.4 Baseline Waste Assimilative Capacity Assessment

The impact of the final effluent on the Lower River Shannon is dependent on its Waste Assimilative Capacity (WAC). WAC refers to the ability of the river to disperse wastes and pollution without exceeding EQS limits and/or causing harm to the aquatic environment. For the purpose of the baseline assessment, it has been calculated for both median and Q95 flow rates, with respective (high status) mean and 95%ile EQS limits.

U/s and d/s WAC figures have been calculated using measured monitoring data as listed in Table 3-3. The results are displayed as the percentage of total assimilative capacity remaining in the river after loads of the primary waste parameters (kg/day) have been deducted. U/s concentrations (converted to kg/day) reflect how much WAC is already taken up by background contributors to water pollution such as agriculture and urban run-off, and how much remains to accept WwTP effluent load. The rate of change in the d/s results indicates the impact on WAC from the WwTP.

Similar to the findings in measured concentrations, there are no significant differences between u/s and d/s values. The greatest deterioration in capacity appears in 95%ile ammonia results from 52 – 41%, but there is still sufficient remaining WAC d/s. Ortho-phosphate capacity improves downstream in the 95%ile results.

Table 3-4 Waste Assimilative Capacity

Baseline Upstream	BOD	ortho-P	Ammonia
Mean & Median Flow	19%	36%	45%
95%ile & Q95 Flow	55%	13%	52%
Baseline Downstream			
Mean & Median Flow	18%	28%	42%
95%ile & Q95 Flow	54%	17%	41%

3.2.2.5 Conclusion of baseline water quality analysis

Conclusions from the baseline water quality assessment indicate that water quality in the vicinity of the discharge point is of good standard. Analysis of 2019-2021 monitoring results confirmed that average concentrations of primary waste water parameters are within High EQS limits. The WwTP is not currently having any significant impact on receiving water quality in terms of increases in d/s concentrations or deterioration in the river's waste assimilative capacity (WAC). It was also observed that the WwTP is producing a final effluent with significantly lower emissions than the allowable ELVs.

Therefore, it can be deduced that there are currently no negative impacts on water quality and aquatic habitats and species as a result of the current discharges from the WwTP.

3.2.3 Future Impacts on Water Quality

The following paragraphs detail the proposed activities associated with the operation of the upgraded wastewater treatment plant and the resulting impact on operational water quality as a result of the upgrade works.

The primary drivers for the Castletroy WwTP upgrades works are as follows:

- The primary discharge (treated outflow) is currently compliant with the EPA WWDL. However, industrial licensees are not fully utilizing their existing allowances and growth projections indicate wastewater loads will intensify.
- The existing storm water overflow (SWO) is non-compliant with the EPA discharge license, as there is no stormwater storage. Stormwater is released to the Lower River Shannon with only preliminary treatment (screening).

The works will help to accommodate the future projected population growth and to provide for stormwater storage and treatment. The current design PE capacity of the Plant is 45,000 PE. The current operations of the Plant cater to a 39,000 PE.

The following objectives will be achieved as a result of the upgrades:

- Ten-year growth period to 77,500 PE with provision to meet the 25-year growth period 81,100 PE.

- 20% headroom allowance, in line with regional planning guidelines for large urban settlements.
- Stormwater storage to reduce the annual rate of spills to the Lower River Shannon and comply with the criteria outlines in the DoEHLG "*Procedures and Criteria for Storm Water Overflows, 1995.2*
- To meet the requirements of the EPA Wastewater Discharge License and Urban Wastewater Treatment Regulations (UWWTR), and compliance with WFD objectives.

Overall, the impacts of the operational phase of the upgrade are anticipated to have a neutral effect on water quality and will achieve the following:

- The volume of treated discharge will increase;
- Quality of the final treated effluent will remain compliant with environmental standards;
- The new storm event pump station will regulate flow rates during heavy rainfall events and greatly reduce the likelihood of surcharging in the network;
- There will be less untreated stormwater pumped into the river as the storm tank will retain stormwater until such a time it can be returned to full treatment; and
- There will be less than 7 spills per bathing season

3.2.3.1 Future Impacts on Water Quality due to Discharge

An analysis of the future impacts on water quality relative to Environmental Quality Standards (EQS) and Waste Assimilative Capacity (WAC) of the River Shannon and The Water Framework Directive was carried out by JB Barry & Partners Ltd and is summarised below.

3.2.3.1.1 *EQS Compliance:*

The assessment of the changes in the final effluent discharge focuses on the environmental impact of the discharge on the local receiving waters with reference to the relevant European and Irish legislation. Calculated predictions were carried out to assess (worst case) future impacts of the final effluent on water quality in the Lower River Shannon according to high status mean EQS concentration limits.

Table 3-5 High Status EQS Concentration Limits

Parameter	BOD (mg/l)	Ortho-P (mg/l)	Ammonia (mg/l)
EQS (High/Mean)	1.3	0.025	0.04

Table 3-6 displays projected downstream concentrations calculated for each loading scenario, and on the basis of median river flow, future hydraulic loading rates (ADF) at the WwTP and relative effluent concentrations when max. ELVs are utilised. It can be seen that d/s ammonia will exceed the EQS under all cases and ortho-phosphorus is on the borderline for both the 10- and 25-year scenarios. BOD comes close to the limit in long range 25-year scenario, but still remains within the allowable EQS.

Table 3-6 Predicted D/s Concentrations using Existing ELVs

Parameter	BOD (25mg/l)	Orth-P (1mg/l)	Ammonia (5mg/l)
EQS (High/Mean)	1.3	0.025	0.04

45,000PE (Design PE)	1.19	0.022	0.051
77,500PE (+10 year)	1.25	0.024	0.062
81,100PE (+25 year)	1.27	0.025	0.065

Following the initial assessment, calculations for the future scenario were altered to consider the d/s effects if the ELVs were reduced, subject to a WWDL review. It has been considered that demands on the WwTP will increase, but improvements in treatment capacity have been designed to meet future requirements. There should be no reduction in WwTP performance compared to the current situation with regard to quality of the final effluent. And therefore, meeting more stringent ELVs will be achievable. Future ELVs will be subject to licence review, but for the purposed of this assessment the following limits have been applied; BOD 20mg/l, Orth-P .75mg/l and Ammonia 2mg/l. Results in Table 3-7 indicate that by reducing the ELVs d/s water quality will remain within high status mean EQS values.

Table 3-7 Predicted D/s Concentrations using Proposed ELVs

Parameter	BOD (20 mg/l)	Orth-P (.75mg/l)	Ammonia (2mg/l)
EQS (High/Mean)	**1.3**	**0.025**	**0.04**
45,000PE (Design PE)	1.16	0.020	0.033
77,500PE (+10 year)	1.21	0.022	0.038
81,100PE (+25 year)	1.22	0.023	0.039

3.2.3.1.2 *WAC Assessment:*

A similar assessment was carried out for future effects on d/s WAC in the Lower River Shannon. Projections listed in Table 3-8 were calculated using high quality EQS standards, maximum emissions from the WwTP at ADF and median river flow in the river. In line with the concentration results in the previous section, ammonia WAC is exceeded at current full design capacity and becomes increasingly deficient in the future loading scenarios.

Table 3-8 Predicted WAC using Existing ELVs

Loading Scenario	BOD	Ortho-P	Ammonia
45,000PE (Design PE)	8%	13%	-27%
77,500PE (+10 year)	4%	3%	-57%
81,100PE (+25 year)	2%	1%	-65%

Again, calculations for the future scenario were altered to consider the d/s effects if the ELVs were reduced, subject to a WWDL review. Using the same method of calculation as above with the reduced emission limits, it can be seen that there will be sufficient WAC in the Lower River Shannon for all parameters and future loading scenarios, Table 3-9.

Table 3-9 WAC calculation using proposed ELVs

Loading Scenario	BOD	Ortho-P	Ammonia
45,000PE (Design PE)	10%	19%	16%
77,500PE (+10 year)	7%	20%	14%
81,100PE (+25 year)	6%	18%	12%

In summary, there will be a % reduction in WAC as the WwTP discharge rate increases, but it is not expected to breech high status environmental constraints if more stringent ELVs are put in place (subject to an WWDL review). There will also be significant improvements in the rate of stormwater overflows due to the addition of stormwater storage.

3.2.3.1.3 Stormwater spills

A drainage area plan (DAP) has been developed by RPS Group for the Castletroy agglomeration. A survey of the entire sewer drainage network was carried out, from which a hydraulic model was built that could assess the condition and performance of the sewers and SWOs in the catchment.

The model was used to quantify the annual frequency and volume of spills currently being discharged to the Lower River Shannon from SWO4. Flow to full treatment (FFT) for the current design capacity 45,000PE at 17,280m^3/day (or 200 l/s) was input to the model. Spill volumes equal-to or over 1m^3 in excess of FFT were recorded as spills.

Table 3-10 lists results in terms of average annual spills, average spills per bathing season and relative spill volumes from 2018 - 2028.

Table 3-10 Baseline Model Output (Spill≥1m3)

Year	Overflow ID	Avg. Annual Spills	Avg. Bathing Season Spills	Avg. Annual Spill Vol. (m^3)	Avg. Bathing Season Spill Vol. (m^3)
2018-2028	Castletroy WwTP Final Outfall	123	33	48,312	16,767

A new 4,500m3 stormwater storage tank will be constructed on-site that will reduce storm spills to the Lower River Shannon. It has been designed to cater for 25-year growth projections, and in accordance with Irish Water Document No. UÉ-TEC-700-99-02 “Inlet works & stormwater treatment (wastewater)”.

The new stormwater tank will significantly reduce spills and will help to meet Recreational Water Standards. As shown above, modelling of existing spills from the outfall at the WwTP, under current conditions, estimated the average annual spill volume to be 48,312m^3. As already detailed above, the discharge from the WwTP is currently within EQS’s and in line with the WFD. The proposed new

stormwater tank will result in significant reductions in yearly stormwater spills and therefore an improvement in treatment of effluent.

Flows in excess of three times the Dry Weather Flow baseline (3DWF) and emergency overflows will be redirected to the new stormwater storage tank. The wastewater will be screened and held until such a time that incoming flows to the WwTP subside, then it will be returned to the main process stream for full treatment. In the event that the storm intensity causes the tank to reach capacity, the (screened) spills will be directed to the final effluent chamber, as per the current situation.

RPS ran a Drainage Area Plan (DAP) model using baseline flow survey data with stormwater storage introduced. Model outputs for the current baseline versus future spill frequency, following the Proposed Development works, can be seen in Table 3-11. It is predicted that there will be an average of less than 7 spills per annum.

Table 3-11 DAP Model Outputs - Current Vs. Future Scenario (Spill≥1m3)

Year	Model Output	Avg. Annual Spills	Avg. Bathing Season Spills	Avg. Annual Spill Vol. (total m^3)	Avg. Bathing Season Spill Vol. (total m^3)
2018 - 2028	Current Baseline	123	33	48,312	16,767
	Future Scenario	7	3	4,839	290

The baseline water quality data and future calculations of effluent and assimilative capacity of the River Shannon have shown that the effluent is currently being discharged to the aquatic environment in line with EPA and WFD objectives and as a result of the proposed upgrade works, will continue to do so. It can therefore be deduced that there will be no deterioration in water quality as a result of operation of the development. Based on the points stated in the sections above, there will be a % reduction in WAC as the WwTP discharge rate increases, but it is not expected to breech high status environmental constraints if more stringent ELVs are put in place (subject to an WWDL review). There will also be significant improvements in the rate of stormwater overflows due to the addition of stormwater storage.

3.3 Flood Risk Assessment

A review of the potential for the site to flood was undertaken due to the potential for deterioration of river water quality as a result of flooding during construction, which would have potential to impact aquatic habitats and species.

A Flood Risk Assessment was carried out by JB Barry & Partners Consultant Engineers. CFRAM mapping has revealed that a portion of the site to the centre and south are within Flood Zone C. A portion of the site around the perimeter of the WwTP is within Flood Zones A and B (Plate 3-2). The CFRAM map indicates that the 1% AEP fluvial flood level (Flood Zone A) is +6.37mOD and the 0.1% AEP fluvial flood level is +6.93mOD.

From a site visit it was noted that recent flood events recorded levels up to the door entrance of the main control building and it was reported that flooding occurred through a channel/ditch which runs along the Western boundary of the site. Water ingress also occurred through the site entrance. Recent flooding was not reported to have occurred in the green area which will be the primary proposed area for new infrastructure.

The Flood Risk Assessment Report is shown in Appendix 2.

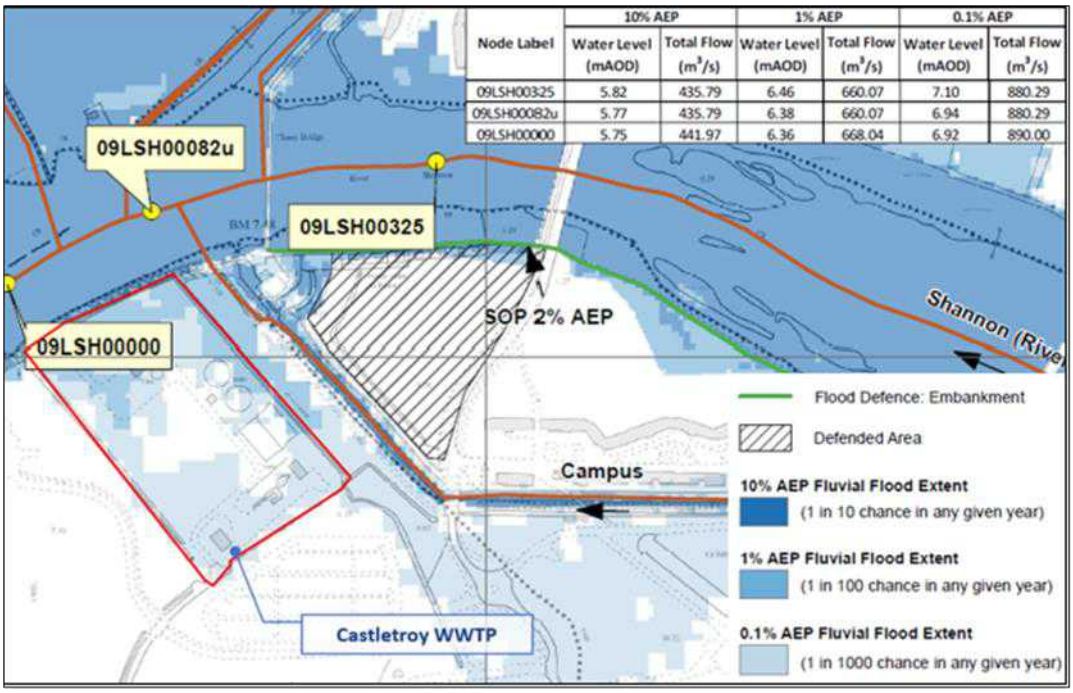


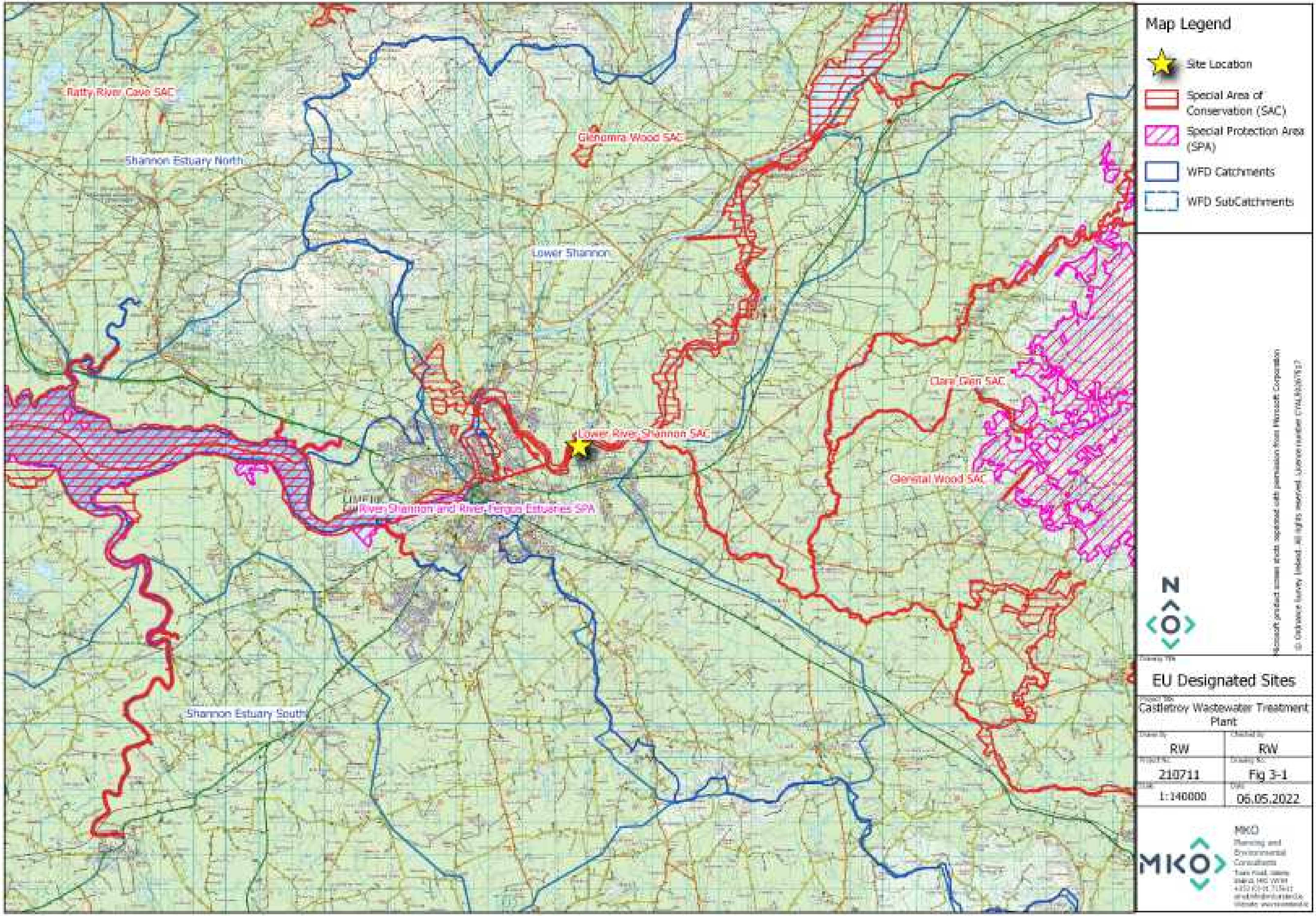
Plate 3-2 CFRAM Flood Mapping. Source: Flood Risk Assessment Report.

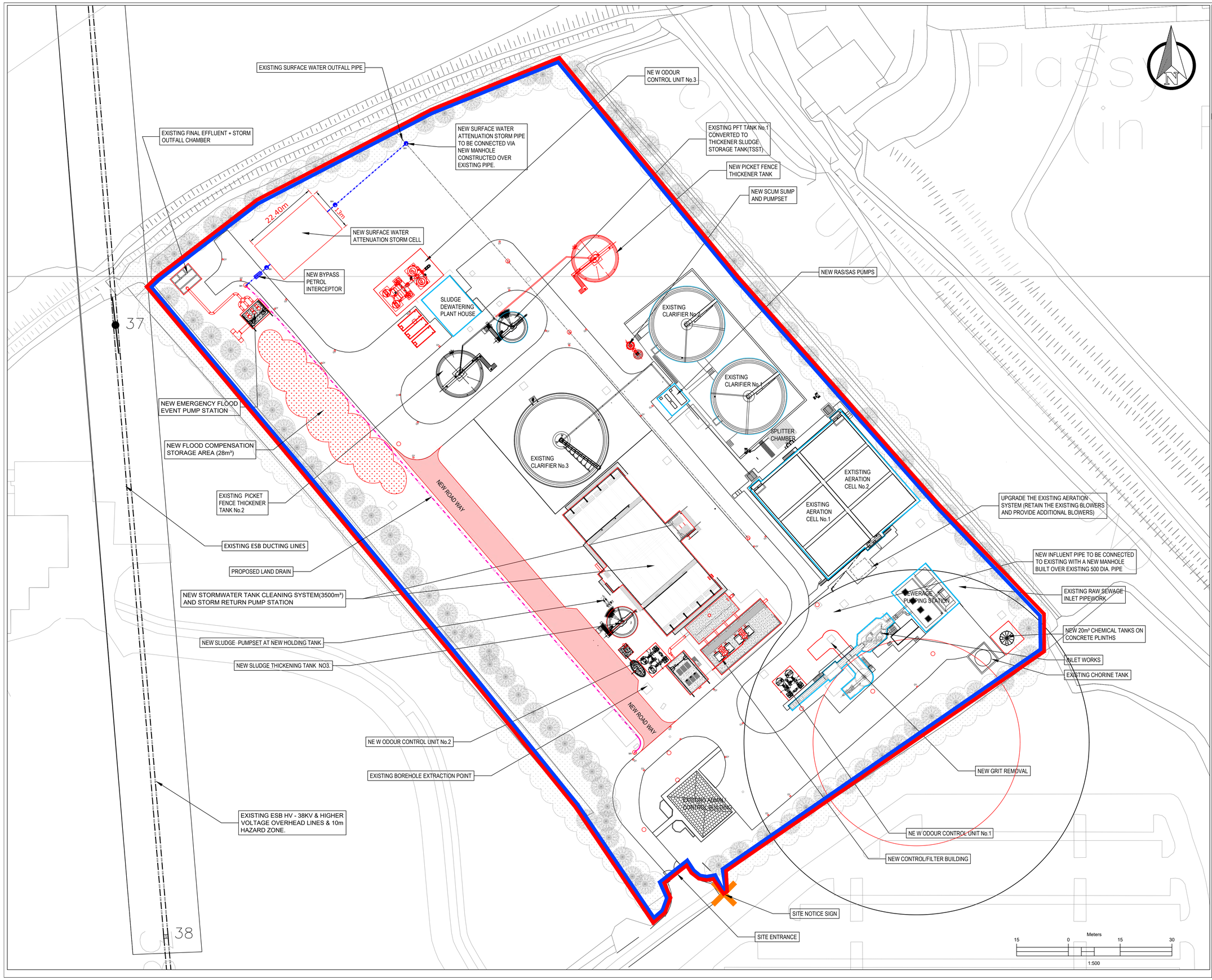
3.4 Groundwater Monitoring

A review of site investigation results of the study site was undertaken due to the potential for groundwater contamination during construction resulting in impacts on aquatic habitats and species.

The anticipated excavation level for the installation of the proposed storm tank structure and forward feed pump station are in the order of 2m OD or approximately 5m below existing ground surface. Three exploratory boreholes were conducted as part of investigations and revealed water-table levels to be between 4.3m bgl to 6.8m bgl (2.75m OD to 0.2m OD). After 20 minutes, levels rose to between 3.7m bgl to 6m bgl. The soil type is granular glacial till and soft silt and clay.

Works are likely to be carried out within the water table.


Map Legend
Site Location
Special Area of Conservation (SAC)
Special Protection Area (SPA)
WFD Catchments
WFD SubCatchments
Ratty River Cave SAC
Shannon Estuary North
Glenomra Wood SAC
Lower Shannon
Lower River Shannon SAC
River Shannon and River Fergus Estuaries SPA
Clare Glen SAC
Glenstal Wood SAC
Shannon Estuary South
N
EU Designated Sites
Castletroy Wastewater Treatment Plant
RW
RW
210711
Fig 3-1
1:140000
06.05.2022
MKO
Planning and Environmental Consultants



Notes:
1. All levels are in metres and relate to O.S. Datum MALIN.
2. This drawing is reproduced from digital maps:
   O.S. MAPS - Scale 1:2,500
   O.S. MAPS - Scale 1:1,000
   Discovery Series - Scale 1:50,000
3. All Maps are referenced to IRISH TRANSVERSE MERCATOR (I.T.M.)
4. Ordnance Survey Ireland Licence No. EN 0003022
   ©Government of Ireland.

LEGEND

MAPPING
OS SHEETS: 4683-A,4683-C,
DISCOVERY SERIES; OS1614_D

SITE BOUNDARY OUTLINED IN RED

LANDS IN CONTROL OF THE APPLICANT OUTLINED IN BLUE

SITE AREA = 3.166Ha

PROPOSED UPGRADE WORKS

PROPOSED NEW WORKS & PIPEWORK

ESB HV - 38KV & HIGHER VOLTAGE OVERHEAD LINES"

NOTE:
MAXIMUM FLOOD LEVEL IS +6.93MOD

Rev.	Suit.	Description	Drawn	Ch'kd	Date
C01	A1	ISSUED FOR PLANNING	LA	PJ	14.12.22

Client:

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Consulting Engineers

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email: info@jbbarry.ie
website: www.jbbarry.ie

Project:

CASTLETROY WASTEWATER TREATMENT PLANT

Drawing Title

PROPOSED SITE DRAINAGE LAYOUT PLAN

Drawn by :	LHA	Date :	DEC.2022
Checked by :	PH	Date :	DEC.2022
Approved by :	PJ	Date :	DEC.2022
Internal Project REF :	20701		
Scales :	1:500 @ A1		
Stage :	PLANNING		

Drawing No. :	Revision	Suitability Code
20701-JBB-00-XX-DR-Z-1207	C01	A1

4. CHARACTERISTICS OF THE RECEIVING ENVIRONMENT

The ecological surveys that were undertaken to inform this NIS are fully described in this section. A general description of the ecology of the site of the proposed development is provided in the AA Screening Report in Appendix 1. The specific surveys that were undertaken to assess the potential effects on the identified European Sites are described below.

4.1 Ecological Survey Methodologies

4.1.1 Ecological Multidisciplinary Walkover Surveys

A multidisciplinary walkover survey was conducted on the 6th of April 2022 and the 23rd of July 2020 in line with NRA (2009) guidelines (Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes) by MKO. The multidisciplinary walkover survey was designed to survey the site for a range of ecological receptors including sensitive habitats, protected species and invasive species. The survey area covered the site of the existing wastewater treatment plant where upgrade works are proposed as well as adjacent wooded areas and watercourses. The ecological survey was undertaken within the optimal time of year to undertake a habitat and flora survey (Smith et. al 2011). The proposed works are restricted to the existing water treatment plant site. All habitats within and adjacent to the works area were readily identifiable during the site visit.

Due to the nature of the development site, an existing and operational wastewater treatment plant comprising treatment infrastructure, buildings, paved surfaces and small areas of amenity grassland, as well as the nature of the proposed upgrade works, dedicated bird surveys of the site were deemed unnecessary.

A dedicated invasive species survey was also undertaken during the site visit. During the survey, the site was searched for species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations (S.I. 477 of 2011).

4.1.2 Otter Survey

A dedicated otter survey was carried out by Rachel Walsh (BSc. Env) on the 6th of April 2022. The survey was carried out in accordance with NRA (2009) guidelines (Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes) and NRA (2009) Guidelines for the Treatment of Otter During Construction of National Road Schemes. A search was carried out along drain ditches adjacent to the development site, as well as the nearby mill race channel, wooded areas, and both 150m upstream and downstream of the development site, along the banks of the River Shannon. The survey included a search for holts, couches, slides, spraints, prints and feeding remains.

The extent of the otter survey is shown in Figure 4-1.

4.2 Results of Ecological Surveys

4.2.1 Desk Study Results

Assessing the impacts of any project and associated activities requires an understanding of the ecological baseline conditions prior to and at the time of the project proceeding. Ecological Baseline conditions are those existing in the absence of proposed activities (CIEEM 2018).

4.2.1.1 Data Collected to Carry Out Assessment

In preparation of the report, the following sources were used to gather information:

- Review of NPWS Site Synopses, Supporting Documents, and Conservation Objectives for the European Sites and all supporting documents.
- Review of 2019, 2013 and 2007 EU Habitats Directive (Article 17) Reports.
- Review of OS maps and aerial photographs of the site of the proposed project.
- Review of other plans and projects within the area.
- Liaison with the project team in relation to the design of the development.
- Review of baseline water quality data provided by JB Barry & Partners Ltd, provided in Section 3.2.2
- Multidisciplinary walkover surveys of the WwTP site and surrounds undertaken on the 6th of April 2022 and 23rd of July 2020 by MKO.

4.2.1.2 Baseline Flora and Fauna

Table 4-1 below provides data obtained from the National Biodiversity Data Centre (NBDC) database on 23/03/2022 in relation to potential Qualifying Interest and Special Conservation Interest species that are associated with the European Sites located downstream and that occur within the hectad pertaining to the site (R65).

Table 4-1 QI's and SCI's associated with downstream European Sites that have been recorded within Hectad R65 (NBDC).

QI Species	Hectad
Otter (*Lutra lutra*) [1355]	R65
SCI Species	**Hectad**
Cormorant (*Phalacrocorax carbo*)	R65
Whooper Swan (*Cygnus cygnus*)	R65
Teal (*Anas crecca*)	R65
Golden Plover (*Pluvialis apricaria*)	R65
Lapwing (*Vanellus vanellus*)	R65
Curlew (*Numenius arquata*)	R65
Black-headed Gull (*Larus ridibundus*)	R65

Table 4-2 Third Schedule Invasive Species recorded within Hectad R65 (NBDC).

Species	Hectad
Water Fern (*Azolla filiculoides*)	R65
Canadian Waterweed (*Elodea canadensis*)	R65
Giant Hogweed (*Heracleum mantegazzianum*)	R65
Giant Knotweed (*Fallopia sachalinensis*)	R65

Species	Hectad
Indian Balsam (*Impatiens glandulifera*)	R65
Japanese Knotweed (*Fallopia japonica*)	R65
Nuttall's Waterweed (*Elodea nuttallii*)	R65
Three-cornered Garlic (*Allium triquetrum*)	R65
Greylag Goose (*Anser anser*)	R65
Brown Rat (*Rattus norvegicus*)	R65
Eastern Grey Squirrel (*Sciurus carolinensis*)	R65
Fallow Deer (Dama dama)	R65
Dace (*Leuciscus leuciscus*)	R65

4.2.1.3 Freshwater Pearl Mussel (*Margaritifera margaritifera*)

The proposed development site is not located within a Freshwater Pearl Mussel Sensitive Catchment. The Freshwater Pearl Mussel population designated under Lower River Shannon SAC is located within the Cloon catchment, which is a separate catchment to the proposed development site.

4.2.1.4 Inland Fisheries Ireland Data

Inland Fisheries Ireland carried out fish stock surveys of the Shannon Estuary, Fergus Estuary and Limerick Docks in 2014 (Kelly et al. 2014). The Limerick Docks sampling site is approx. 7.5km downstream of Castletroy WwTP. A total of six beach seines, six fyke nets and six beam trawls were deployed in Limerick Docks water body in October 2014.

4.2.1.4.1 *Limerick Docks*

A total of 13 fish species were recorded in Limerick Docks. Flounder was the most abundant species, followed by smelt. In a similar trend to many of the other transitional water surveys, flounder was widespread, being recorded using all three netting methods.

A number of species were newly recorded in the 2014 survey, including lamprey sp., plaice, sand goby, smelt, sprat and thick-lipped grey mullet. Dace, an invasive species to this country, was also newly recorded in 2014. Common goby, pike and salmon were previously caught in 2008 but not captured in the 2014 survey of the Limerick Docks. European eel was also recorded during this survey.

Fish were recorded in the following order of decreasing frequency: Flounder (Platichthys flesus), Smelt (Osmerus eperlanus), Three-spined stickleback (Gasterosteus aculeatus), Roach (Rutilus rutilus), European eel (Anguilla Anguilla), Sprat (Sprattus sprattus), Dace (Leuciscus leucisus) Perch (Perca fluvialtilis), Sand goby (Pomatoschistus minutus), Brown trout (Salmo trutta), Lamprey sp., Plaice (Pleuronectes platessa), Thick-lipped grey mullet (Chelon labrosus).

Common goby (Pomatoschistus microps), Pike (Esox lucius) and Salmon (Salmo salar) were previously recorded in 2008 surveys of the Limerick Docks but were not recorded during 2014 surveys.

4.2.1.4.2 Upper Shannon Estuary

A total of 22 fish species were recorded in the Upper Shannon Estuary in October 2014. Flounder was the most abundant species, followed by sprat and sand goby. Flounder was widely distributed throughout the water body, being captured using all three netting methods, while other species such as sand goby were more localised, only recorded in the shallow marginal areas using beach seines. A number of species were newly recorded in 2014, including Atlantic horse mackerel/scad, bib, brill, coalfish/saithe, fifteen-spined stickleback, pogge and grey gurnard. Long-spined sea scorpion, perch, poor cod and short-spined sea scorpion were previously caught in 2008 but not captured in the 2014 survey. European eel was also recorded during this survey.

4.2.1.4.3 Lower Shannon Estuary

A total of 29 fish species were recorded in the Lower Shannon Estuary in October 2014. Sprat was the most abundant fish species, followed by sand goby, thick-lipped mullet and sand smelt. Flounder was well distributed throughout this water body, being captured using all three netting methods. A number of species were newly recorded in 2014, including bib, coalfish/saithe, grey gurnard, mackerel and sand sole. A number of species were previously caught in 2008 but not captured in the 2014 survey, including black goby, cod, European sea bass and European eel. This was the only water body surveyed during 2014 in which thornback ray was recorded.

The report concludes that plaice, smelt, flounder, sand goby, and sprat were among the most abundant and widespread species recorded between Limerick Docks and the Lower Shannon Estuary.

4.2.1.5 Lower River Shannon SAC [002165]

4.2.1.5.1 Review of Conservation Objectives

The relevant QIs, as described in Section 2.1, and their associated conservation objectives are presented in Table 4-3.

Table 4-3 Qualifying Interest and Conservation Objectives (Version 01, 2012)

Qualifying Interest	Conservation Objective (Version 01, 2012)
Sea Lamprey *Petromyzon marinus* [1095]	To restore the favourable conservation condition of Sea Lamprey in the Lower River Shannon SAC
Brook Lamprey *Lampetra planeri* [1096]	To maintain the favourable conservation condition of Brook Lamprey in the Lower River Shannon SAC
River Lamprey *Lampetra fluviatili* [1099]	To maintain the favourable conservation condition of River Lamprey in the Lower River Shannon SAC
Atlantic Salmon *Salmo salar* [1106]	To restore the favourable conservation condition of Salmon in the Lower River Shannon SAC
Otter *Lutra lutra* [1355]	To restore the favourable conservation condition of Otter in the Lower River Shannon SAC

Qualifying Interest	Conservation Objective (Version 01, 2012)
Bottlenose Dolphin *Tursiops truncatus* [1349]	To maintain the favourable conservation condition of Bottlenose Dolphin in the Lower River Shannon SAC
Estuaries [1130]	To maintain the favourable conservation condition of Estuaries in the Lower River Shannon SAC
Mudflats and sandflats not covered by seawater at low tide [1140]	To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in the Lower River Shannon SAC
Sandbanks which are slightly covered by sea water all the time [1110]	To maintain the favourable conservation condition of Sandbanks which are slightly covered by sea water all the time in the Lower River Shannon SAC
Mediterranean salt meadows (Juncetalia maritimi) [1410]	To restore the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) in the Lower River Shannon SAC
Atlantic salt meadows (Glauco-Puccinellietalia maririmae) [1330]	To restore the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae)* in the Lower River Shannon SAC
Salicornia and other annuals colonising mud and sand [1310]	To maintain the favourable conservation condition of Salicornia and other annuals colonizing mud and sand in the Lower River Shannon SAC
*Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]	To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) in the Lower River Shannon SAC
Reefs [1170]	To maintain the favourable conservation condition of Reefs in the Lower River Shannon SAC
Coastal Lagoons [1150]	To restore the favourable conservation condition of Coastal lagoons in the Lower River Shannon SAC
Large shallow inlets and bays [1160]	To maintain the favourable conservation condition of Large shallow inlets and bays in the Lower River Shannon SAC

Qualifying Interest	Conservation Objective (Version 01, 2012)
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]	To maintain the favourable conservation condition of Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation in the Lower River Shannon SAC

4.2.1.5.2 Site Specific Pressures and Threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to effect on the SAC were reviewed and considered in relation to the proposed works. These are provided in Table 4-4.

With regard to the proposed development, a pressure/threat to the SAC exists in the form of E03 'Discharges' and I01 'Invasive non-Native Species'.

Table 4-4 Site-specific threats, pressures and activities with potential to effect on the SAC (Natura Form, September 2018).

Rank	Code	Threats and pressures	Inside/outside/both
L	C01.01.02	Removal of beach materials	I
L	F01	Marine and freshwater aquaculture	I
M	E03	Discharges	B
M	J02.01.01	Polderisation	I
L	J02.12.01	Sea defence or coast protection works, tidal barrages	I
L	G01.01	Nautical sports	I
L	J02.10	Management of aquatic and bank vegetation for drainage purposes	I
L	F03.01	Hunting	I
M	A04	Grazing	I
L	B	Sylviculture, forestry	I
M	H04	Air pollution, air-borne pollutants	O
L	D01.01	Paths, tracks, cycling tracks	I
M	J02.01.02	Reclamation of land from sea, estuary or marsh	O
L	I01	Invasive non-native species	I
M	E01	Urbanised areas, human habitation	O
M	A08	Fertilisation	B
M	K02.03	Eutrophication (natural)	O
L	C01.03.01	Hand cutting of peat	I

Rank: H = high, M = medium, L = low. I= inside, O = outside, B = both

4.2.1.5.3 Sea Lamprey

According to the site-specific conservation objectives, adult sea lamprey at sea as external parasites on host fish or marine mammals grow in length from 60 to 100 cm before migrating in spring into freshwater to excavate redds or spawning nests in gravelled areas of large rivers. Artificial barriers can block lampreys' upstream migration, such as is present in the upper extent of the SAC including at River Fergus, Mulkear and Feale. Lampreys require clean gravels to spawn. However, despite observed spawning activity, sampling for ammocoetes consistently fails to find these in many sampling stations. The sea lamprey is listed in the most recent Irish Red Data Book as Near Threatened. This assessment was primarily based on (a) the limited access to freshwater due to impassable anthropogenic barriers in the lower reaches of numerous large rivers and (b) the very limited degree to which juvenile sea Sea Lamprey were occurring in catchment-wide surveys in systems where spawning was known to occur. The low level of occurrence may be due to profligacy in spawning, with reports indicating up to 75% of gametes lost or washed out of the spawning nest, or due to competition for occupancy of sedimented areas by already-resident brook and/or river lamprey. This low level of occurrence of larvae requires investigation. Barriers to upstream migration (e.g. weirs), which limit access to spawning beds and juvenile habitat, are considered the major impediment to good conservation status for sea lamprey. According to the Article 17 Report (NPWS 2019), the conservation status for Sea Lamprey has been assessed as 'Bad' and the conservation trend as 'Stable'.

Lamprey species are likely to be present upstream and downstream of the proposed development.

4.2.1.5.4 Brook Lamprey

According to the site-specific conservation objectives, the brook lamprey (*Lampetra planeri*) is the smallest of the three lampreys recorded in Ireland, typically reaching no more than 15-18cm in length. Unlike the sea lamprey (*Petromyzon marinus*) and the river lamprey (*Lampetra fluviatilis*), the brook lamprey is non-parasitic and non-migratory as an adult, living its entire life in freshwater. Adults spawn in spring, excavating shallow nests in relatively small-sized gravels in areas of reduced flow. After hatching, the larvae ('ammocoetes') drift or swim downstream to areas of riverbed or margins with fine silt deposits. Juveniles burrow in areas of fine sediment in still water. They burrow into this substrate and live as filter feeders over a period of years before transforming into young adult fish. For brook lamprey in Ireland there are extensive areas of suitable habitat and no significant pressures impacting this species. According to the Article 17 Report (NPWS 2019), the conservation status for Brook Lamprey has been assessed as 'Favourable' and the conservation trend as 'Stable'.

Lamprey species are likely to be present upstream and downstream of the proposed development.

4.2.1.5.5 River Lamprey

According to the site-specific conservation objectives, the river lamprey (*Lampetra fluviatilis*) breeds in freshwater rivers and streams. Adults spawn in spring, excavating shallow nests in riverine sections comprising fine gravels and small stones. After hatching, the larvae or 'ammocoetes' drift or swim downstream to areas of river bed or margins with fine silt deposits. They burrow into this bed material where they live as filter feeders over a period of years before transforming into young adult fish and migrating downriver to estuarine and marine habitats. For adults and juveniles there are extensive areas of suitable habitat; however the presence of barriers to migration within river systems can, depending on timing of arrival and flow conditions, undoubtedly influence their distribution. The inability to distinguish between *L. fluviatilis* and *L. planeri* larvae, and the challenges associated with sampling for adult river lamprey, means that an evaluation of their actual range and population size cannot be undertaken and status is assessed as unknown for the current reporting period.

Lamprey species are likely to be present upstream and downstream of the proposed development.

4.2.1.5.6 *Atlantic Salmon [1106]*

According to the site-specific conservation objectives, artificial barriers block salmons' upstream migration, thereby limiting the species to lower stretches and restricting access to spawning areas. The large hyrdo-electric station at Ardnacrusha and the Parteen regulating weir present considerable obstructions to upstream passage of salmon on the Shannon main channel. While both have fish passes installed, upstream migration of salmon is still problematical. Further weirs upstream on the Shannon also restrict access to spawning habitat. No such obstacles, causing significant fish passage issues for salmon are present on the Feale and Mulkear rivers. Salmon spawn in clean gravels. Artificial barriers are currently preventing salmon from accessing suitable spawning habitat on the Shannon main channel. It is a target of the conservation objective for Salmon in the Lower River Shannon SAC to attain a water quality status of Q4 at all EPA sampling sites. According to the Article 17 Report (NPWS 2019), the conservation status for Atlantic Salmon has been assessed as 'Inadequate' and the conservation trend as 'Stable'.

Atlantic Salmon are likely to be present upstream and downstream of the proposed development.

4.2.1.5.7 *Otter Lutra lutra [1355]*

No field survey was carried out for otter within the SAC for the purposes of the Conservation Objectives. Suitable habitat area was mapped using a 10m buffer from riverbanks. According to NPWS Article 17 reporting point data, otter records are present 860m southwest and 1.1km northeast of the development site. There were no signs of otter found within 150m of the development site during walkover surveys. According to the Article 17 Report (NPWS 2019), the conservation status has been assessed as 'Favourable' and the conservation trend as 'Improving'.

There is potential for this QI to occur in the wider area of the development site.

4.2.1.5.8 *Bottlenose Dolphin Tursiops truncatus [1349]*

According to the site-specific conservation objectives for Bottlenose Dolphin species range within the site should not be restricted by artificial barriers, and critical areas representing habitat used preferentially by Bottlenose Dolphin should be maintained in natural condition. According to the Article 17 Report (NPWS 2019), the conservation status has been assessed as 'Favourable' and the conservation trend as 'Stable'.

Whilst the conservation objectives do not identify this species occurring in the vicinity of the proposed works, taking a precautionary approach, there is potential suitable habitat for this species that occurs downstream in the catchment (Map 16, NPWS). Suitable habitat for the species is mapped approx. 13km downstream of the WwTP.

4.2.1.5.9 *Estuaries [1130]*

According to the Site-Specific Conservation Objectives, the area of this habitat within the SAC was calculated at 24,273ha. According to the Article 17 Report (NPWS 2019), an estuary is the downstream part of a river valley, subject to the tide and extending from the limit of brackish waters. River estuaries are coastal inlets where, unlike 'Large shallow inlets and bays', there is generally a significant freshwater influence. According to the Article 17 Report (NPWS 2019), the conservation status has been assessed as 'Inadequate' and the conservation trend as 'Deteriorating'.

According to NPWS Article 17 (2019) mapping, this habitat occurs 3km downstream of the development site.

4.2.1.5.10 Mudflats and sandflats not covered by seawater at low tide [1140]

According to the Site-Specific Conservation Objectives, the habitat area within the SAC has been mapped at 8,808ha. According to the Article 17 Report (NPWS 2019), over-enrichment of large shallow inlets and bays as a result of agricultural intensification, wastewater discharge, commercial forestry and aquaculture, alone and in combination, appear to be the most significant pressures acting on Mudflats and sandflats not covered by seawater at low tide. The overall Conservation Status for this species is 'Inadequate' and the overall Conservation Trend is 'Deteriorating'.

According to the site-specific conservation objectives and NPWS Article 17 (2019) mapping, this habitat occurs approx. 7.7km downstream of the development site.

4.2.1.5.11 Sandbanks which are slightly covered by sea water all the time [1110]

According to the Site-Specific Conservation Objectives, the habitat area within the SAC has been mapped at 1,353ha. According to the Article 17 Report, the EU interpretation manual describes Sandbanks which are slightly covered by seawater all the time as permanently submerged sandbanks where the water depth is seldom more than 20m Below Chart Datum (BCD). In the North Atlantic these include non-vegetated sandbanks or sandbanks with vegetation belonging to the Zostera sp. and free-living species of the Corallinaceae family. The overall Conservation Status for this species is 'Favourable' and the overall Conservation Trend is 'Stable'.

According to the site-specific conservation objectives, this habitat is located 80km downstream of the WwTP and is included on a highly precautionary basis.

4.2.1.5.12 Mediterranean salt meadows (Juncetalia maritimi) [1410]

According to the Site-Specific Conservation Objectives, the total estimated area of this habitat within the SAC is 48.025ha. According to the Article 17 Report (NPWS 2019), Mediterranean salt meadows occupy the upper zone of saltmarshes and usually occur adjacent to the boundary with terrestrial habitats. They are widespread on the Irish coastline; however, they are not as extensive as Atlantic salt meadows (1330). The habitat is distinguished from Atlantic salt meadows by the presence of rushes such as sea rush (*Juncus maritimus*) and/or sharp rush (*Juncus acutus*), along with a range of species typically found in Atlantic salt meadows, including sea aster (*Aster tripolium*), sea purslane (*Atriplex portulacoides),* sea-milkwort (*Glaux maritima*), saltmarsh rush (*Juncus gerardii*), parsley water-dropwort (*Oenanthe lachenalii*), sea plantain (*Plantago maritima*) and common saltmarsh grass (*Puccinellia maritima*). The overall Conservation Status for this species is 'Inadequate' and the overall Conservation Trend is 'Deteriorating'.

According to the site, specific conservation objectives, saltmarsh habitats are likely to occur over 17km downstream of the WwTP and are included on a precautionary basis.

4.2.1.5.13 Atlantic salt meadows (Glauco-Puccinellietalia maririmae) [1330]

According to the Site-Specific Conservation Objectives, the total estimated area of this habitat within the SAC is 495.43ha. According to the Article 17 Report (NPWS 2019), Atlantic salt meadows generally occupy the widest part of the saltmarsh gradient with a distinctive topography – including an intricate network of creeks and salt pans occurring on the medium to large-sized saltmarshes. Several distinctive zones may be present that are related to elevation and submergence frequency. The lowest part along the tidal zone is generally dominated by common saltmarsh-grass (*Puccinellia maritima*) with species like glassworts (*Salicornia spp.),* annual seablite (*Suaeda maritima*) and lax-flowered sea-lavender (*Limonium humile*) also important. The invasive common cordgrass (*Spartina anglica*) can be locally abundant in this habitat. The mid-marsh zones are generally characterised by thrift (*Armeria maritima*) and/or sea plantain (*Plantago maritima*). This zone is generally transitional to an upper marsh herbaceous community with red fescue (*Festuca rubra*), saltmarsh rush (*Juncus gerardii*) and creeping

bent (*Agrostis stolonifera*). This habitat is also important for other wildlife including wintering waders and wildfowl. The overall Conservation Status for this species is 'Inadequate' and the overall Conservation Trend is 'Deteriorating'.

According to the site, specific conservation objectives, saltmarsh habitats are likely to occur over 17km downstream of the WwTP and are included on a precautionary basis.

4.2.1.5.14 Salicornia and other annuals colonising mud and sand [1310]

According to the Site-Specific Conservation Objectives, the total estimated area of this habitat within the SAC is 0.223ha, but further unsurveyed areas may be present. According to the Article 17 Report (NPWS 2019), as this habitat is dominated by annuals it can be ephemeral or transient in nature and is highly susceptible to erosion. Its distribution can vary considerably from year to year and it can move in response to changing conditions, e.g. in estuaries with shifting river channels. It is a pioneer saltmarsh community that may occur on muddy sediment seaward of established saltmarsh, or form patches within other saltmarsh communities where the elevation is suitable and there is regular tidal inundation. The overall Conservation Status for this species is 'Favourable' and the overall Conservation Trend is 'Stable'.

According to the site, specific conservation objectives, saltmarsh habitats are likely to occur over 17km downstream of the WwTP and are included on a precautionary basis.

4.2.1.5.15 *Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]

According to the site-specific conservation objectives, the permanent habitat area, estimated at approx. 8.5ha, should be stable or increasing, subject to natural processes, with no decline in the occurrence of the habitat. The diversity and extent of community types should be maintained, with diverse structure with a relatively closed canopy containing mature trees, a subcanopy layer with semi- mature trees and shrubs, and well-developed herb layer. Seedlings, saplings and pole age-classes should occur in adequate proportions to ensure survival of woodland canopy. According to the Article 17 Report (NPWS 2019), the herbaceous layer includes many large species such as *Filipendula ulmaria, Angelica sylvestris, Rumex sanguineus* and *Carex spp.,* vernal species such as Ficaria verna and *Anemone nemorosa,* and other indicative species such as *Carex remota, Lycopus europaeus, Urtica dioica* and *Geum rivale.* In addition, there are gallery forests of tall willows (*Salicion albae*) alongside river channels and occasionally on river islands, where the tree roots are almost continuously submerged. These are dominated by *Salix alba, S. viminalis* and *S. triandra,* sometimes with *S. cinerea,* but *Alnus glutinosa* should be rare. There is a luxuriant herb layer of species such as *Phalaris arundinacea, Urtica dioica* and *Filipendula ulmaria.* The Irish Vegetation Classification (IVC; Perrin, 2016) primarily places 91E0 habitat within the WL3 *Alnus glutinosa – Filipendula ulmaria* group. All vegetation communities in this group (WL3A-WL3F) have an affinity to the Annex I habitat. The overall Conservation Status for this species is 'Bad' and the overall Conservation Trend is 'Deteriorating'.

The conservation objectives do not identify this habitat in the vicinity of the proposed works; this habitat occurs upstream of the proposed works site (Map 14, NPWS), mapped approx. 500m upstream of the development site.. However, taking a precautionary approach, there is potential for the habitat to occur downstream of the development site.

4.2.1.5.16 Reefs [1170]

According to the site-specific conservation objectives, the total area within the SAC was estimated as 21,421haAccording to the Article 17 Report (NPWS 2019), reef habitats are widespread marine features with immobile hard substrate available for colonisation by epifauna. Reef habitat in Irish waters ranges from the intertidal to 4500m below the sea surface and more than 400km from the coast. The overall Conservation Status for this species is 'Inadequate' and the overall Conservation Trend is 'Stable'.

This habitat occurs over 40km downstream of the development site, however it is included on a precautionary basis.

4.2.1.5.17 Coastal Lagoons [1150]

According to the Site-Specific Conservation Objectives, five lagoon areas have been mapped within the SAC, totalling 33.4ha: Shannon Airport Lagoon (24.2ha); Cloonconeen Pool (3.9ha); Scattery Lagoon (2.8ha); Quayfield and Poulaweala Loughs (2.5ha). According to the Article 17 Report (NPWS 2019), the overall Conservation Status for this species is 'Bad' and the overall Conservation Trend is 'Deteriorating'.

According to the site-specific conservation objectives, this habitat occurs over 30km downstream of the WwTP, however it is included on a precautionary basis.

4.2.1.5.18 Large shallow inlets and bays [1160]

According to the Site-Specific Conservation Objectives, the habitat area was estimated as 35,282ha using OSi data and the Transitional Water Body area as defined under the Water Framework Directive. According to the Article 17 Report (NPWS 2019), The EU interpretation manual describes Large shallow inlets and bays as indentations of the coast where, in contrast to estuaries, the influence of freshwater is generally limited or reduced. These habitats are typically shallower and more sheltered than open coasts. They generally constitute a large physiographic feature that may wholly or partially incorporate other Annex I habitats including, for example, Mudflats and sandflats not covered by seawater at low tide, Estuaries and Reefs. According to the Article 17 Report (NPWS 2019), the conservation status has been assessed as 'Bad' and the conservation trend as 'Deteriorating'.

According to the site-specific conservation objectives, this habitat occurs over 70km downstream of the WwTP, however it is included on a highly precautionary basis.

4.2.1.5.19 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]

According to the Site-Specific Conservation Objectives, three sub-types of high conservation value are know to occur in the site. Although many of the high-conservation- value sub-types are dominated by coarse substrata, for certain sub-types, notably triangular club-rush (*Schoenoplectus triqueter*) and opposite-leaved pondweed (*Groenlandia densa*), fine substrata are required. According to the NPWS Article 17 Report, the habitat has a broad definition, covering from upland, flashy, oligotrophic, bryophyte- and algal-dominated rivers, to tidal reaches dominated by higher plants. In Ireland, the highest conservation interest is associated with lowland depositing and tidal rivers and unmodified, fast-flowing, low-nutrient rivers. Crow-footed dominated reaches typically have low species diversity and generally indicates poor condition and damage. The main problems for river habitats in Ireland are damage through hydrological and morphological change, eutrophication and other water pollution. Agriculture and municipal and industrial discharges are the most significant sources of nutrient and organic pollution. The overall Conservation Status for this habitat is 'Inadequate' and the Conservation Trend is 'Deteriorating'.

According to Map 13 of the site-specific conservation objectives, this habitat occurs downstream of the WwTP.

4.2.1.6 River Shannon and River Fergus Estuaries SPA [004077]

4.2.1.6.1 Review of Conservation Objectives

The relevant SCI and the associated conservation objective of the site are presented in Table 4-5.

Table 4-5 SCI and Conservation Objective.

Special Conservation Interest	Conservation Objective
Wetlands [A999]	To maintain the favourable conservation condition of the wetland habitat in the River Shannon and River Fergus Estuaries SPA as a resource for the regularly-occurring migratory waterbirds that utilise it

4.2.1.6.2 Site-Specific Pressures and Threats

As per the Natura 2000 Data Form, the site-specific threats, pressures and activities with potential to effect on the SPA were reviewed and considered in relation to the proposed works. These are provided in Table 4-6.

With regard to the proposed development, a pressure/threat to the SAC exists in the form of E03 'Discharges'.

Table 4-6 Site-specific Pressures and Threats (October 2020).

Rank	Code	Threats and pressures	Inside/outside/both
M	G01.01	Nautical sports	i
M	D.03.02	Shipping lanes	i
H	E03	Discharges	i
H	E01	Urbanised areas, human habitation	o
H	A08	Fertilisation	o
H	E02	Industrial or commercial areas	o
M	F01	Marine and freshwater aquaculture	i

Rank: H = high, M = medium, L = low. i = inside, o = outside, b = both

4.2.1.6.3 Site Synopsis

The wetland habitat area was estimated as 32,261ha using OSi data and relevant orthophotographs.

The following is extracted from the Site Synopsis of the SPA:

The estuaries of the River Shannon and River Fergus form the largest estuarine complex in Ireland. The site comprises the entire estuarine habitat from Limerick City westwards as far as Doonaha in Co. Clare and Dooneen Point in Co. Kerry.

The site has vast expanses of intertidal flats which contain a diverse macroinvertebrate community, e.g. Macoma-Scrobicularia-Nereis, which provides a rich food resource for the wintering birds. Salt marsh vegetation frequently fringes the mudflats and this provides important high tide roost areas for the wintering birds. Elsewhere in the site the shoreline comprises stony or shingle beaches

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Cormorant, Whooper Swan, Lightbellied Brent Goose, Shelduck, Wigeon, Teal, Pintail, Shoveler, Scaup, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Greenshank and Black-headed Gull. It is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The site is the most important coastal wetland site in the country and regularly supports in excess of 50,000 wintering waterfowl (57,133 - five year mean for the period 1995/96 to 1999/2000), a concentration easily of international importance. The site has internationally important populations of Light-bellied Brent Goose (494), Dunlin (15,131), Black-tailed Godwit (2,035) and Redshank (2,645). A further 17 species have populations of national importance, i.e. Cormorant (245), Whooper Swan (118), Shelduck (1,025), Wigeon (3,761), Teal (2,260), Pintail (62), Shoveler (107), Scaup (102), Ringed Plover (223), Golden Plover (5,664), Grey Plover (558), Lapwing (15,126), Knot (2,015), Bar-tailed Godwit (460), Curlew (2,396), Greenshank (61) and Black-headed Gull (2,681) - figures are five year mean peak counts for the period 1995/96 to 1999/2000. The site is among the most important in the country for several of these species, notably Dunlin (13 % of national total), Lapwing (6% of national total) and Redshank (9% of national total).

The site also supports a nationally important breeding population of Cormorant (93 pairs in 2010).

Other species that occur include Mute Swan (103), Mallard (441), Red-breasted Merganser (20), Great Crested Grebe (50), Grey Heron (38), Oystercatcher (551), Turnstone (124) and Common Gull (445) - figures are five year mean peak counts for the period 1995/96 to 1999/2000.

Apart from the wintering birds, large numbers of some species also pass through the site whilst on migration in spring and/or autumn.

The River Shannon and River Fergus Estuaries SPA is an internationally important site that supports an assemblage of over 20,000 wintering waterbirds. It holds internationally important populations of four species, i.e. Light-bellied Brent Goose, Dunlin, Black-tailed Godwit and Redshank. In addition, there are 17 species that have wintering populations of national importance. The site also supports a nationally important breeding population of Cormorant. Of particular note is that three of the species which occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Whooper Swan, Golden Plover and Bar-tailed Godwit. Parts of the River Shannon and River Fergus Estuaries SPA are Wildfowl Sanctuaries.

4.2.2 General description of Ecology of the Site

Assessing the impacts of any project and associated activities requires an understanding of the ecological baseline conditions prior to and at the time of the project proceeding. Ecological Baseline conditions are those existing in the absence of proposed activities (CIEEM 2018, updated 2021).

Multidisciplinary walkover surveys were conducted on the 6th of April 2022 by Rachel Walsh (BSc) and 23rd of July 2020 in line with NRA (2009) guidelines (Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes) by Claire Stephens (BSc) of MKO. The ecological surveys were undertaken within the optimal time of year to undertake a habitat and flora survey (Smith *et al.* 2011). The proposed works are restricted to the existing water treatment plant site. All habitats within and adjacent to the works area were readily identifiable during the site visits. A dedicated invasive species survey was also undertaken during the site visits. During the surveys, the site was searched for species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations (S.I. 477 of 2011).

The existing WwTP infrastructure is classified as *buildings and artificial surfaces (BL3).* Associated hard standing areas are classified as *(BL3), spoil and bare ground (ED2)* and *recolonising bare ground (ED3)* (Plate 4-1). The WwTP site boundary is demarcated by palisade and post and wire fencing inside, outside of which is broadleaved woodland (WD1) consisting of ash *(Fraxinus excelsior),* sycamore (*Acer pseudoplatanus*), willow *(Salix* spp.), alder (*Alnus glutinosa)* and cypress (*Cupressus* sp.). Other species recorded along the perimeter include elder *(Sambucus nigra),* horse-chestnut (*Aesculus hippocastanum)* and hazel (*Corylus avellana).* Species recorded in the understory include hedge bindweed *(Calystegia sepium),* laurel (*Prunus spp.),* giant hogweed *(Heracleum mantegazzianum),* wild Angelica *(Angelica sylvestris*) cleavers *(Galium aparine),* hart's-tongue fern *(Asplenium scolopendrium),* pendulous sedge (*Carex pendula),* ivy *(Hedera hibernica),* Himalayan balsam *(Impatiens glandulifera)*, bramble (*Rubus fruticosus* agg.) and *Hydrangea.*

A perimeter of scrub (WS1) is found along the north-eastern boundary consisting of hazel and willows. A treeline (WL2) along the northern boundary separates the site from a drain (FW4) and a public river walkway.

Areas of grassland within the WwTP boundary are classified as *amenity grassland (GA2)* with *scattered trees and parkland (WD5)* in places, there being individual ornamental trees planted within the grounds (Plate 4-2). Species present within the grassland and recolonising ground habitats include cock's foot (*Dactylis glomerata*), Yorkshire fog (*Holcus lanatus*), broad-leaved dock (*Rumex obtusifolius*), ribwort plantain (*Plantago lanceolata)*, creeping buttercup (*Ranunculus repens),* common daisy (*Bellis perennis*), dandelion (*Taraxacum officinale agg.*), red clover (*Trifolium pratense*), bush vetch (*Vicia sepium*), white clover (*Trifolium repens),* great willowherb *(Epilobium hirsutum)* and self-heal (*Prunella vulgaris*). Tree species located on grassland include Scots pine (*Pinus sylvestris),* sycamore (*Acer pseudoplatanus),* silver birch (*Betula pendula),* and rowan (*Sorbus aucuparia).*

An unmanaged area of grassland to the north and north-east of the site was categorised as *dry meadows and grassy verges (GS2)* with some *wet grassland (GS4)* influences including rushes *(Juncus spp.).*

A drainage ditch (FW4) surrounds the entire site, within the boundary fencing to the southern and western boundary and directly adjacent to the north and eastern boundary (Plate 4-3). The drains were dry on the day of the site visit. No other watercourses occur within the site boundary. The River Shannon, a lowland/depositing river (FW2), part of Lower River Shannon SAC, flows approximately 20m to the north of the site. Treated effluent from the wastewater treatment plant is discharged to the River Shannon via the existing outfall approximately 70m north-west of the wastewater treatment site boundary.

The wider area consists of woodland, public river walkway (Plate 4-4) and a mill race channel to the east.

None of the habitats within or adjacent to the works areas correspond to those listed in Annex I of the EU Habitats Directive. No Annex II or Annex V species were recorded on site. No works will take place within any of the adjacent habitats as works will be confined to the existing wastewater treatment plant. No works are proposed at the outfall.

The non-native invasive species, giant hogweed *(Heracleum mantegazzianum)* was recorded in a large proportion of the site boundary. The species within the grassland had been sprayed in March 2020, but re-growth was obvious in a number of areas. This species is listed on the 'Third Schedule' of Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011).

A number of stands of the non-native invasive species, Himalayan Balsam *(Impatiens glandulifera)* were recorded within the site boundary to the north, north-west and north-east and in the wider area along the banks of the River Shannon. This species is listed on the 'Third Schedule' of Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011).

No other invasive species listed under Regulations 49 and 50 of the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011) were recorded during the field survey.

Plate 4-1 WwTP infrastructure classified as buildings and artificial surfaces (BL3) and associated hard stand areas of (BL3)/spoil and bare ground (ED2)/recolonising bare ground (ED3). Grassland classified as amenity grassland (GA2).

Plate 4-2 Scattered trees and parkland (WD5) in the centre of the site.

Plate 4-3 Drainage ditch (FW4), dry at the time of the surveys, outside of the eastern boundary.

Plate 4-4 Public river walkway separating the WwTP from the River Shannon and associated woodland.

Plate 4-5 Infestation of Giant Hogweed along the northwestern boundary

Plate 4-6 Infestation to the northwest of the site adjacent to the existing final effluent and storm outfall chamber.

4.2.3 Fauna

An otter survey was carried out on the 6th of April 2022 by Rachel Walsh (BSc.) of MKO. The otter survey area is depicted in Figure 4-1. No signs of otter, including holts, slides, couches, prints, spraints or feeding remains, were found during the survey. However, otter are likely to use the section of the River Shannon adjacent to the WwTP for commuting and foraging. Otter also potentially use nearby drains and the mill race channel to the east of the site boundary.

No evidence of any other QI or SCI associated with any European Site were observed within the site boundary. The WwTP site itself is dominated by highly managed amenity grassland, artificial surfaces, buildings and infrastructure and contains limited potential to support QI or SCI species. Due to this, and the nature of the proposed development which comprises upgrades to existing infrastructure at an operational Wastewater Treatment Plant site, dedicated bird surveys were not deemed to be required.

Otter Survey Extent

Castletroy Wastewater Treatment Plant

RW	RW
210711	Fig 4-1
1:1,800	06.05.2022

MKO
Planning and Environmental Consultants

5. ASSESSMENT OF POTENTIAL EFFECTS & ASSOCIATED MITIGATION

This section of the NIS assesses the potential effects of the proposed development on the identified relevant Qualifying Interests/Special Conservation Interests. This assessment is undertaken in the absence of any mitigation and in respect of the conservation objectives of the European Sites. The Conservation Objectives each of the European Sites assessed were reviewed on the 10th of May 2022. The Conservation Objectives for these sites are available at the following locations:

- Lower River Shannon SAC (002165)

https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002165.pdf

- River Shannon and River Fergus Estuaries SPA (004077)

https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004077.pdf

Following the initial impact assessment, mitigation is prescribed where necessary to avoid adverse effects on the Conservation Objectives of the relevant QIs/SCIs. These are listed below, underneath the effect that it mitigates.

5.1 Potential for Direct Effects on the European Sites

The SAC is located approximately 8m from the development site and outside of the site boundary. Furthermore, the Site is separated from the WwTP by a palisade fence, drainage ditch and public walkway. Therefore, there is no potential for direct effects.

5.2 Potential for Indirect Effects on the European Sites

5.2.1 Surface and Ground Waters and the Hydrological Regime

A potential for adverse effect via deterioration of surface water and groundwater was identified, potentially affecting downstream aquatic QI habitats and species of Lower River Shannon SAC and the SCI-supporting habitat of the River Shannon and River Fergus Estuaries SPA.

5.2.1.1 Construction

The construction of the proposed development carries a risk of silt/sediment and hydrocarbons run-off to adjacent drains and watercourses, as well as run-off of other pollutant materials such as cement. Deep excavations are required and as such there is also a risk of groundwater pollution in the absence of mitigation. The development site is located primarily within Flood Zone A which also presents a risk of contamination in the absence of mitigation. Contamination may occur due to the inappropriate storage of pollutant materials, stockpiles and sediments within floodable areas.

A potential for adverse effect on the aquatic-dependant QIs of Lower River Shannon SAC was identified, as well as on downstream SCI supporting habitat of River Shannon and River Fergus Estuaries SPA.

The deterioration of the aquatic environment has a potential to affect QI aquatic species which use it, as high levels of sedimentation can result in smothering or oxygen starvation for species. Increased sedimentation can impact on fish species by clogging gills, reducing visibility when foraging, and clogging spawning gravels for salmonids and lamprey. The release of certain materials, such as hydrocarbons or cement products, would be toxic to fish life. In turn, as mentioned above, potential fish-kills would result in indirect impacts to otter via reduced fish biomass for foraging.

5.2.1.1.1 Mitigation Measures

Surface/groundwater mitigation measures

- Prior to the outset of works, a double silt fence will be erected along the drains present to the west, north and east of the WwTP boundary. This will comprise wooden posts and geotextile membrane buried in an 'L' shape to a minimum depth of 250mm. The silt fence will filter any potential surface water run-off from the site generated during the proposed works. All surface water will thus be intercepted in this way before potentially entering any of the perimeter drainage ditches. An indicative layout of the double silt fences is provided in Figure 5-1.
- Access routes will be clearly marked / identified. Access during construction to any working areas will be restricted to land within the outlined works area.
- Plant will travel slowly across bare ground at a maximum of 5 kilometres per hour (km/hr).
- Excavations will be carried out using a suitably sized excavator and, in all circumstances, excavation depths and volumes will be minimised.
- Stockpiling of excavated material will be temporary and located in a clearly defined and demarcated area, away from any watercourse. Stockpiles will be removed on a regular basis to avoid potential sediment-laden run-off escaping the site, or will be surrounded with silt fencing to prevent pathways to sensitive receptors.
- Earthworks will not take place during periods of high rainfall to reduce run-off and potential siltation of watercourses. Details on rain levels provided in 'Environmental Monitoring' section below.
- Good construction practices such as dust suppression on site roads, and regular plant maintenance will ensure minimal risk.
- Works may be required to be carried out within the water-table. Any ingress of groundwater into excavations will be pumped out to ground via a silt bag which will filter remaining sediment from the pumped water. The entire discharge area from silt bags will be enclosed by a perimeter of silt fencing. Alternatively, it will be pumped to a sealed clean tanker and removed from the site for appropriate treatment and discharge. Indicative areas for the discharge over grassland, surrounded by silt fencing, is shown on Figure 5-1. In addition, silt traps or straw bales will be provided within the drain closest to this area to provide another level of interception. Water monitoring will be carried out while this measure is being used. This will include monitoring two points as indicated on **Error! Reference source not found.**, for turbidity. If downstream NTU levels are 10% higher than those upstream, works will pause until the issue has been addressed or further silt prevention measures are implemented.

Earth Works

- Excavation depths will be kept to a minimum.

- Material (excluding soils contaminated with invasive species, see biosecurity mitigation measures in Section 11.5.6) that cannot be re-used will be transported off site to a designated waste facility.
- Soil excavation will be completed during dry periods and will be undertaken with excavators and dump trucks. No excavation works will take place during periods of heavy rainfall. Details on rain levels provided in 'Environmental Monitoring' section below.
- A silt fence will be erected around any stockpiling of material associated with earthworks.

Cement-based Products Control Measures

- No batching of wet-cement products will occur on site.
- Ready-mixed supply of wet concrete products will be used where needed.
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site.
- Where concrete is delivered on site, only chute cleaning will be permitted, using the smallest volume of water possible, in an area within the compound at least 30m away from any drain within the site. No discharge of cement contaminated waters to any drain or watercourse will be allowed. This will be contained within the site compound area which will be bunded to ensure that there is no escape of cement-laden water from works areas. The compound will be buffered from nearby drains on the site with sandbags and a double silt fence. If this is not practicable, chute cleaning will be avoided on the site.
- The weather forecast will be checked prior to the pouring of concrete and no such works will be undertaken when heavy rain is forecast. Concrete will not be poured at times when rain is predicted as this may lead to run off and over spillage of the formwork.
- Ensure pour site is free of standing water and plastic covers will be ready in case of sudden rainfall event.

Refuelling, fuel and hazardous materials storage

- All plant will be inspected prior to use. Defective plant shall not be used until the defect is satisfactorily fixed. All major repair and maintenance operations will take place off site.
- Minimal refuelling or maintenance of vehicles or plant will take place on site. Off-site refuelling will occur at a controlled fuelling station.
- Vehicles will never be left unattended during refuelling. Only dedicated, trained, and competent personnel will carry out refuelling operations. Plant refuelling procedures, which will include the below listed measures, shall be detailed in the contractor's method statements.
- Fuels, lubricants and hydraulic fluids for equipment used will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment.
- Refuelling will be completed in a controlled manner using drip trays at all times.
- Fuels volumes stored on site will be minimised. Any fuel storage areas will be bunded appropriately for the fuel storage volume for the time period of the works and fitted with a storm drainage system and an appropriate oil interceptor.
- Mobile storage tanks such as fuel bowsers will be bunded to 110% capacity to prevent spills. Tanks for bowsers and generators shall be double skinned. When not in use, all valves and fuel trigger guns from fuel storage containers will be locked.
- All pipework from containers to pump nozzles will have anti siphon valves fitted.
- The plant refuelling procedures shall be detailed in the contractor's method statements.
- The plant used will be regularly inspected for leaks and fitness for purpose.

- An Emergency Response Procedure to deal with accidental spillages has been devised as detailed below. Spill kits, oil soakage pads and oil booms will be available to deal with and accidental spillage in and outside the refuelling area and will be kept within the site compound.

Dust control

- Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions.
- Public roads outside the site and along the main access route to the site will be regularly inspected by the Site Manager for cleanliness, most notably before and after plant and machinery deliveries to site.
- Material handling systems and material storage areas will be designed and laid out to minimise exposure to wind.
- Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- Water misting or bowsers will operate on-site as required to mitigate dust in dry weather conditions.
- If transport of soils or other material off site is required, which has significant potential to generate dust, this will be undertaken in tarpaulin-covered vehicles where necessary.
- Daily inspection of site to examine dust measures and their effectiveness.

Environmental Monitoring

- The contractor will assign a member of the site staff as the Environmental Manager with the responsibility for ensuring the environmental measures prescribed in this document are adhered to. Any environmental incidents or non-compliance issues will immediately be reported to the project team.
- An ECoW will be employed by the contractor for the duration of the project. The ECoW will be present during site set up and will inspect the silt fence and other mitigations as described prior to commencement of the proposed works, and will ensure efficiency is maintained throughout the construction phase. ECoW visits will be conducted at least twice per month to ensure that all mitigations are in place.
- Daily general visual inspections of site operations and inspections of all watercourses within the site and in the surrounding area will also be carried out by the Environmental Manager.
- Inspection to include silt fences and all monitoring. Inspections required to ensure that mitigation measures are operating correctly and to identify any maintenance that is required. Daily inspections checks will be completed on plant and equipment, and whether materials such as silt fencing or oil absorbent materials need replacement.
- Silt fences will be checked and repaired as necessary in the case of a flood event.
- Event based inspections by the Site Manager as follows:
    - Rainfall >10 mm/hr (i.e. high intensity localised rainfall event)
    - Rainfall >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
    - Rainfall total greater than monthly average recorded in 7 consecutive days (prolonged heavy rainfall over a week).
- Water monitoring will be carried out by the ECoW at agreed intervals during works that have potential to result in sediment-laden water entering the mill race channel to the east of the site boundary and subsequently to the Lower River Shannon. A point upstream and downstream of the confluence of the drain network with the mill race channel to the east of the site boundary, as shown on Figure 5-1, will be monitored for turbidity. If the downstream

turbidity (NTU) is 10% higher than the upstream turbidity within the mill race channel, works will be paused and silt prevention measures will be inspected and improved where necessary.
- A written record will be maintained or available on-site of all monitoring undertaken.

Flood Risk

- As a portion of the site is within Flood Zone A, strict long-range and short-range weather forecasting will be used for works which carry a pollution risk such as excavations.
- Works will be postponed if heavy rain is forecast.
- The contractor will devise an appropriate construction-phase flood defence around works areas, such as a defined area bunded with sandbags. Please see Figure 5-1 for an indicative drawing of the areas to be bunded.
- If a flood is forecast, potentially pollutant materials will be removed from the site and will not be stored within the floodable areas around the peripheries of the site.
- An indicative area for a raised and bunded site compound is shown on Figure 5-1.

Emergency Response Procedure

Emergency incidents are those occurrences that give rise to negative environmental effects including but not limited to the following:

- Any malfunction of any mitigation measure and/or environmental protection system;
- Any emission that does not comply with the requirements of the contract and relevant licences;
- Any circumstance with the potential for environmental pollution; or
- Any emergency that may give rise to environmental effects (e.g. significant spillages or fire outbreak).

Every effort will be made to prevent pollution incidents associated with spills during the construction of the Proposed Development. The risk of oil/fuel spillages will exist on the site and any such incidents requires an emergency response procedure. The following steps provide the procedure to be followed in the event of an oil/fuel spill occurring on site:

- Identify and stop the source of the spill and alert people working in the vicinity;
- Notify the Environmental Manager immediately giving information on the location, type and extent of the spill so that they can take appropriate action;
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident;
- Contain the spill using the spill control materials, track mats or other material as required. Do not spread or flush away the spill;
- If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses and/or sensitive habitats;
- If possible, clean up as much as possible using the spill control materials;
- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited;
- The Environmental Manager shall inspect the site as soon as practicable and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring; and

- The Environmental Manager will notify the appropriate stakeholders such as Limerick City and County Council, National Parks and Wildlife Service, Department of Communications, Climate Action and Environment and Department of Housing, Planning and Local Government and/or the EPA.
- Environmental incidents are not limited to just fuel spillages. Therefore, any environmental incident must be reported, recorded, and investigated.
- In the event of an emergency incident occurring, the contractor will be required to investigate and provide a report including the following, as a minimum:
    - A description of the incident, including location, the type and quantity of contaminant and the likely receptor(s);
        - Contributory causes;
        - Negative impacts;
        - Measures implemented to mitigate impacts; and
        - Any recommendations to reduce the risk of similar incidents occurring.

5.2.1.1.2 *Residual effect*

No residual effects via deterioration of water quality during construction is predicted once the above mitigation measures have been implemented.

5.2.1.2 Operation

As described in Section 3.2, the operational phase of the development will have a neutral/imperceptible effect on water quality of the aquatic environment of the River Shannon as a result of the wastewater treatment plant upgrade works. The upgrade works will accommodate future loadings to the Plant and will ensure that the resulting effluent will remain within EQS's for the Lower River Shannon. Improved stormwater storage will be provided such that untreated spills to the River Shannon will be reduced annually. In addition, a procedure will be in place for a Wastewater Discharge Licence review for the Plant. Once planning permission for the development is received, the EPA will determine whether a review is required. It is likely that ELVs for the Plant will be reduced to account for additional loading to the plant. Given the improved operational performance of the Plant, more stringent ELVs will be achievable.

Where feasible, new development will be constructed within Flood Zone C of the current site, and all highly essential infrastructure be constructed at an elevation higher than the 1% AEP flood level with a suitable freeboard and an allowance for the effects of climate change. This will protect the proposed development against flooding and to preserve the existing flood plain as to avoid flooding elsewhere. Where it is not possible to locate new infrastructure in Flood Zone C due to physical or hydraulic constraints, compensatory storage will be provided so as not to increase flood risk elsewhere. As per the FRM Guidelines, the volume of compensatory storage will equal the volume of flood plain lost to the proposed development, 28m3. It will also be situated in an area where flood flow routes are protected.

Therefore, there is no requirement for mitigation with regard to water quality during operation of the development.

5.2.1.2.1 *Residual Effect*

The operation of the development will have a neutral effect on water quality and will ensure that the effluent remains within EQS's even with anticipated increased future loadings to the WwTP, and will

remain in line with UWWTR and the objectives of the WFD. Therefore, there is no potential for residual effect.

5.2.2 Disturbance

5.2.2.1 Construction

No Otter breeding or resting sites were identified during the site visit.

Otter are predominantly crepuscular in nature and activity at the site is predominantly confined to daytime hours, thus minimizing potential disturbance related impacts to the species. In addition, activities will be confined to the existing wastewater treatment plant. Otter are anticipated to have habituated to the ongoing anthropogenic activities associated with the operation of the plant.

Irish Wildlife Manual No 76 (*National Otter Survey of Ireland 2010/2012*) notes that the occurrence of Otter was unaffected by perceived levels of disturbance at the survey sites. It also notes that there is little published evidence demonstrating any consistent relationship between Otter occurrence and human disturbance (Mason & Macdonald 1986, Delibes et al. 1991; Bailey &Rochford, 2006). Irish Wildlife Manual No 23 (*National Otter Survey of Ireland 2004/2005*) found no significant relationship between disturbance and otter occurrence. It also states "the lowest percentage occurrence was found at the sites with the lowest recorded disturbance".

Channin P (2003) [1] provides a literary review with regard to anthropogenic disturbance and refers to several reports which have found that disturbance is not detrimental to Otters (Jefferies (1987), (Durbin 1993). (Green & Green 1997). The report also describes successful breeding in towns, under ferry terminals and under the jetties of one of Europe's largest oil and gas terminals at Sullom Voe in North Scotland.

Taking a precautionary approach, the following measures will be in place to avoid disturbance effects to otter:

- All plant and equipment for use will comply with Statutory Instrument No 359 of 1996 "European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations 1996".
- Operating machinery will be restricted to the proposed development site boundary.
- Work will be completed during daylight hours. However, if lighting is needed for construction during certain periods over winter months, this lighting will be limited and will face downwards, with no lighting focussed onto surrounding woodland.
- A pre-commencement survey for Otter will be carried out prior to any works commencing. Should Otter holts be recorded within 150m of the proposed works, a derogation license will be obtained from NPWS and works carried out in accordance with NRA (2006) *Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes*. The otter survey will be carried out no more than 10 months in advance of commencement. The survey will be supplemented with an additional inspection immediately prior to commencement.
- Regular maintenance of plant will be carried out in order to minimise noise emissions. Particular attention will be paid to the lubrication of bearings and the integrity of silencers.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the works.

[1] *Chanin P (2003). Ecology of the European Otter. Conserving Natura 2000 Rivers Ecology Series No. 10. English Nature, Peterborough.*

- Compressors will be of the "sound reduced" models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- Machines, which are used intermittently, will be shut down during those periods when they are not in use.

5.2.2.1.1 *Residual Effect*

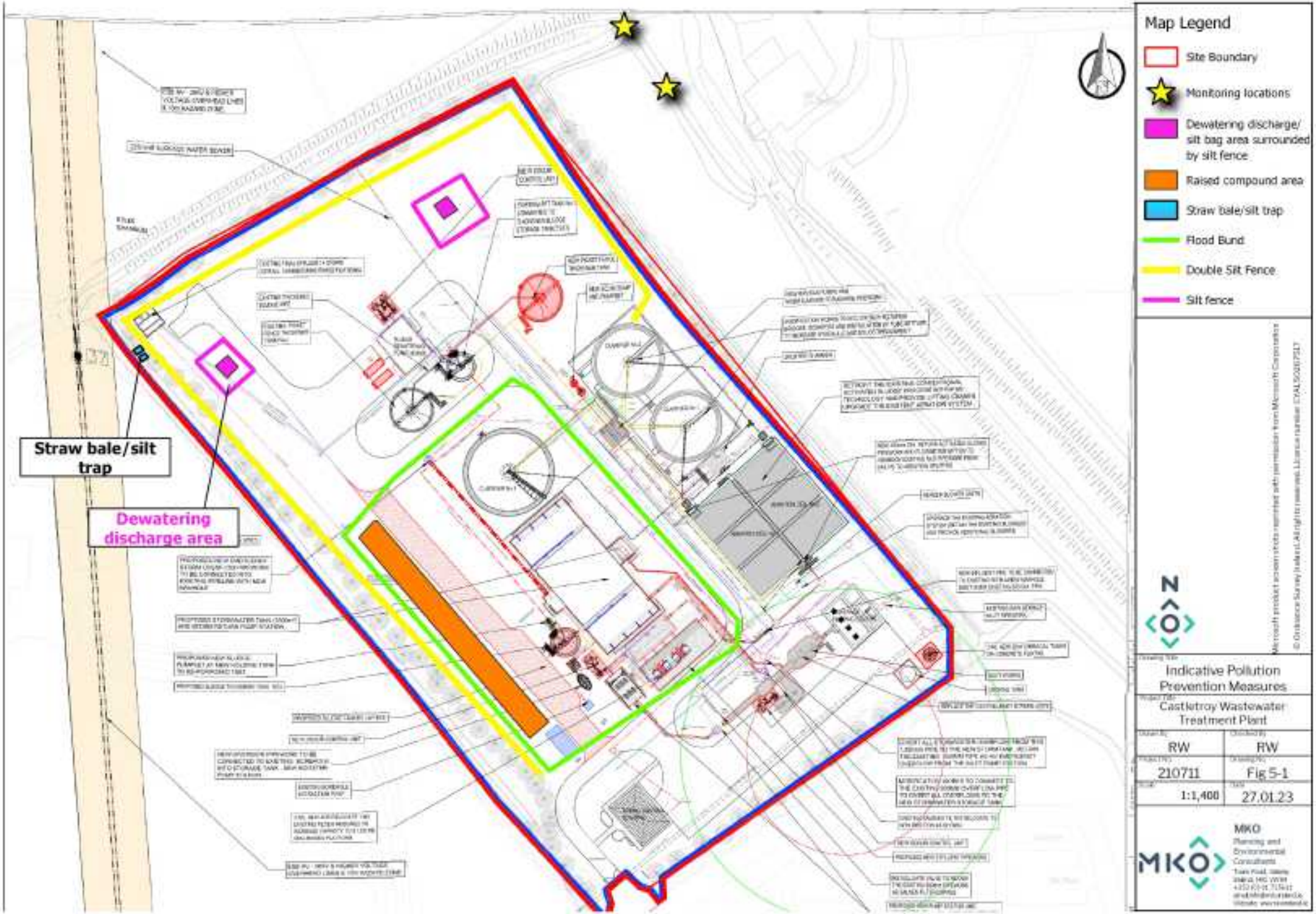
No residual effects via disturbance of Otter is predicted once the above mitigation measures have been implemented.

5.2.2.2 Operation

There will be no significant increase in activities and disturbance effects to fauna in the area during operation. The development site is an existing wastewater treatment plant is located within a suburban setting adjacent to University of Limerick campus grounds and public river walkway. No Otter breeding or resting sites were identified during the site visit. As described in Section 5.2.2.1 above, otter in the area are expected to be habituated to ongoing human activities in the area and will not be affected by the operation of the development.

5.2.3 Biosecurity

The Third Schedule Invasive Species Himalayan Balsam (*Impatiens glandulifera)* and Giant Hogweed (*Heracleum mantegazzianum)* are present within the development site, around the boundaries of the site, on grassland areas and within the proposed development footprint. Infestations are also present outside of the site on adjacent properties. In the absence of mitigation and biosecurity protocol, there is potential for the construction works and excavations to cause further spread of the plants to other sites. A site-specific Invasive Species Management Plan has been prepared which details measures to eradicate the plants in advance of construction as much as possible, avoid infestations within the site where possible, appropriate biosecurity protocol to prevent the spread of the plants outside of the site, and recommendations for their continued treatment during operation. The Invasive Species Management Plan is attached as Appendix 3.


Straw bale/silt trap
Dewatering discharge area
Map Legend
Site Boundary
Monitoring locations
Dewatering discharge/ silt bag area surrounded by silt fence
Raised compound area
Straw bale/silt trap
Flood Bund
Double Silt Fence
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Indicative Pollution Prevention Measures
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6. ASSESSMENT OF RESIDUAL ADVERSE EFFECTS

The sections provided below detail the site-specific residual impact assessment in relation to the relevant QIs of the above EU sites in light of their site-specific targets and attributes. The assessment takes into consideration the proposed measures to avoid, reduce and block identified pathways for impact.

6.1 Lower River Shannon SAC [002165]

The potential for adverse effects on each of the individual Qualifying Interests that were identified as being at risk of potential effects is assessed in this section in view of the Conservation Objectives of those habitats and species.

Tables below provide an assessment of the proposal, as described in Section 3 of this report and associated Appendices, against the Attributes and Targets for each of the 'Screened in' QIs of the EU Designated Site.

6.1.1 Sea Lamprey

The attributes and targets for Sea Lamprey as per the Site Specific Conservation Objectives (SSCOs) for Lower River Shannon SAC (NPWS Version 1.0, 2012) and an assessment of the proposed development against the nominated attributes and targets for the species is provided in Table 6-1 below.

Table 6-1 Targets and attributes associated with nominated site-specific conservation objectives for Sea Lamprey (Petromyzon marinus) [1095].

Attribute	Target	Assessment
Distribution: extent of anadromy	Greater than 75% of main stem length of rivers accessible from estuary	No works are proposed outside the existing WwTP site and no instream works are proposed. All works will be separated from the SAC by a distance of 8m and an existing public walkway. There will be no effect on distribution as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Population structure of juveniles	At least three age/size groups present	No works are proposed outside the existing WwTP site and no instream works are proposed. All works will be separated from the SAC by a distance of 8m and an existing public walkway There will be no impact on the population structure or juvenile density as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the
Juvenile density in fine sediment	Juvenile density at least 1/m²	

		design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Extent and distribution of spawning habitat	No decline in extent and distribution of spawning beds	No works are proposed outside the existing WwTP site and no instream works are proposed. All works will be separated from the SAC by a distance of 8m and an existing public walkway There will be no impact on the extent, distribution or availability of habitat as a result of the proposed development Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Availability of juvenile habitat	More than 50% of sample sites positive	

6.1.2 Brook Lamprey

The attributes and targets for Brook Lamprey as per the Site Specific Conservation Objectives (SSCOs) for Lower River Shannon SAC (NPWS Version 1.0, 2012) and an assessment of the proposed development against the nominated attributes and targets for the species is provided in Table 6-18 below.

Table 6-2 Targets and attributes associated with nominated site-specific conservation objectives for Brook Lamprey (Lampetra planeri) [1096].

Attribute	Target	Assessment
Distribution	Access to all watercourses down to first order streams	No works are proposed outside the existing WwTP site and no instream works are proposed. All works will be separated from the SAC by a distance of 8m and an existing public walkway There will be no effect on distribution as a result of the proposed works. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will

		remain within EQSs during operation of the development.
Population structure of juveniles	At least three age/size groups of brook/river lamprey present	No works are proposed outside the existing WwTP site and no instream works are proposed. All works will be separated from the SAC by a distance of 8m and an existing public walkway. There will be no impact on the population structure or juvenile density as a result of the proposed works. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Juvenile density in fine sediment	Mean catchment juvenile density of brook/river lamprey at least 2/m²	
Extent and distribution of spawning habitat	No decline in extent and distribution of spawning beds	No works are proposed outside the existing WwTP site and no instream works are proposed. All works will be separated from the SAC by a distance of 8m and an existing public walkway. There will be no impact on the extent or distribution of spawning habitat as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Availability of juvenile habitat	More than 50% of sample sites positive	No works are proposed at the outfall of the WwTP. No works are proposed outside the existing WwTP site and no instream works are proposed. All works will be separated from the SAC by a distance of 8m and an existing public walkway. There will be no impact on the availability of juvenile habitat as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will

		remain within EQSs during operation of the development.

6.1.3 River Lamprey

The attributes and targets for River Lamprey as per the Site Specific Conservation Objectives (SSCOs) for Lower River Shannon SAC (NPWS Version 1.0, 2012) and an assessment of the proposed development against the nominated attributes and targets for the species is provided in Table 6-3 below.

Table 6-3 Targets and attributes associated with nominated site-specific conservation objectives for River Lamprey.

Attribute	Target	Assessment
Distribution	Access to all watercourses down to first order streams	No works are proposed at the outfall of the WwTP. No works are proposed outside the existing WwTP site and no instream works are proposed. All works will be separated from the SAC by a distance of 8m and an existing public walkway. There will be no effect on distribution as a result of the proposed works. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Population structure of juveniles	At least three age/size groups of brook/river lamprey present	No works are proposed at the outfall of the WwTP. No works are proposed outside the existing WwTP site and no instream works are proposed. All works will be separated from the SAC by a distance of 8m and an existing public walkway. There will be no impact on the population structure or juvenile density as a result of the proposed works. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Juvenile density in fine sediment	Mean catchment juvenile density of brook/river lamprey at least 2/m²	

Extent and distribution of spawning habitat	No decline in extent and distribution of spawning beds	No works are proposed outside the existing WwTP site and no instream works are proposed. All works will be separated from the SAC by a distance of 8m and an existing public walkway. There will be no impact on the extent, distribution or availability of spawning habitat as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Availability of juvenile habitat	More than 50% of sample sites positive	No works are proposed at the outfall of the WwTP. No works are proposed outside the existing WwTP site and no instream works are proposed. All works will be separated from the SAC by a distance of 8m and an existing public walkway. There will be no impact on the availability of juvenile habitat as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.

6.1.4 Atlantic Salmon [1106]

The attributes and targets for Atlantic Salmon as per the Site-Specific Conservation Objectives (SSCOs) for Lower River Shannon SAC (NPWS Version 1.0, 2012) and an assessment of the proposed development against the nominated attributes and targets for the species is provided in Table 6-4 below.

Table 6-4 Targets and attributes associated with nominated site-specific conservation objectives for Salmon (Salmo salar) [1106].

Attribute	Target	Assessment
Distribution: extent of anadromy	100% of river channels down to second order accessible from estuary	No works are proposed at the outfall of the WwTP. No works are proposed outside the existing WwTP site and no instream works are proposed. All works will be separated from the SAC by a distance of 8m and an existing public

		walkway. There will be no effect on distribution of salmon as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Adult spawning fish	Conservation Limit (CL) for each system consistently exceeded	No works are proposed outside the existing WwTP site and no instream works are proposed. All works will be separated from the SAC by a distance of 8m and an existing public walkway. There will be no reduction in adult spawning fish, salmon fry abundance, out-migrating smolt abundance or the number and distribution of redds as a result of the propsed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Salmon fry abundance	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling	
Out-migrating smolt abundance	No significant decline	
Number and distribution of redds	No decline in number and distribution of spawning redds due to anthropogenic causes	
Water quality	At least Q4 at all sites sampled by EPA	There will be no reduction in water quality as a result of the proposed developement. According to EPA data, operations at the WwTP are not currently having an observably negative effect on biological water wuality. The operation of the proposed development will have a neutral effect on water quality. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.

6.1.5 Otter [1355]

The attributes and targets for Otter as per the Site-Specific Conservation Objectives (SSCOs) for Lower River Shannon SAC (NPWS Version 1.0, 2012) and an assessment of the proposed development against the nominated attributes and targets for the species is provided in *Table 6-5* below.

Table 6-5 Targets and attributes associated with nominated site-specific conservation objectives for Otter (Lutra lutra).

Attribute	Target	Assessment
Distribution	No significant decline	There were no breeding signs or other evidence of otter found within 150m of the development site during walkover surveys. There will be no decline on the species distribution as a result of the proposed works. Indirect pathways that would allow impacts to occur via water pollution and disturbance of otter were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Extent of terrestrial habitat	No significant decline. Area mapped and calculated as 596.8ha above high water mark (HWM); 958.9ha along river banks/ around ponds	There will be no reduction to the terrestiral habitat extent. There will be no effects on riparian or any other suitable otter habitat as a result of the works. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.
Extent of marine habitat	No significant decline. Area mapped and calculated as 4,461.6ha	There will be no reduction to the marine habitat extent. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.
Extent of freshwater (river) habitat	No significant decline. Length mapped and calculated as 500.1km	There will be no reduction to the freshwater (river) habitat extent Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction

		and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Extent of freshwater (lake/lagoon) habitat	No significant decline. Area mapped and calculated as 125.6ha	There will be no reduction or alteration to the freshwater (lake) habitat extent as a reult of the proposed works. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.
Couching sites and holts	No significant decline.	There will be no reduction in holt or couching sites as a result of the proposed works. No couching sites or holts were found within 150m of the development site during walkover surveys. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.
Fish biomass available	No significant decline	There will be no changes to the fish biomass available to otter as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Barries to connectivity	No significant increase.	There will be no changes to the connectivity between communting routes used by Otter as a result of the proposed development.

6.1.6 Bottlenose Dolphin [1349]

The attributes and targets for Bottlenose dolphin as per the Site-Specific Conservation Objectives (SSCOs) for Lower River Shannon SAC (NPWS Version 1.0, 2012) and an assessment of the proposed development against the nominated attributes and targets for the species is provided in Table 6-6 below.

Table 6-6 Targets and attributes associated with nominated site-specific conservation objectives for Bottlenose Dolphin.

Attribute	Target	Assessment
Access to suitable habitat	Species range within the site should not be restricted by artificial barriers to site use. See map 16 for suitable habitat	There will be no decline on the species distribution as a result of the proposed works. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Habitat use: critical areas	Critical areas, representing habitat used preferentially by bottlenose dolphin, should be maintained in a natural condition.	There will be no reduction in habitat use of critical areas by Bottlenose Dolphin as a result of the proposed works. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.
Disturbance	Human activities should occur at levels that do not adversely affect the bottlenose dolphin population at the site.	There is no potential for disturbance to Bottlenose Dolphin as a result of the proposed works. The development site is located upstream of suitable Bottlenose Dolphin habitat.

6.1.7 Estuaries [1130]

The attributes and targets for Estuaries as per the Site Specific Conservation Objectives (SSCOs) for Lower River Shannon SAC (NPWS Version 1.0, 2012) and an assessment of the proposed development against the nominated attributes and targets for the species is provided in Table 6-7 below.

Table 6-7 Targets and attributes associated with nominated site-specific conservation objectives for Estuaries.

Attribute	Target	Assessment
Habitat Area	The permanent habitat area is stable or increasing, subject to natural processes.	There will be no decline in habitat area with the proposed project. The proposed works are located entirely outside of the SAC boundary. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.

Community distribution	Conserve the following community types in a natural condition: Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Estuarine subtidal muddy sand to mixed sediment with gammarids community complex; Subtidal sand to mixed sediment with *Nucula nucleus* community complex; Subtidal sand to mixed sediment with *Nephtys* spp. community complex; Fucoid-dominated intertidal reef community complex; Faunal turf-dominated subtidal reef community; and Anemone-dominated subtidal reef community.	The proposed development will not affect the communities characterising this habitat, in terms of extent, structure or distribution. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.

6.1.8 Mudflats and sandflats not covered by seawater at low tide [1140]

The attributes and targets for Mudflats and sandflats not covered by seawater at low tide [1140] as per the Site Specific Conservation Objectives (SSCOs) for Lower River Shannon SAC (NPWS Version 1.0, 2012) and an assessment of the proposed development against the nominated attributes and targets for the species is provided in Table 6-8 below.

Table 6-8 Targets and attributes associated with nominated site-specific conservation objectives for Mudflats and sandflats not covered by seawater at low tide [1140]

Attribute	Target	Assessment
Habitat Area	The permanent habitat area is stable or increasing, subject to natural processes.	There will be no decline in habitat area or alteration to community distribution as a result of the proposed development. The proposed works are located entirely outside of the SAC boundary. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Community distribution	Conserve the following community types in a natural condition: Intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community; and Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex.	

6.1.9 Sandbanks which are slightly covered by sea water all the time [1110]

The attributes and targets for Sandbanks which are slightly covered by sea water all the time [1110] as for the Site Specific Conservation Objectives (SSCOs) for Lower River Shannon SAC (NPWS Version 1.0, 2012) and an assessment of the proposed development against the nominated attributes and targets for the species is provided in Table 6-8 below.

Table 6-9 Targets and attributes associated with nominated site-specific conservation objectives for Sandbanks which are slightly covered by sea water all the time [1110]

Attribute	Target	Assessment
Habitat Distribution	The distribution of sandbanks is stable, subject to natural processes.	There will be no decline in habitat distribution, area or alteration to community distribution as a result of the proposed development. The proposed works are located entirely outside of the SAC boundary. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Habitat Area	The permanent habitat area is stable or increasing, subject to natural processes.	
Community distribution	Conserve the following community type in a natural condition: Subtidal sand to mixed sediment with *Nephtys* spp. community complex.	

6.1.10 Mediterranean salt meadows (Juncetalia maritimi) [1410]

The attributes and targets for Mediterranean salt meadows *(Juncetalia maritimi* as per the Site Specific Conservation Objectives (SSCOs) for Lower River Shannon SAC (NPWS Version 1.0, 2012) and an assessment of the proposed development against the nominated attributes and targets for the species is provided in Table 6-10 below.

Table 6-10 Targets and attributes associated with nominated site-specific conservation objectives for Mediterranean salt meadows (Juncetalia maritimi) [1410].

Attribute	Target	Assessment
Habitat area	Area increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle- 4.193ha; Barrigone, Aughinish- 2.407ha; Bunratty- 0.865ha; Inishdea, Owenshere- 11.609ha; Killadysert, Inishcorker- 0.705ha; Knock- 0.143ha, Querin- 0.008ha; Rinevilla Bay- 2.449ha.	There will be no decline in habitat area or distribution with the proposed project. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of

Habitat distribution	No decline, or change in habitat distribution, subject to natural processes.	the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Physical structure: sediment supply	Restore natural circulation of sediments and organic matter, without any physical obstructions.	There will be no alteration to the physical structure of the habitat as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Physical structure: creeks and pans	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	
Physical structure: flooding regime	Maintain natural tidal regime.	
Vegetation structure: zonation	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession.	There will be no alteration to the vegetation zonation, vegetation height or vegetation cover. There will be no change to the vegetation composition of the typical species and subcommunities or introduction of negative indicator species as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.
Vegetation structure: vegetation height	Maintain structural variation within sward	
Vegetation structure: vegetation cover	Maintain more than 90% of area outside creeks vegetated	
Vegetation composition: typical species	Maintain range of sub- communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	
Vegetation structure: negative indicator species - *Spartina anglica*	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	

6.1.11 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]

The attributes and targets for Atlantic salt meadows (Glauco-Puccinellietalia maritimae) as per the Site Specific Conservation Objectives (SSCOs) for Lower River Shannon SAC (NPWS Version 1.0, 2012) and an assessment of the proposed development against the nominated attributes and targets for the species is provided in Table 6-11 below.

Table 6-11 Targets and attributes associated with nominated site-specific conservation objectives for Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]

Attribute	Target	Assessment
Habitat area	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle- 6.774ha; Barrigone, Aughinish- 10.288ha; Beagh- 0.517ha; Bunratty- 26.939ha; Shepperton, Fergus Estuary- 37.925ha; Inishdea, Owenshere- 18.127ha; Killadysert, Inishcorker- 2.604ha; Knock- 0.576ha; Querin- 3.726ha; Rinevilla Bay- 11.883ha.	There will be no decline in habitat area or distribution with the proposed project. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Habitat distribution	No decline or change in habitat distribution, subject to natural processes.	
Physical structure: sediment supply	Restore natural circulation of sediments and organic matter, without any physical obstructions.	There will be no alteration to the physical structure of the habitat as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Physical structure: creeks and pans	Maintain creek and pan structure, subject to natural processes, including erosion and succession	
Physical structure: flooding regime	Maintain natural tidal regime.	
Vegetation structure: zonation	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession.	There will be no alteration to the vegetation zonation, vegetation height or vegetation cover. There will be no change to the vegetation composition of the typical species and subcommunities or introduction of negative indicator species as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.
Vegetation structure: vegetation height	Maintain structural variation within sward	
Vegetation structure: vegetation cover	Maintain more than 90% of the saltmarsh area vegetated	
Vegetation composition: typical species and sub-communities	Maintain range of sub- communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	

Vegetation structure: negative indicator species - *Spartina anglica*	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	

6.1.12 *Salicornia* and other annuals colonising mud and sand [1310]

The attributes and targets for *Salicornia* and other annuals colonising mud and sand as per the Site Specific Conservation Objectives (SSCOs) for Lower River Shannon SAC (NPWS Version 1.0, 2012) and an assessment of the proposed development against the nominated attributes and targets for the species is provided in Table 6-12 below.

Table 6-12 Targets and attributes associated with nominated site-specific conservation objectives for Salicornia and other annuals colonising mud and sand [1310]

Attribute	Target	Assessment
Habitat area	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle - 0.005ha; Inishdea, Owenshere - 0.003ha; Knock - 0.029ha; Querin - 0.185ha; Rinevilla Bay - 0.001ha.	There will be no decline in habitat area or distribution associated with the proposed works. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Habitat distribution	No decline, or change in habitat distribution, subject to natural processes	
Physical structure: sediment supply	Maintain natural circulation of sediments and organic matter, without any physical obstructions	There will be no impact on sediment supply, creeks and pans, flooding regime or zonation as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Physical structure: creeks and pans	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	
Physical structure: flooding regime	Maintain natural tidal regime	
Vegetation structure: zonation	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	
Vegetation structure: vegetation height	Maintain structural variation within sward	There will be no impact on vegetation height or cover as a result of the proposed development.

Vegetation structure: vegetation cover	Maintain more than 90% of area outside creeks vegetated	Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.
Vegetation composition: typical species and subcommunities	Maintain the presence of species-poor communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	There will be no impact on typical species composition as a result of the proposed development. There will be no introduction of *Spartina anglica* as a result of the proposed development.
Vegetation structure: negative indicator species - *Spartina anglica*	No significant expansion of common cordgrass (*Spartina anglica),* with an annual spread of less than 1%	Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.

6.1.13 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]

The attributes and targets for Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) as per the Site Specific Conservation Objectives (SSCOs) for Lower River Shannon SAC (NPWS Version 1.0, 2012) and an assessment of the proposed development against the nominated attributes and targets for the species is provided in Table 6-13 below.

Table 6-13 Targets and attributes associated with nominated site-specific conservation objectives for Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)

Attribute	Target	Assessment
Habitat area	Area stable or increasing, subject to natural processes, at least c.8.5ha for sites surveyed. S	This QI habitat is mapped approx. 500m upstream of the development site. However, works are confined to within the WwTP boundary and this habitat is not mapped downstream of the development site. There will be no decline in habitat area or distribution as a result of the proposed development. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.
Habitat distribution	No decline. Surveyed locations shown on map 14	

Woodland size	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	There will be no alteration to woodland size or structure associated with this habitat as a result of the proposed project. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.
Woodland structure: cover and height	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi- mature trees and shrubs; and well-developed herb layer	
Woodland structure: community diversity and extent	Maintain diversity and extent of community types	
Woodland structure: natural regeneration	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	
Hydrological regime: flooding depth/height of water table	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	There will be no alteration to flooding depth or height of water table as a result of the proposed project. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution or effects of Flood Risk during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Woodland structure: dead wood	At least 30m³/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder)	There will be no alteration to woodland structure or vegetation composition associated with this habitat as a result of the proposed project. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.
Woodland structure: veteran trees	No decline	
Woodland structure: indicators of local disctinctiveness	No decline	
Vegetation composition: native tree cover	No decline. Native tree cover not less than 95%	
Vegetation composition: typical species	A variety of typical native species present, depending on woodland type, including alder (Alnus glutinosa), willows (Salix spp) and, locally, oak (Quercus robur) and ash (Fraxinus excelsior)	

Vegetation composition: negative indicator species	Negative indicator species, particularly non-native invasive species, absent or under control	

6.1.14 Reefs [1170]

The attributes and targets for Reefs [1170] as per the Site Specific Conservation Objectives (SSCOs) for Lower River Shannon SAC (NPWS Version 1.0, 2012) and an assessment of the proposed development against the nominated attributes and targets for the species is provided in *Table 6-14* below.

Table 6-14 Targets and attributes associated with nominated site-specific conservation objectives for Reefs [1170].

Attribute	Target	Assessment
Habitat Distribution	The distribution of Reefs is stable, subject to natural processes	There will be no decline in habitat area or distribution with the proposed project. The proposed works are located entirely outside of the SAC boundary. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Habitat area	The permanent habitat area is stable, subject to natural processes.	
Community distribution	Conserve the following reef community types in a natural condition: Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone-dominated subtidal reef community; and *Laminaria*- dominated community complex.	The proposed development will not affect the communities characterising this habitat or their distribution. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.

6.1.15 Coastal Lagoons [1150]

The attributes and targets for Coastal lagoons [1150] as per the Site-Specific Conservation Objectives (SSCOs) for Lower River Shannon SAC (NPWS Version 1.0, 2012) and an assessment of the proposed development against the nominated attributes and targets for the species is provided in Table 6-15 below.

Table 6-15 Targets and attributes associated with nominated site-specific conservation objectives for Coastal lagoons [1150].

Attribute	Target	Assessment
Habitat area	Area stable, subject to natural processes. Favourable reference area 33.4ha- Shannon Airport Lagoon 24.2ha; Cloonconeen Pool 3.9ha; Scattery Lagoon 2.8ha; Quayfield and Poulaweala Loughs 2.5ha.	There will be no decline in habitat area or distribution as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.
Habitat distribution	No decline, subject to natural processes.	
Salinity regime	Median annual salinity and temporal variation within natural ranges	There will be no alteration to the salinity or hydrological regime associated with this habitat as a result of the proposed project. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.
Hydrological regime	Annual water level fluctuations and minima within natural ranges	
Barrier: connectivity between lagoon and sea	Appropriate hydrological connections between lagoons and sea, including where necessary, appropriate management	No barriers between the lagoons and the sea will be created as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.
Water quality: Chlorophyll a	Annual median chlorophyll a within natural ranges and less than 5µg/L	Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Water quality: Molybdate Reactive Phosphorus (MRP)	Annual median MRP within natural ranges and less than 0.1mg/L	
Water quality: Dissolved Inorganic Nitrogen (DIN)	Annual median DIN within natural ranges and less than 0.15mg/L	
Depth of macrophyte colonization	Macrophyte colonisation to maximum depth of lagoons	There will be no alteration of the depth of macrophyte colonization as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during

		the construction and operational stage of the proposed works.
Typical plant species	Maintain number and extent of listed lagoonal specialists, subject to natural variation	No decline in typical species associated with this habitat will occur as a result of the proposed development. No introduction of negative indicator species is expected as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.
Typical animal species	Maintain number and extent of listed lagoon specialists, subject to natural variation	
Negative indicator species	Negative indicator species absent or under control	

6.1.16 Large shallow inlets and bays [1160]

The attributes and targets for Large shallow inlets and bays [1160] as per the Site Specific Conservation Objectives (SSCOs) for Lower River Shannon SAC (NPWS Version 1.0, 2012) and an assessment of the proposed development against the nominated attributes and targets for the species is provided in Table 6-16 below.

Table 6-16 Targets and attributes associated with nominated site-specific conservation objectives for Large shallow inlets and bays [1160].

Attribute	Target	Assessment
Habitat Area	The permanent habitat area is stable or increasing, subject to natural processes.	There will be no decline in habitat area with the proposed project. The proposed works are located entirely outside of the SAC boundary. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Community distribution	Conserve the following community types in a natural condition: Intertidal sand with *Scolelepis squamata* and *Pontocrates spp.* community; Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Subtidal sand to mixed sediment with *Nucula nucleus* community complex; Subtidal sand to mixed sediment *with Nephtys spp.* community complex; Fucoid-	The proposed development will not affect the communities characterising this habitat, in terms of extent, structure or distribution. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.

	dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone- dominated subtidal reef community; and *Laminaria*-dominated community complex. S	

6.1.17 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]

The attributes and targets for Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260] as per the Site Specific Conservation Objectives (SSCOs) for Lower River Shannon SAC (NPWS Version 1.0, 2012) and an assessment of the proposed development against the nominated attributes and targets for the species is provided in Table 6-17 below.

Table 6-17 Targets and attributes associated with nominated site-specific conservation objectives for Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260].

Attribute	Target	Assessment
Habitat area	Area stable or increasing, subject to natural processes	This habitat was not recorded within the development site and therefore there will be no direct loss of this habitat. No works are proposed at the outfall of the site. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.
Habitat distribution	No decline, subject to natural processes	
Hydrological regime: river flow	Maintain appropriate hydrological regimes	There will be no impacts on the hydrological regime where this habitat occurs or where there is potential for this habitat to occur. There will be no changes to river flow downstream tidal influence or freshwater seepages.
Hydrological regime: tidal influence	Maintain natural tidal regime	
Hydrological regime: freshwater seepages	Maintain appropriate freshwater seepage regimes	
Substratum composition: particle size range	The substratum should be dominated by the particle size ranges, appropriate to the habitat sub-type (frequently sands, gravels and cobbles)	The proposed works will not result in the alteration of the substratum particle size range, quantity or quality of the habitat. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to

		avoid all water pollution during the construction and operational stage of the proposed works.
Water quality: nutrients	The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition	There will be no impact on water quality associated with the proposed works. As described in Section 3, the proposed upgrade works will result in improved treatment of effluent from the Plant, and therefore improved water quality. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.
Vegetation composition: typical species	Typical species of the relevant habitat sub-type should be present and in good condition	This habitat was not recorded within the development site and therefore there will be no direct loss of this habitat. There will be no impacts on typical species, floodplain connectivity or riparian habitat area associated with the proposed works. Indirect pathways that would allow impacts to occur via water pollution or flood risk were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.
Floodplain connectivity: area	The area of active floodplain at and upstream of the habitat should be maintained	There will be no changes to the area of active floodplain associated with the development. The flood zone area within the development site will continue to act as a flood plain when the development is complete. The project has been designed so that the most significant infrastructure is built within Flood Zone C. For any other infrastructure contained within Flood Zone A, compensatory storage will be provided.
Riparian habitat: area	The area of riparian woodland at and upstream of the bryophyte-rich sub-type should be maintained	This habitat was not recorded within the development site and there will be no direct loss of this habitat as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works.

6.1.18 Determination on Potential Adverse Effects on Lower River Shannon SAC

Based on the above, in view of best scientific knowledge, on the basis of objective information, the proposed project will not adversely affect surface water or ground water in the area during either construction or operation of the proposed project. In addition, there is no potential for adverse effect on the QI species otter as a result of disturbance. No otter breeding or resting habitats were identified during ecological surveys, and disturbance measures have been included to ensure there is no potential for effect

via disturbance. There is no potential for adverse effect on the identified QIs and their associated targets and attributes.

All identified pathways for effect during construction of the development have been robustly blocked through measures to avoid impacts and the incorporation of best practice/mitigation measures into the project design. As described in Section 5.2, the operation of the proposed development will ensure continued effective treatment of discharge and will accommodate expected increased P.E in the future. The WwTP will continue to treat effluent to ensure that it is within EQS' for the River Shannon and in line with WFD objectives.

The proposed development will not inhibit the conservation objective to restore the conservation status of the following QIs. The proposed development will ensure continued effective treatment of effluent and will contribute to achieving the conservation objectives of the following QIs:

- Sea Lamprey *Petromyzon marinus* [1095]
- Atlantic Salmon *Salmo salar* [1106]
- Otter *Lutra lutra* [1355]
- Mediterranean salt meadows (Juncetalia maritimi) [1410]
- Atlantic salt meadows (Glauco-Puccinellietalia maririmae) [1330]
- *Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]
- Coastal Lagoons [1150]

The proposed development will not inhibit the conservation objective to maintain the conservation status of the following QIs. The proposed development will ensure continued effective treatment of effluent and will contribute to achieving the conservation objectives of the following QIs:

- Brook Lamprey *Lampetra planeri* [1096]
- River Lamprey *Lampetra fluviatili* [1099]
- Bottlenose Dolphin *Tursiops truncatus* [1349]
- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Sandbanks which are slightly covered by sea water all the time [1110]
- Salicornia and other annuals colonising mud and sand [1310]
- Reefs [1170]
- Large shallow inlets and bays [1160]
- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]

6.2 River Shannon and River Fergus Estuaries SPA [004077]

The potential for adverse effects on the Special Conservation Interest that was identified as being at risk of potential effects is assessed in this section in view of the Conservation Objectives of the SCI.

The Table below provides an assessment of the proposal, as described in Section 3 of this report and associated Appendices, against the Attributes and Targets for the 'Screened in' SCI habitat.

Table 6-18 Targets and attributes associated with site specific conservation objectives for wetlands [A999] (NPWS 2012).

Attribute	Target	Assessment

Habitat area	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 32,261ha, other than that occurring from natural patterns of variation	The proposed development is located outside of this European site. There will be no change to the extent of this habitat area as a result of the proposed development. Indirect pathways that would allow impacts to occur via water pollution were considered in the design of the proposed development as outlined in Section 3, and a range of mitigation measures, outlined in Section 5 of this report, are in place to avoid all water pollution during the construction and operational stage of the proposed works. The objectives of the WFD will not be compromised and the effluent will remain within EQSs during operation of the development.

6.2.1 Determination on Potential Adverse Effects on River Shannon and River Fergus Estuaries SPA

Based on the above, in view of best scientific knowledge, on the basis of objective information, the proposed project will not adversely affect surface water or ground water in the area during either construction or operation of the proposed project. There is no potential for adverse effect on the SCI-supporting habitat and its associated targets and attributes. All identified pathways for effect have been robustly blocked through measures to avoid impacts and the incorporation of best practice/mitigation measures into the project design.

7. CUMULATIVE EFFECTS

A search and review in relation to plans and projects that may have the potential to result in cumulative and/or in-combination impacts on European Sites was conducted. This assessment focuses on the potential for cumulative in-combination effects on the European Sites where potential for adverse effects was identified at the screening stage (Appendix 1). This included a review of online Planning Registers, development plans and other available information and served to identify past and future plans and projects, their activities and their predicted environmental effects.

The following Plans were reviewed and are provided below:

- Limerick City Development Plan 2022-2028
- Limerick City Council Biodiversity Action Plan
- National Biodiversity Action Plan 2017-2021
- Regional Spatial and Economic Strategy for the Southern Region

7.1 Plans

Table 7.1 Review of plans

Plans	Key Policies/Issues/Objectives Directly Related To European Sites, Biodiversity and Sustainable Development In The Zone of Influence	Assessment of development compliance with policy
Limerick City Development Plan 2022-2028	**Policy EH P1** Protection of Natural Heritage and Biodiversity. It is a policy of the Council to: a) Protect and conserve Limerick's natural heritage and biodiversity, in particular, areas designated as part of the European Sites Natura 2000 network, such as Special Protection Areas (SPAs) and Special Areas of Conservations (SACs), in accordance with relevant EU Directives and national legislation and guidelines. b) Maintain the conservation value of all Natural Heritage Areas and	The proposed development has been designed so that there will be no adverse effect on any European Site including Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA. The Site-Specific Conservation Objectives for the relevant QIs and SCIs of these sites have been reviewed in light of the proposed development. Appropriate mitigation measures have been included in order to ensure the integrity of the Natura 2000 Network.

Plans	Key Policies/Issues/Objectives Directly Related To European Sites, Biodiversity and Sustainable Development In The Zone of Influence	Assessment of development compliance with policy
	proposed Natural Heritage Areas (pNHAs) for the benefit of existing and future generations.	
	Objective EH O1 Designated Sites and Habitats Directive. It is an objective of the Council to ensure that projects/plans likely to have significant effects on European Sites (either individually or in combination with other plans or projects) are subject to an appropriate assessment and will not be permitted under the Plan unless they comply with Article 6 of the Habitats Directive. The Council, will through the planning enforcement process where applicable, seek to restore the ecological functions of designated sites, where they have been damaged through inappropriate development.	The precautionary principle has been applied in the design of the proposed development with precautionary mitigation included to avoid adverse effect on European Sites through water quality deterioration, disturbance and biosecurity during construction and operation.
Limerick City Council Biodiversity Action Plan	To maintain, protect and enhance the biodiversity of Limerick City for future generations and to educate and promote the importance of Limerick City's biodiversity for all.	The design and mitigations included as part of the proposed development are such that there will be no adverse effect on any European Site and the Protected Areas Network.
National Biodiversity Action Plan 2017-2021	Target 6.2 - Sufficiency, coherence, connectivity, and resilience of the protected areas network substantially enhanced by 2020.	
Regional Spatial and Economic Strategy for the Southern Region	**RPO 1** **b.** The RSES seeks to protect, manage, and through enhanced ecological connectivity, improve the coherence of the Natura 2000 Network in the Southern Region. c. RSES support for other plans/ programmes (and initiatives arising) is on the basis of appropriate SEA, SFRA, EIA and AA processes being undertaken in order to ensure the avoidance of adverse effects on European Sites and ensure implementation of mitigation measures where required.	The site-specific conservation objectives for Lower River Shannon SAC, River Shannon and River Fergus Estuaries SPA were comprehensively reviewed in undertaking this assessment. The surveys undertaken in the preparation of this application, the design of the development and the proposed mitigations in place, demonstrate that the proposed project will not adversely affect the Qualifying Interests/Special Conservation Interests associated with any European Site, during construction or operation of development.

Plans	Key Policies/Issues/Objectives Directly Related To European Sites, Biodiversity and Sustainable Development In The Zone of Influence	Assessment of development compliance with policy
	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	The proposed upgrades will help Irish Water to meet the aims of the Strategy with regard to improvement in wastewater infrastructure and avoiding adverse impacts on the integrity of the Natura 2000 network.
	RPO 11 **k.** To plan increasing population growth in all Key Towns on a phased basis in collaboration with Irish Water, the local authority and other stakeholders to ensure that the assimilative capacity of the receiving environment is not exceeded and that increased wastewater discharges from population growth does not contribute to degradation of water quality and avoids adverse impacts on the integrity of water dependent h habitats and species within the Natura 2000 network.	
	RPO124 **Green Infrastructure a**. It is an objective to promote the concept of connecting corridors for the movement of wildlife and encourage the retention and creation of features of biodiversity value, ecological corridors and networks that connect areas of high conservation value such as woodlands, hedgerows, earth banks, watercourses and wetlands. The RSES recognises the necessity of protecting such corridors and the necessity to encourage the management of features of the landscape.	

Plans	Key Policies/Issues/Objectives Directly Related To European Sites, Biodiversity and Sustainable Development In The Zone of Influence	Assessment of development compliance with policy
	RPO 208 **Irish Water and Water Supply** It is an objective to: a. Support the implementation of Irish Water Investment Plans (prepared in five-year cycles) and subsequent investment plans and seek such plans to align the supply of water services with the settlement strategy and objectives of the RSES and Metropolitan Area Strategic Plans for Cork, Limerick, Shannon and Waterford; b. Support the role of Irish Water Investment Plans in taking into account seasonal pressures on critical service infrastructure, climate change implications and leakage reduction in the design of all relevant projects; c. Deliver and phase services, subject to the required appraisal, planning and environmental assessment processes and avoid adverse impacts on the integrity of the Natura 2000 network; d. Local Authority Core Strategies shall demonstrate compliance with DHPLG Water Services Guidelines for Planning Authorities and demonstrate phased infrastructure led growth to meet demands on the water supply, suitability of new and/or existing drinking water sources (for example hydro morphological pressures) and prevent adverse impacts on the integrity of water dependent habitats and species within the Natura 2000 network.	

Plans	Key Policies/Issues/Objectives Directly Related To European Sites, Biodiversity and Sustainable Development In The Zone of Influence	Assessment of development compliance with policy
	RPO 212 **Strategic Wastewater Treatment Facilities** **a**. It is an objective to support investment and the sustainable development of strategic wastewater treatment facilities by Irish Water in the Region arising from initiatives including Investment Plans, Strategic Drainage Area Plans subject to appropriate environmental assessment and the planning process. b. For the management of wastewater, increasing population growth should be planned on a phased basis in collaboration with Irish Water and the local authorities to ensure that the assimilative capacity of the receiving environment is not exceeded and that increased wastewater discharges from population growth does not contribute to degradation of water quality and to avoid adverse impacts on the integrity of the Natura 2000 network.	

7.2 Other Projects

The potential for the proposed works to contribute to a cumulative impact on European Sites was considered. The online planning system for Limerick County Council was consulted on the 30/01/2023. Projects in the area included small-scale single house extensions and the following:

- Repairs to the pontoon and gangway adjacent to the UL Boathouse at Dromroe. The works involve the replacement of the existing decking and the installation of a security gate at the entrance to the pontoon. An Appropriate Assessment(AA) & Natura Impact Statement(NIS) will be submitted to the Planning Authority with the application (pl ref: 22281)
- Permission for development which will consist of a floodlit Sports Pitch including the use of existing soil on site, together with the provision of boundary fence and other ancillary works. A Natura Impact Statement (NIS) will be submitted to the Planning Authority with the application (pl ref: 211221)
- Extension of Duration for pl. ref: 15/697: the construction of a new single storey, PGA Accredited Golf Academy Building incorporating 19 covered driving range bays, two teaching bays, two manufacturing bays, a ball management area, toilets, reception, a shop and ancillary spaces. The associated site works include an outfield area 150m wide and 300m long, a putting green, a pitching area, a chipping green and a chipping area, with perimeter call catch nets and associated landscaping. The site works will also include the relocation underground of the existing overhead 38kv power cables and includes the removal of two existing pylons and the erection of two new steel pylons at the extremities of the diverted cables (A Natura Impact Statement will be submitted with the application. The site is located 235 metres from Plassey Mill and Headrace (a protected structure) and 790 metres from Plassey House (a protected structure). The site is located to the southeast of the existing University Boat House, to the west of the main campus and to the east of the River Shannon Candidate Special Area of Conservation (cSAC, site code 002165) and within the Architectural Conservation Area (ACA) - extended under 21/7002 until 28/02/2026.
- Extension of Duration for 06/4024 for construction of 240 dwellings in three areas/lots: Area 1 consists of 152 no. two storey dwellings, types A-G . Areas 2 & 3 consist of 88 dwellings - three storey duplex dwellings with 34 two bed apartments at ground floor with 34 three bed duplex houses on first and second floor and 20 two storey dwellings and creche. Site entrance to area 1 to be widened and improved. Site entrance to area 2 & 3 is via the existing Woodhaven estate. The proposed development includes all ancillary site works, parking landscape and drainage (pl ref: 217036)
- Permission for construction of 23 no. two-storey residential units and associated infrastructure on lands situated adjacent to the 'Carrowkeel' and 'Woodhaven' residential estates and the Castletroy Urban Greenway. The proposed development includes 17 no. terrace and 6 no. semi detached style residential units, associated landscaping including connection with the Castletroy Urban Greenway, public lighting, surface water attenuation tank, petrol interceptor, connection to public water and foul water infrastructure and vehicular access from Kilmurry Road via existing estate roads (pl ref: 211475)
- Permission for a residential development comprising 96 no. residential units, (16 no. semi-detached houses, 6 no. terrace houses, 2 detached units along with 2 no. 5 storey apartment blocks over basement, comprised of 72 no. apartments and basement parking), bin & bike stores, demolition of existing farm buildings, additional parallel parking along the Castletroy College road, accessed via a new entrance onto the Castletroy College road and all ancillary development works. Ancillary site development works include a new connection to the public water main, foul and surface water drainage, access roads,

footpaths, vehicle parking, landscaping, boundary treatments and site development works above and below ground. The planning application is accompanied by a NIS(Natura Impact Statement). (pl ref: 211400)

- Permission for construction of a single storey pre-school building, new site entrance, boundary walls and connection to services with all associated site works (pl ref: 211241)
- Permission was sought for the erection of illuminated signage on the eastern elevation of the existing boat house. The site is located circa 832m from Plassey House (protected structure) and circa 247m from Plassey Mill and Headrace (protected structure). The University of Limerick campus falls within an architectural conservation area. [Pl. Ref. 18440]
- Permission was sought for the demolition of an existing concrete canopy and alterations to the existing East elevation of the Glucksman Library and Information Services Building along with providing a new external sign approx. size 3.2m X 3.2m, to facilitate the relocation of current main entrance located North to further South along the East elevation. The works involve the addition of internal entrance glazed screens and doors with internal alterations to the existing ground floor level at 11.500m OD, of c. 200m2 gross floor area to facilitate the new main entrance relocation and to provide an new media area. Works also to involve the addition of a new single storey extension at 11.500m OD for a new exhibition and meeting area along with a new café entrance of c. 112m2 gross floor area at an overall height of 16.275m OD (Ground Level at 11.500m OD) adjacent to the existing main entrance area, along with some existing internal room alterations at 11.500m OD of c. 100m2 in this area to extend the existing café. The construction of a new three storey infill extension of c.88m2 gross floor area at an overall maximum height of c. 12.975m and at an overall height of 24.475m OD (Ground Level at 11.500m OD). The construction of a new canopy to the East elevation at a maximum height of c. 7.530m and at an overall height of 19.030m OD (Ground LEVEL AT 11.500M OD), an existing stone sculpture relocation, along with new soft and hard landscaping and all associated site engineering works to be provided to the site measuring 0.70 hectares. The University Campus falls within an Architectural Conservation Area (ACA), which contains Protected Structures including Plassey Bridge, Plassey House, Plassey Mill, Plassey Mountain, Milford House and Gate Lodge which are all at least 200mm from the proposed development. [Pl. Ref. 16630]
- Permission was sought for the construction of an external lift to the south of the Foundation Building, University of Limerick, Sreelane, Castletroy, Co. Limerick. The development will consist of a three storey lift enclosure (16.5m2) between the upper plaza level and lower ground floor terrace level with a glazed link to the first floor level of the Foundation Building. The lift enclosure (13.2m high) will be clad in brickwork, concrete spandrel panels and copper roofing to match the existing building. The site is located circa 155m from Plassey House (protected structure) and circa 542m from Plassey Mill and Headrace (protected structure). The University of Limerick campus falls within architectural campus falls within an architectural conservation area. [Pl. Ref. 18396]
- Permission was sought for extension of the existing common room mezzanine at the Millstream Building, University of Limerick, Sreelane, Co. Limerick. The development will comprise of a mezzanine extension of 59.5 sq.m and minor elevational modifications. The site is located circa 153 metres from Plassey House (a protected structure) and circa 509 metres from Plassey Mill and Headrace (a protected structure). The University of Limerick campus falls within an Architectural Conservation Area. [Pl. Ref. 20543]
- Permission was sought for the erection of a temporary pedestrian and vehicular entrance at the end of Drumroe Estate, construct an internal access road to the existing carpark and clubhouse, close up the existing access road as shown on plans and incorporate closed off section of existing roadway into the carpark and all associated site works. [Pl. Ref. 181064]
- Permission was sought for the change of use from light industrial to office use. [Pl. Ref. 21428]

Other Irish Water Projects identified within the vicinity of the Lower River Shannon include:

- Demolition of existing inlet works and pumping station. Construction of a new inlet works, inlet and storm and final effluent pumping stations, storm tank, control building and all ancillary site works (Adare WwTP) (pl ref: 191200), approximately 15km southwest of the development site.
- Demolition of existing sludge bed. Construction of new inlet works, storm tank, picket fence thickener, pumping stations, control buildings and all ancillary site works (Croom WwTP) (pl ref: 191201) approximately 15km southwest of the development site.

Other permitted Discharges located along the Lower River Shannon include:

- Primary discharge and stormwater overflow 20km downstream of Castletroy - D0045-01 – Shannon Town
- Stormwater overflow 8.2km upstream of Castletroy: DTEMP0008-01
- Stormwater overflow 9.8km downstream of Castletroy: DTEMP0007-01 Limerick
- Primary discharge and stormwater overflow 43km downstream of Castletroy - D0502-01 Foynes
- Primary discharge 55km downstream of Castletroy - D0504-01 Glin

The existing listed discharges above are of significant distances from the Castletroy discharge. The Waste Assimilative Capacity of the River Shannon at the time of writing, as described in Section 3.2.3, is such that there will be no cumulative effects to the aquatic habitats and fauna of the Lower River Shannon.

The potential for cumulative effects on water quality of the Lower River Shannon as a result of the proposed project in-combination with the downstream discharge from the Bunlicky Wastewater Treatment Plant was also considered. Bunlicky WwTP is 13km downstream of Castletroy. It currently serves a population equivalent of 186,233PE (2021 AER) and is due to undergo a development project which will upgrade the treatment capacity of wastewater and sludge processes on the site. Due to the distance downstream and mixing of flow with other tributaries, there will be no cumulative effects from the combination of Castletroy effluent with current or future discharges from the Bunlicky WwTP on aquatic habitats and species of the River Shannon.

At the time of writing, there is no evidence for the construction phase of nearby developments coinciding with the construction phase of the Proposed Development. Nor will the Proposed Development interact with any of the projects listed above. Therefore, the possibility of cumulative impacts occurring during the construction phase of the Proposed Development is considered to be imperceptible.

7.2.1 Conclusion of Cumulative Assessment

Following the detailed assessment provided in the preceding sections, it is concluded that, the proposed development will not result in any residual adverse effects on any of the European Sites, their integrity or their conservation objectives when considered on its own. There is therefore no potential for the proposed development to contribute to any cumulative adverse effects on any European Site when considered in-combination with other plans and projects.

In the review of the projects that was undertaken, no connection, that could potentially result in additional or cumulative impacts was identified. Neither was any potential for different (new) impacts resulting from the combination of the various projects and plans in association with the proposed development.

Taking into consideration the reported residual impacts from other plans and projects in the area and the predicted impacts with the current proposal, no residual cumulative impacts have been identified with regard to any European Site.

8. CONCLUDING STATEMENT

This NIS has provided an assessment of all potential direct or indirect adverse effects on European Sites.

Where the potential for any adverse effect on any European Site has been identified, the pathway by which any such effect may occur has been robustly blocked through the use of avoidance, appropriate design and mitigation measures as set out within this report and its appendices. The measures ensure that the construction, operation and decommissioning of the proposed development will not have an adverse effect on the integrity of any European sites in light of their conservation objectives.

Following an examination, evaluation and analysis, in light of best scientific knowledge and the conservation objectives of the sites, and, on the basis of objective information, having taken into account the relevant mitigation measures, it can be concluded that the proposed development will not have an adverse effect on any European Sites, either alone or in combination with other plans or projects.

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APPENDIX 1

APPROPRIATE ASSESSMENT SCREENING REPORT

Article 6 (3) Appropriate Assessment Screening Report

Wastewater Treatment Plant Upgrades at Castletroy, County Limerick

DOCUMENT DETAILS

Client:	**Irish Water**
Project Title:	**Wastewater Treatment Plant Upgrades at Castletroy, County Limerick**
Project Number:	**210711**
Document Title:	**Appropriate Assessment Screening Report**
Document File Name:	**AASR F – 2023.02.23- 210711**
Prepared By:	**MKO** **Tuam Road** **Galway** **Ireland** **H91 VW84**

Planning and Environmental Consultants

Rev	Status	Date	Author(s)	Approved By
02	Draft	2023/02/01	RW	PR
01	Final	2023/02/23	RW	PR

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1. INTRODUCTION

1.1 Background

MKO has been appointed to provide the information necessary to allow the competent authority to conduct an Article 6(3) Screening for Appropriate Assessment of development proposal for expansion of a wastewater treatment facility at Castletroy, County Limerick (Grid Ref: R 60730 58485).

Screening for Appropriate Assessment is required under Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive). Where it cannot be excluded that a project or plan, either alone or in combination with other projects or plans, would have a significant effect on a European Site then same shall be subject to an appropriate assessment of its implications for the site in view of the site's conservation objectives. The current project is not directly connected with, or necessary for, the management of any European Site consequently the project has been subject to the Appropriate Assessment Screening process.

The assessment in this report is based on a desk study and field surveys undertaken between July 2020 and January 2023 by MKO. It specifically assesses the potential for the subject development to result in significant effects on European sites in the absence of any best practice, mitigation or preventative measures.

This Appropriate Assessment Screening Report has been prepared in accordance with the European Commission's Assessment of Plans and Projects Significantly affecting Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC (EC, 2021) and Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (EC, 2018) as well as the Department of the Environment's Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DoEHLG, 2010) and the Appropriate Assessment Screening for Development Management. Office of the Planning Regulator, Dublin 7, Ireland OPR (2021).

In addition to the guidelines referenced above, the following relevant documents were also considered in the preparation of this report:

1. *Council of the European Commission (1992) Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Official Journal of the European Communities. Series L 20, pp. 7-49.*
2. *EC (2007) Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence. Opinion of the commission.*
3. *EC (2013) Interpretation Manual of European Union Habitats. Version EUR 28. European Commission.*

1.2 Appropriate Assessment

1.2.1 Screening for Appropriate Assessment

Screening is the process of determining whether an Appropriate Assessment is required for a plan or project. Under Part XAB of the Planning and Development Act, 2000, as amended, screening must be carried out by the Competent Authority. As per Section 177U of the Planning and Development Act, 2000, as amended '*A screening for appropriate assessment shall be carried out by the competent authority to assess, in view of best scientific knowledge, if that Land use plan or proposed development, individually or in combination with another plan or project is likely to have a significant effect on the European site*'. The Competent Authority's determination as to whether an Appropriate Assessment is required must be made on the basis of objective information and should be recorded. The Competent Authority may request information to be supplied to enable it to carry out screening.

Consultants or project proponents may provide for the competent authority, the information necessary for them to determine whether an Appropriate Assessment is required and provide advice to assist them in the Article 6(3) Appropriate Assessment Screening decision.

Where it cannot be excluded beyond reasonable scientific doubt at the Screening stage, that a proposed plan or project, individually or in combination with other plans and projects, would have a significant effect on the conservation objectives of a European site, an Appropriate Assessment is required.

Where an Appropriate Assessment is required, the Competent Authority may require the applicant to prepare a Natura Impact Statement.

The term Natura Impact Statement (NIS) is defined in legislation[1]. An NIS, where required, should present the data, information and analysis necessary to reach a definitive determination as to 1) the implications of the plan or project, alone or in combination with other plans and projects, for a European site in view of its conservation objectives, and 2) whether there will be adverse effects on the integrity of a European site. The NIS should be underpinned by best scientific knowledge, objective information and by the precautionary principle.

This Article 6(3) Appropriate Assessment Screening Report has been prepared in compliance with the provision of section 177U of the Planning & Development Act 2010 as amended.

1.2.2 Statement of Authority

A baseline ecological survey was undertaken on the 6th of April 2022 by Rachel Walsh (BSc. Env) of MKO and on the 23rd of July 2020 by Claire Stephens (BSc. Env.) of MKO. This report has been prepared by Rachel Walsh (B.Sc. Env.), who has 2 years' experience in ecological consultancy. This report has been reviewed by Pat Roberts (B.Sc., MCIEEM) who has over 16 years' experience in ecological assessment.

[1] As defined in Section 177T of the Planning and Development Act, 2000 as amended, an NIS means a statement, for the purposes of Article 6 of the Habitats Directive, of the implications of a proposed development, on its own and in combination with other plans and projects, for a European site in view of its conservation objectives. It is required to include a report of a scientific examination of evidence and data, carried out by competent persons to identify and classify any implications for the European site in view of its conservation objectives

2. DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 Site Location

The proposed development site is an existing wastewater treatment plant located in the suburb of Castletroy, County Limerick (Grid Ref: R 60761 58471). It is situated approximately 800m north west of the University of Limerick and 4km east of Limerick City Centre.

The site is located along the south bank of the Lower River Shannon which is a Special Area of Conservation as designated under the EU Habitats Directive. The site is accessed via the regional road R445 and Plassey Park Road.

The site location is shown in Figure 2-1.

2.2 Characteristics of the Proposed Development

2.2.1 Description of the project

2.2.1.1 Existing Situation

Castletroy Wastewater Treatment Plant (WwTP) has been providing wastewater treatment to the area since the 1990s. Irish Water, in partnership with Limerick City and County council, have identified that an upgrade to the WwTP is vital to support existing and future development in the area. The WwTP is currently operating at the limitations of its design capacity. An upgrade is required to ensure that it continues to meet the EPA licence requirements. There is currently no provision of stormwater storage, therefore excess flows from heavy rainfall events are discharged directly to the Lower River Shannon. The current wastewater discharge licence (WWDL) allows the plant to serve a population equivalent (PE) of 45,000. The current operations at the Plant cater to a PE of 39,000. The current WwTP provides the following treatment:

- Main Pump Station and Preliminary treatment: management of stormwater flows, removal of inorganic solids (grit and screenings).
- Primary Treatment: removal of gross organic solids.
- Secondary treatment - removal of suspended and dissolved pollutants using a secondary conventional aeration, activated sludge system.
- Nutrient removal – ammonia removal and chemical dosing to promote Phosphorous removal in the secondary clarifiers.
- Sludge treatment – gravity thickening and sludge de-watering using a belt press before removal to offsite sludge processing.
- Outfall to the River Shannon - combined storm and treated effluent outfall.

The existing discharge point from the Plant includes three outfall pipes which exit the final effluent pumping station within the WwTP site. These outfall pipes extend approximately 75m into the main river channel and each is fitted with 2 no. diffuser heads. The diffuser heads have 4 no. legs to disperse discharge and enhance mixing with the river flow.

During normal weather conditions the final effluent consists of treated discharge from the WwTP process (SWO1). However, during storm and heavy rainfall conditions it may be mixed with screened stormwater from the inlet works (SWO4) and possibly unscreened emergency overflows (EOs).

The EPA issued a wastewater discharge licence (WWDL) for the agglomeration of Castletroy and its environs on the 22nd April 2009. The WWDL was issued under Regulation 28(1) of the Waste Water Discharge (Authorisation) Regulations 2007. The licence register number is D0019-01 and the Licensee was Limerick County Council. The discharge location is the River Shannon (WFD Code: IE_SH_25_3904).

Emission limit values (ELVs) are specified in the WWDL. They determine the maximum allowable concentrations of waste components/pollutants that can be discharged in the final effluent without adversely affecting the receiving aquatic environment. ELVs assigned to Castletroy WwTP are listed below.

BOD – 25mg/L
COD – 125mg/L
Suspended Solids – 35mg/L
Ammonia (as N) – 5mg/L
Ortho-phosphate (as P) – 1mg/L
Total Phosphorous (as P) – 2mg/L
pH – 6.0 to 9.0

2.2.1.2 Planned Works

Irish Water intend to carry out upgrades at the existing Castletroy Wastewater Treatment Plant. The planning application is for upgrade of an existing Secondary Extended Aeration Activated Sludge Plant to cater for the 10-year growth projections 77,500 PE, including IDA Load, and to allow for future phase 2 works expansion to 81,100 PE. The proposed works are as follows:

1. *Retain existing inlet pump station, including foul and storm pumps*
2. *Retain the existing inlet screens and grit removal system*
3. *Installation of 1 no. new c. 3,750 m^3 Stormwater Storage Tank and Return Pump Station required for 77,500 PE with capacity for Phase 2 expansion to 81,100 PE*
4. *Relocation of the existing Salsnes filter unit and installation of additional Salsnes filter units to cater for 77,500 PE with capacity for Phase 2 expansion to 81,100 PE*
5. *Installation of a new Salsnes filter Primary Sludge Holding/Mixing Tank*
6. *New Salsnes filter Lift Pump Station directly after the Inlet Works*
7. *Upgrade the existing 500mm inlet pipe work to oxidation tanks to allow design flows to be delivered to the tanks*
8. *Retain the 2 no. existing Oxidation Tanks and raise the Top Water Level in the tanks by 300mm*
9. *Installation of a system of textile curtains housed in a removable IFAS frame in the oxidation tanks*
10. *Retain the existing air blowers and install additional units including a new control panel*
11. *Provision of IFAS frame lifting cranes*
12. *Retain the existing 3 no. existing FSTs as this will be sufficient for IFAS system*
13. *Retain the existing Return Activated Sludge (RAS) Pump Station however replace the existing RAS pumps and upgrade the existing 250mm RAS pipework.*
14. *Replace existing chemical dosing system*
15. *Retain existing Picket Fence Thickeners (PFTs) and repair*
16. *Replace existing sludge dewatering equipment to provide for additional capacity required for 10-year design loads with capacity for Phase 2 expansion to 81,100 PE*

All works will be within the existing WwTP boundary and there will be no works carried out at the outfall. There are no instream works required.

The proposed layout drawing of the development is provided as Figure 3-2 of the NIS.

2.2.1.2.1 Stormwater Storage Tank

The new stormwater storage tank will store stormwater until rainfall levels subside and it can be pumped into the plant for full treatment. Construction will involve:

- Rectangular twin cell tank with 3,750m^3 volume (minimum).
- 45m (length) x 20m (breath) x 4.2m (depth).
- Storm return pumping station up to 1DWF to full treatment.

The new stormwater tank will reduce spills and will help to meet Recreational Water Standards.

Modelling of existing spills from the outfall at the WwTP, under current conditions, estimated the average annual spill volume to be 48,312m^3. Modelling was undertaken of a future scenario which includes the proposed upgrades to the plant (including the new storm tank), and future population growth to 81,100 PE, which estimates a reduction in average annual spills to less than 7 spills per bathing season.

2.2.1.2.2 Primary Treatment

Primary Filtration – Additional grit traps and new primary treatment filters will increase the removal of suspended solids and BOD.

- Installation of primary treatment filters within a footprint of 218m^2.
- Construct a building to house filters, control panels, associated equipment and instrumentation.

2.2.1.2.3 Secondary Treatment Aeration System

Aeration tanks retrofitted with Integrated Fixed-Film Activated Sludge (IFAS) technology will provide additional treatment capacity. This element will increase capacity for ammonia removal.

- Install a system of textile curtains housed in a removable Integrated Fixed-Film Activated Sludge (IFAS) frame.
- 36 no. IFAS frames integrated into the existing structure
- Replace existing air diffusers which will be near end of life and install additional diffusers.
- Modify existing road to facilitate crane set-up area.
- Retain the existing air blowers and install additional units.

2.2.1.2.4 Secondary Clarifiers

Install tube settlers or baffles on the 2 no. 20m diameter picket fence thickeners (PFT's) to increase their hydraulic capacity.

- A new scum pumping station to transfer scum directly to the sludge treatment process.
- Install additional chemical dosing tank to increase storage capacity.

2.2.1.2.5 Sludge Treatment

Existing sludge treatment involves 2 no. picket fence thickeners (PFTs) of 7.1m diameter, 195m^3 volume and 12m diameter, 470m^3 volume. Dewatering equipment includes a belt press installed in 1992 and a centrifuge which is not currently operational. The following is proposed:

- Construct a new 12m diameter picket fence thickener.

- Repurpose the 7.1m diameter tank for mixing primary and secondary sludge to improve sludge quality.
- Upgrade and replace the sludge dewatering equipment.

2.2.1.3 Surface Water System

Increased hardstanding areas and infrastructure will increase surface water run-off from the site during operation. However, as shown on **Error! Reference source not found.**, additional surface water created w ill be directed through to a surface water attenuation storm cell, measuring 22.4m x 13m in surface area, in the north of the site via a hydrocarbon interceptor. A flood compensation storage area measuring 28m^3 will also be provided within the site.

2.2.2 Existing Impacts on Water Quality

The existing discharge point from the WwTP includes three outfall pipes which exit the final effluent inspection chamber. These outfall pipes extend approximately 75m into the main river channel and each is fitted with 2 no. diffuser heads. The diffuser heads have 4 no. legs to disperse discharge and enhance mixing with the river flow.

During normal weather conditions the final effluent consists of treated discharge from the WwTP process (SW-1). Due to the lack stormwater storage on site, screened stormwater from the inlet works (SW-4), and an upstream unscreened emergency overflow (EO), flow directly to the final effluent chamber, where they are mixed with treated effluent before discharging to the Lower River Shannon.

2.2.2.1 WFD Waterbody Status

The EPA GIS Application (EPA Maps) and Catchments.ie were reviewed in order to establish a baseline on existing receiving water quality (accessed 21/10/2022). The outfall point for effluent discharge from Castletroy WwTP is located in the Shannon River (Lower), European Code IE_SH_25S012600. *Table 2-1* below provides a summary of WFD Waterbody Status attributes for the Lower River Shannon (Lower) (EPA Code: 25S01) and main tributaries upstream of the Castletroy WwTP site.

Results from surveys carried out between 2013 and 2018, class the reach as 'moderate' WFD water quality status. It was also assigned a WFD risk score 1a in 2008, which indicates the waterbody is at risk of not achieving 'good' status.

Biological Q values upstream of the WwTP are also an indicator of receiving water quality. Most recent Q values were recorded 2021. Results for upstream monitoring points in the Shannon , Mulkear and Blackwater rivers range from 'poor' to 'good' ecological status. It has also been noted the Shannon Estuary (Limerick Dock) begins approximately 3km downstream of the outfall point where the river changes into a transitional waterbody with 'good' water quality status.

Table 2-1 Lower River Shannon WFD Waterbody Status Attributes

WFD Waterbody Status	
River Waterbody Code	IE_SH_25S012600
Protected Area	Yes
WFD Risk (3rd cycle)	Under review
WFD Status (2016-2021)	Moderate
Sub catchment	Shannon [Lower]_SC_090

Pressures	No Significant Pressures identified
Q-Values	
9.4km u/s, Shannon (Lower), RS25S012500	Q3, Poor (2021)
4.9km u/s, Mulkear (Limerick), RS25M040590	Q4 Good (2021)
3.6km u/s, Blackwater (Clare), RS25B060250	Q3-4, Moderate(2021)

2.2.2.2 Water Quality Monitoring Data

Further analysis of baseline water quality was carried out by JB Barry & Partner Ltd and is summarised below.

Ambient Chemistry Monitoring data was obtained from catchments.ie (accessed 10/08/2022) for the following monitoring stations (*Plate 2-1*):

Upstream of Castletroy WwTP - RS25S012561 'WDLE 21 Shannon BR in UL u/s Castletroy STP'

Downstream of Castletory WwTP - 'RS25S012570 'D/S Castletroy UWWTP WDLE22'

Results for the EQS parameters BOD, Ortho-P and Ammonia were analysed.

Plate 2-1 EPA Water-monitoring stations.

2.2.2.3 EQS Compliance

A preliminary assessment of sample results was carried out to establish the baseline water quality upstream (u/s), and downstream (d/s) of the WwTP. The assessment also considers the physiochemical status of the water with regard to corresponding EQS values. High status EQS values are listed for reference in Table 2-2.

Table 2-2 High Status EQS Values

Parameter	BOD (mg/l)	Ortho-P (mg/l)	Ammonia (mg/l)
EQS (High/Mean)	1.3	0.025	0.04
EQS (High/95%ile)	2.2	0.045	0.09

Both mean and 95%ile concentrations of BOD, ammonia and ortho-phosphate were calculated for a three-year period: January 2019 to November 2021. U/s and d/s results for both categories are listed in *Table 2-3*. It can be seen that changes are insignificant between u/s and d/s concentrations for all parameters. The 95%ile results for ammonia show the greatest change, at .01 mg/l or an increase of 18% in the d/s concentration, but it is still safely within the 95%ile EQS range. The 95%ile ortho-phosphate concentration is higher u/s.

Table 2-3 Upstream and downstream monitoring results

Baseline Water Quality Monitoring Results (2019-2022)			
Baseline Upstream	**BOD (mg/l)**	**Ortho-P (mg/l)**	**Ammonia (mg/l)**
Mean Conc.	1.05	0.016	0.022
95%ile Conc.	1	0.039	0.043
Baseline Downstream			
Mean Conc.	1.06	0.018	0.023
95%ile Conc.	1	0.037	0.053

All sample results for measured concentrations are of WFD High Water Quality Status. This indicates the existing WwTP is not having any significant long-term effect on the receiving water quality and confirms the WwTP is operating safely within the allowable ELVs.

2.2.2.4 Baseline Waste Assimilative Capacity Assessment

The impact of the final effluent on the Lower River Shannon is dependent on its Waste Assimilative Capacity (WAC). WAC refers to the ability of the river to disperse wastes and pollution without exceeding EQS limits and/or causing harm to the aquatic environment. For the purpose of the baseline assessment, it has been calculated for both median and Q95 flow rates, with respective (high status) mean and 95%ile EQS limits.

U/s and d/s WAC figures have been calculated using measured monitoring data as listed in Table 2-3. The results are displayed as the percentage of total assimilative capacity remaining in the river after loads of the primary waste parameters (kg/day) have been deducted. U/s concentrations (converted to kg/day) reflect how much WAC is already taken up by background contributors to water pollution such as agriculture and urban run-off, and how much remains to accept WwTP effluent load. The rate of change in the d/s results indicates the impact on WAC from the WwTP.

Similar to the findings in measured concentrations, there are no significant differences between u/s and d/s values. The greatest deterioration in capacity appears in 95%ile ammonia results from 52 – 41%, but

there is still sufficient remaining WAC d/s. Ortho-phosphate capacity improves downstream in the 95%ile results.

Table 2-4 Waste Assimilative Capacity

Baseline Upstream	BOD	ortho-P	Ammonia
Mean & Median Flow	19%	36%	45%
95%ile & Q95 Flow	55%	13%	52%
Baseline Downstream			
Mean & Median Flow	18%	28%	42%
95%ile & Q95 Flow	54%	17%	41%

2.2.2.5 Conclusion of baseline water quality analysis

Conclusions from the baseline water quality assessment indicate that water quality in the vicinity of the discharge point is of good standard. Analysis of 2019-2021 monitoring results confirmed that average concentrations of primary waste water parameters are within High EQS limits. The WwTP is not currently having any significant impact on receiving water quality in terms of increases in d/s concentrations or deterioration in the river's waste assimilative capacity (WAC). It was also observed that the WwTP is producing a final effluent with significantly lower emissions than the allowable ELVs.

Therefore, it can be deduced that there are currently no negative impacts on water quality and aquatic habitats and species as a result of the current discharges from the WwTP.

2.2.3 Future Impacts on Water Quality

The following paragraphs detail the proposed activities associated with the operation of the upgraded wastewater treatment plant and the resulting impact on operational water quality as a result of the upgrade works.

The primary drivers for the Castletroy WwTP upgrades works are as follows:

- The primary discharge (treated outflow) is currently compliant with the EPA WWDL. However, industrial licensees are not fully utilizing their existing allowances and growth projections indicate wastewater loads will intensify.
- The existing storm water overflow (SWO) is non-compliant with the EPA discharge license, as there is no stormwater storage. Stormwater is released to the Lower River Shannon with only preliminary treatment (screening).

The works will help to accommodate the future projected population growth and to provide for stormwater storage and treatment. The current design PE capacity of the Plant is 45,000 PE. The current operations of the Plant cater to a 39,000 PE.

The following objectives will be achieved as a result of the upgrades:

- Ten-year growth period to 77,500 PE with provision to meet the 25-year growth period 81,100 PE.
- 20% headroom allowance, in line with regional planning guidelines for large urban settlements.
- Stormwater storage to reduce the annual rate of spills to the Lower River Shannon and comply with the criteria outlines in the DoEHLG "*Procedures and Criteria for Storm Water Overflows, 1995.2*

- To meet the requirements of the EPA Wastewater Discharge License and Urban Wastewater Treatment Regulations (UWWTR), and compliance with WFD objectives.

Overall, the impacts of the operational phase of the upgrade are anticipated to have a neutral effect on water quality and will achieve the following:

- The volume of treated discharge will increase;
- Quality of the final treated effluent will remain compliant with environmental standards;
- The new storm event pump station will regulate flow rates during heavy rainfall events and greatly reduce the likelihood of surcharging in the network;
- There will be less untreated stormwater pumped into the river as the storm tank will retain stormwater until such a time it can be returned to full treatment; and
- There will be less than 7 spills per bathing season

2.2.3.1 Future Impacts on Water Quality due to Discharge

An analysis of the future impacts on water quality relative to Environmental Quality Standards (EQS) and Waste Assimilative Capacity (WAC) of the River Shannon and The Water Framework Directive was carried out by JB Barry & Partners Ltd and is summarised below.

2.2.3.1.1 *EQS Compliance:*

The assessment of the changes in the final effluent discharge focuses on the environmental impact of the discharge on the local receiving waters with reference to the relevant European and Irish legislation. Calculated predictions were carried out to assess (worst case) future impacts of the final effluent on water quality in the Lower River Shannon according to high status mean EQS concentration limits.

Table 2-5 High Status EQS Concentration Limits

Parameter	BOD (mg/l)	Ortho-P (mg/l)	Ammonia (mg/l)
EQS (High/Mean)	1.3	0.025	0.04

Table 2-6 displays projected downstream concentrations calculated for each loading scenario, and on the basis of median river flow, future hydraulic loading rates (ADF) at the WwTP and relative effluent concentrations when max. ELVs are utilised. It can be seen that d/s ammonia will exceed the EQS under all cases and ortho-phosphorus is on the borderline for both the 10- and 25-year scenarios. BOD comes close to the limit in long range 25-year scenario, but still remains within the allowable EQS.

Table 2-6 Predicted D/s Concentrations using Existing ELVs

Parameter	BOD (25mg/l)	Orth-P (1mg/l)	Ammonia (5mg/l)
EQS (High/Mean)	**1.3**	**0.025**	**0.04**
45,000PE (Design PE)	1.19	0.022	0.051
77,500PE (+10 year)	1.25	0.024	0.062
81,100PE (+25 year)	1.27	0.025	0.065

Following the initial assessment, calculations for the future scenario were altered to consider the d/s effects if the ELVs were reduced, subject to a WWDL review. It has been considered that demands on the WwTP will increase, but improvements in treatment capacity have been designed to meet future requirements. There should be no reduction in WwTP performance compared to the current situation with regard to quality of the final effluent. And therefore, meeting more stringent ELVs will be achievable. Future ELVs will be subject to licence review, but for the purposed of this assessment the following limits have been applied; BOD 20mg/l, Orth-P .75mg/l and Ammonia 2mg/l. Results in *Table 2-7* indicate that by reducing the ELVs d/s water quality will remain within high status mean EQS values.

Table 2-7 Predicted D/s Concentrations using Proposed ELVs

Parameter	BOD (20 mg/l)	Orth-P (.75mg/l)	Ammonia (2mg/l)
EQS (High/Mean)	**1.3**	**0.025**	**0.04**
45,000PE (Design PE)	1.16	0.020	0.033
77,500PE (+10 year)	1.21	0.022	0.038
81,100PE (+25 year)	1.22	0.023	0.039

2.2.3.1.2 WAC Assessment:

A similar assessment was carried out for future effects on d/s WAC in the Lower River Shannon. Projections listed in *Table 2-8* were calculated using high quality EQS standards, maximum emissions from the WwTP at ADF and median river flow in the river. In line with the concentration results in the previous section, ammonia WAC is exceeded at current full design capacity and becomes increasingly deficient in the future loading scenarios.

Table 2-8 Predicted WAC using Existing ELVs

Loading Scenario	BOD	Ortho-P	Ammonia
45,000PE (Design PE)	8%	13%	-27%
77,500PE (+10 year)	4%	3%	-57%
81,100PE (+25 year)	2%	1%	-65%

Again, calculations for the future scenario were altered to consider the d/s effects if the ELVs were reduced, subject to a WWDL review. Using the same method of calculation as above with the reduced emission limits, it can be seen that there will be sufficient WAC in the Lower River Shannon for all parameters and future loading scenarios, *Table 2-9*.

Table 2-9 WAC calculation using proposed ELVs

Loading Scenario	BOD	Ortho-P	Ammonia
45,000PE (Design PE)	10%	19%	16%
77,500PE (+10 year)	7%	20%	14%
81,100PE (+25 year)	6%	18%	12%

In summary, there will be a % reduction in WAC as the WwTP discharge rate increases, but it is not expected to breech high status environmental constraints if more stringent ELVs are put in place (subject to an WWDL review). There will also be significant improvements in the rate of stormwater overflows due to the addition of stormwater storage.

2.2.3.1.3 Stormwater Spills

A drainage area plan (DAP) has been developed by RPS Group for the Castletroy agglomeration. A survey of the entire sewer drainage network was carried out, from which a hydraulic model was built that could assess the condition and performance of the sewers and SWOs in the catchment.

The model was used to quantify the annual frequency and volume of spills currently being discharged to the Lower River Shannon from SWO4. Flow to full treatment (FFT) for the current design capacity 45,000PE at 17,280m^3/day (or 200 l/s) was input to the model. Spill volumes equal-to or over 1m^3 in excess of FFT were recorded as spills.

Table 2-10 lists results in terms of average annual spills, average spills per bathing season and relative spill volumes from 2018 - 2028.

Table 2-10 Baseline Model Output (Spill≥1m3)

Year	Overflow ID	Avg. Annual Spills	Avg. Bathing Season Spills	Avg. Annual Spill Vol. (m^3)	Avg. Bathing Season Spill Vol. (m^3)
2018-2028	Castletroy WwTP Final Outfall	123	33	48,312	16,767

A new 4,500m3 stormwater storage tank will be constructed on-site that will reduce storm spills to the Lower River Shannon. It has been designed to cater for 25-year growth projections, and in accordance with Irish Water Document No. UÉ-TEC-700-99-02 "Inlet works & stormwater treatment (wastewater)".

The new stormwater tank will significantly reduce spills and will help to meet Recreational Water Standards. As shown above, modelling of existing spills from the outfall at the WwTP, under current conditions, estimated the average annual spill volume to be 48,312m^3. As already detailed above, the discharge from the WwTP is currently within EQS's and in line with the WFD. The proposed new stormwater tank will result in significant reductions in yearly stormwater spills and therefore an improvement in treatment of effluent.

Flows in excess of three times the Dry Weather Flow baseline (3DWF) and emergency overflows will be redirected to the new stormwater storage tank. The wastewater will be screened and held until such a time that incoming flows to the WwTP subside, then it will be returned to the main process stream for full treatment. In the event that the storm intensity causes the tank to reach capacity, the (screened) spills will be directed to the final effluent chamber, as per the current situation.

RPS ran a Drainage Area Plan (DAP) model using baseline flow survey data with stormwater storage introduced. Model outputs for the current baseline versus future spill frequency, following the Proposed Development works, can be seen in Table 2-11. It is predicted that there will be an average of less than 7 spills per annum.

Table 2-11 DAP Model Outputs - Current Vs. Future Scenario (Spill≥1m3)

Year	Model Output	Avg. Annual Spills	Avg. Bathing Season Spills	Avg. Annual Spill Vol. (total m^3)	Avg. Bathing Season Spill Vol. (total m^3)
2018 - 2028	Current Baseline	123	33	48,312	16,767
	Future Scenario	7	3	4,839	290

The baseline water quality data and future calculations of effluent and assimilative capacity of the River Shannon have shown that the effluent is currently being discharged to the aquatic environment in line with EPA and WFD objectives and as a result of the proposed upgrade works, will continue to do so. It can therefore be deduced that there will be no deterioration in water quality as a result of operation of the development. Based on the points stated in the sections above, there will be a % reduction in WAC as the WwTP discharge rate increases, but it is not expected to breech high status environmental constraints if more stringent ELVs are put in place (subject to an WWDL review). There will also be significant improvements in the rate of stormwater overflows due to the addition of stormwater storage.

2.2.4 Flood Risk Assessment

A review of the potential for the site to flood was undertaken due to the potential for deterioration of river water quality as a result of flooding during construction, which would have potential to impact aquatic habitats and species.

A Flood Risk Assessment was carried out by JB Barry & Partners Consultant Engineers. CFRAM mapping has revealed that a portion of the site to the centre and south are within Flood Zone C. A portion of the site around the perimeter of the WwTP is within Flood Zones A and B (Plate 2-2). The CFRAM map indicates that the 1% AEP fluvial flood level (Flood Zone A) is +6.37mOD and the 0.1% AEP fluvial flood level is +6.93mOD.

From a site visit it was noted that recent flood events recorded levels up to the door entrance of the main control building and it was reported that flooding occurred through a channel/ditch which runs along the Western boundary of the site. Water ingress also occurred through the site entrance. Recent flooding was not reported to have occurred in the green area which will be the primary proposed area for new infrastructure.

The Flood Risk Assessment Report is shown in Appendix 2.

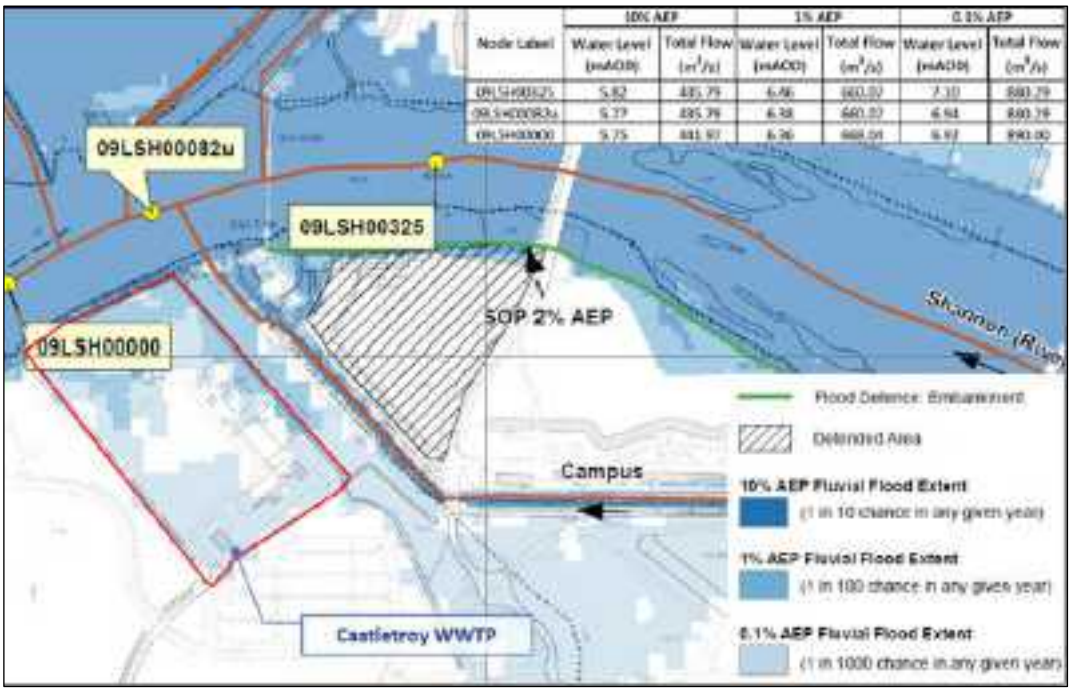


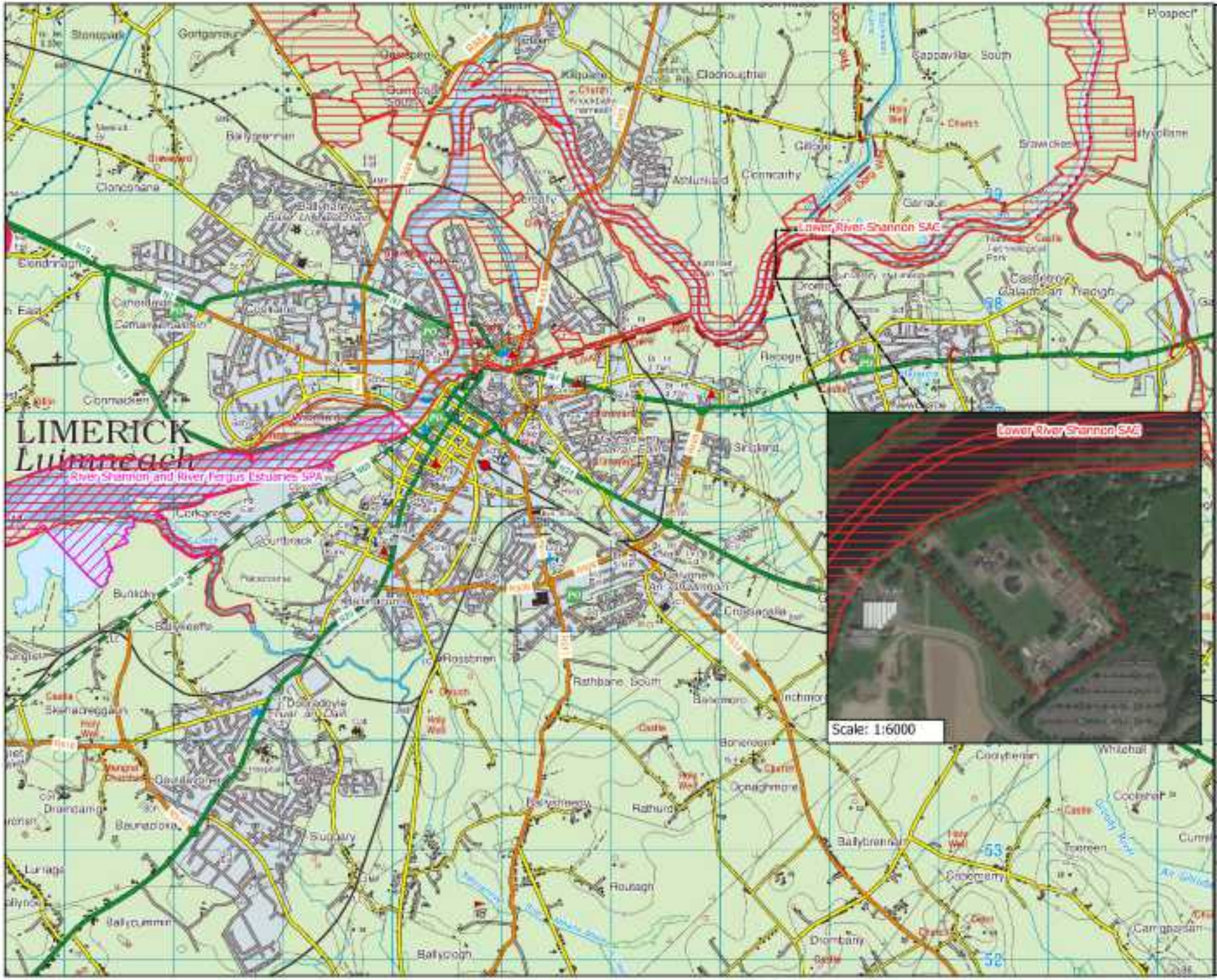
Plate 2-2 CFRAM Flood Mapping. Source: Flood Risk Assessment Report.

2.2.5 Groundwater Monitoring

A review of site investigation results of the study site was undertaken due to the potential for groundwater contamination during construction resulting in impacts on aquatic habitats and species.

The anticipated excavation level for the installation of the proposed storm tank structure and forward feed pump station are in the order of 2m OD or approximately 5m below existing ground surface. Three exploratory boreholes were conducted as part of investigations and revealed water-table levels to be between 4.3m bgl to 6.8m bgl (2.75m OD to 0.2m OD). After 20 minutes, levels rose to between 3.7m bgl to 6m bgl. The soil type is granular glacial till and soft silt and clay.

Works are likely to be carried out within the water table.



Map Legend

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

Site Location

Project title: Castletroy Wastewater Treatment Plant	
Drawn by: AwdGM	Checked by: RW
Project No.: 210711	Drawing No.: Fig 2-1
Scale: 1:45000	Date: 23.03.22

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2.2.6 Description of the Baseline Ecological Environment

2.2.6.1 Baseline Water Quality

The EPA web mapper and Catchments.ie were reviewed in order to provide a baseline for the current conditions of the site and adjacent watercourse (accessed 23/03/2022). Table 2-12 below provides the baseline water quality of the River Shannon (Lower) (EPA Code: 25S01) within which the outfall from the WwTP is located.

Please note that further information with regard to baseline water quality is provided in Section 2.2.2 above.

Table 2-12 Baseline water quality in the vicinity of the site (https://www.catchments.ie/ and https://gis.epa.ie/EPAMaps/ accessed 23/03/2022).

Water body: River Shannon (Lower)	
River Waterbody Code	IE_SH_25S012600
Protected Area	Yes
WFD Risk	Review
Ecological Status/ Potential (2013-2018)	Unassigned
Subcatchment:	Shannon[Lower]_SC_090
Pressures	No Significant Pressures identified
Q-Value	
3.1km downstream (Athlunkard Br d/s LHS)	Q3-4, Moderate (2002)
9.4km upstream (Castleconnell: World's End)	Q3, Poor (2021)

2.2.6.2 Ecological Walkover Survey

Assessing the impacts of any project and associated activities requires an understanding of the ecological baseline conditions prior to and at the time of the project proceeding. Ecological Baseline conditions are those existing in the absence of proposed activities (CIEEM 2018, updated 2021).

Multidisciplinary walkover surveys were conducted on the 6th of April 2022 by Rachel Walsh (BSc) and 23rd of July 2020 in line with NRA (2009) guidelines (Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes) by Claire Stephens (BSc) of MKO. The ecological surveys were undertaken within the optimal time of year to undertake a habitat and flora survey (Smith *et al.* 2011). The proposed works are restricted to the existing water treatment plant site. All habitats within and adjacent to the works area were readily identifiable during the site visits. A dedicated invasive species survey was also undertaken during the site visits. During the surveys, the site was searched for species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations (S.I. 477 of 2011).

The existing WwTP infrastructure is classified as buildings and artificial surfaces (BL3). Associated hard standing areas are classified as (BL3), spoil and bare ground (ED2) and recolonising bare ground (ED3) (Plate 2-3). The WwTP site boundary is demarcated by palisade and post and wire fencing inside, outside of which is broadleaved woodland (WD1) consisting of ash *(Fraxinus excelsior),* sycamore (*Acer pseudoplatanus*), willow *(Salix* spp.), alder (*Alnus glutinosa)*, sycamore (*Acer pseudoplatanus)* and cypress (*Cupressus* sp.). Other species recorded along the perimeter include elder *(Sambucus nigra),* horse-chestnut (*Aesculus hippocastanum)* and hazel (*Corylus avellana).* Species recorded in the understory include hedge bindweed *(Calystegia sepium),* laurel (*Prunus spp.),* giant hogweed *(Heracleum mantegazzianum),* wild Angelica *(Angelica sylvestris*) cleavers *(Galium aparine),* hart's-tongue fern *(Asplenium scolopendrium),* pendulous sedge (*Carex pendula),* ivy *(Hedera hibernica),* Himalayan balsam *(Impatiens glandulifera)*, bramble (*Rubus fruticosus* agg.) and *Hydrangea.*

A perimeter of scrub (WS1) is found along the north-eastern boundary consisting of hazel and willows. A treeline (WL2) along the northern boundary separates the site from a drain (FW4) and a public river walkway.

Areas of grassland within the WwTP boundary are classified as amenity grassland (GA2) with scattered trees and parkland (WD5) in places, there being individual ornamental trees planted within the grounds (Plate 2-4). Species present within the grassland and recolonising ground habitats include cock's foot (*Dactylis glomerata*), Yorkshire fog (*Holcus lanatus*), broad-leaved dock (*Rumex obtusifolius*), ribwort plantain (*Plantago lanceolata)*, creeping buttercup (*Ranunculus repens),* common daisy (*Bellis perennis*), dandelion (*Taraxacum officinale agg.*), red clover (*Trifolium pratense*), bush vetch (*Vicia sepium*), white clover (*Trifolium repens),* great willowherb *(Epilobium hirsutum)* and self-heal (*Prunella vulgaris*). Tree species located on grassland include Scots pine (*Pinus sylvestris),* sycamore (*Acer pseudoplatanus),* silver birch (*Betula pendula),* and rowan (*Sorbus aucuparia).*

An unmanaged area of grassland to the north and north-east of the site was categorised as *dry meadows and grassy verges (GS2)* with some *wet grassland (GS4)* influences including rushes *(Juncus spp.).*

A drainage ditch (FW4) surrounds the entire site, within the boundary fencing to the southern and western boundary and directly adjacent to the north and eastern boundary (Plate 2-5). The drains were dry on the day of the site visit. No other watercourses occur within the site boundary. The River Shannon, a lowland/depositing river (FW2), part of Lower River Shannon SAC, flows approximately 20m to the north of the site. Treated effluent from the wastewater treatment plant is discharged to the River Shannon via the existing outfall approximately 70m north-west of the wastewater treatment site boundary.

The wider area consists of woodland, public river walkway and a mill race channel to the east.

None of the habitats within or adjacent to the works areas correspond to those listed in Annex I of the EU Habitats Directive. No Annex II or Annex V species were recorded on site. No works will take place within any of the adjacent habitats as works will be confined to the existing wastewater treatment plant. No works are proposed at the outfall.

The non-native invasive species, giant hogweed *(Heracleum mantegazzianum)* was recorded in a large proportion of the site boundary. The species within the grassland had been sprayed in March 2020, but re-growth was obvious in a number of areas. This species is listed on the 'Third Schedule' of Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011).

A number of stands of the non-native invasive species, Himalayan Balsam *(Impatiens glandulifera)* were recorded within the site boundary to the north, north-west and north-east and in the wider area along the banks of the River Shannon. This species is listed on the 'Third Schedule' of Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011).

No other invasive species listed under Regulations 49 and 50 of the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011) were recorded during the field survey

Plate 2-3 WwTP infrastructure classified as buildings and artificial surfaces (BL3) and associated hard stand areas of (BL3)/spoil and bare ground (ED2)/recolonising bare ground (ED3). Grassland classified as amenity grassland (GA2).

Plate 2-4 Scattered trees and parkland (WD5) in the centre of the site.

Plate 2-5 Drainage ditch (FW4), dry at the time of the surveys, outside of the eastern boundary.

Plate 2-6 Public river walkway separating the WwTP from the River Shannon and associated woodland.

2.2.7 Fauna in the Existing Environment

No QIs of Lower River Shannon SAC or SCIs of the River Shannon and River Fergus Estuaries SPA were recorded within the WwTP site during walkover surveys.

The proposed works are located within the existing wastewater treatment plant infrastructure which has low potential to support fauna. The Lower River Shannon is known to support the following aquatic species associated with the SAC:

- *Petromyzon marinus* (Sea Lamprey) [1095]
- *Lampetra planeri* (Brook Lamprey) [1096]
- *Lampetra fluviatilis* (River Lamprey) [1099]
- *Salmo salar* (Salmon) [1106]
- *Lutra lutra* (Otter) [1355]
- *Tursiops truncatus* (Bottlenose Dolphin) [1349]

During the multidisciplinary walkover survey on the 6th of April 2022, a dedicated survey for otter was carried out along the banks of the River Shannon and woodland surrounding the WwTP. The survey was undertaken following NRA (2006) Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes'. This survey covered an area of riverbank, 150m upstream and 150 downstream of the outfall of the existing wastewater treatment plant. The survey area is shown in Figure 3-3 of the accompanying NIS. No signs of otter were recorded during this survey, though Lower River Shannon and its banks do provide suitable habitat for the species. There is no suitable habitat for otter within the site of the proposed works. The drain ditches surrounding the WwTP were also surveyed for signs of otter. These were predominantly dry and were deemed to be suboptimal for use by otter.

2.3 Significance of Habitats and Species

Ecological evaluation follows a methodology that is set out in Chapter 3 of the 'Guidelines for Assessment of Ecological Impacts of National Roads Schemes' (NRA, 2009). The habitats within and adjacent to the development site were evaluated in accordance with the criteria developed by the NRA (2009b), which classifies sites in terms of their ecological importance, *i.e.* '*international importance*', '*national importance*', '*county importance*', '*local importance (higher value)*' or '*local importance (lower value)*'.

Habitats within the development site did not correspond to any Annex I habitats listed on the EU Habitats Directive.

The habitats occurring within the site are comprised predominantly of buildings and artificial surfaces, bare ground and recolonising bare ground which are not of ecological significance.

Improved and rank grassland habitats, and scrub have been categorised as *Local Importance (Lower value)* given that they are unlikely to provide significant habitat for QI/SCI flora and fauna but are of some local importance for local wildlife.

The treelines, woodland, scattered trees and the drainage ditches habitats were categorised as Local Importance *(higher valu*e) as they provide some cover for small mammals, commuting and foraging corridors for a bats and birds to the wider environment, as well as being of local biodiversity importance in the built-up area.

The Lower River Shannon, lowland/depositing river (FW2), part of Lower River Shannon SAC, is of *International Importance.*

2.3.1.1 Significance of Fauna

No QI's or SCI's associated any European sites were recorded within or adjacent of the proposed development site boundary.

The development site is not designated or under the protection of any European Sites and does not provide significant habitat for QI/SCI species populations associated with any European Site. The WwTP consists of predominantly improved amenity grassland and built infrastructure associated with the existing plant and access roads thus is considered to be of low ecological value for faunal species.

Although no suitable habitat for any QIs or SCIs exists within the site boundary itself, the Lower River Shannon SAC, to which the wastewater treatment plant outfalls, hosts habitat for a number of QIs including otter, river lamprey, brook lamprey, sea lamprey, bottlenose dolphin, and Atlantic salmon which are of *International Importance.*

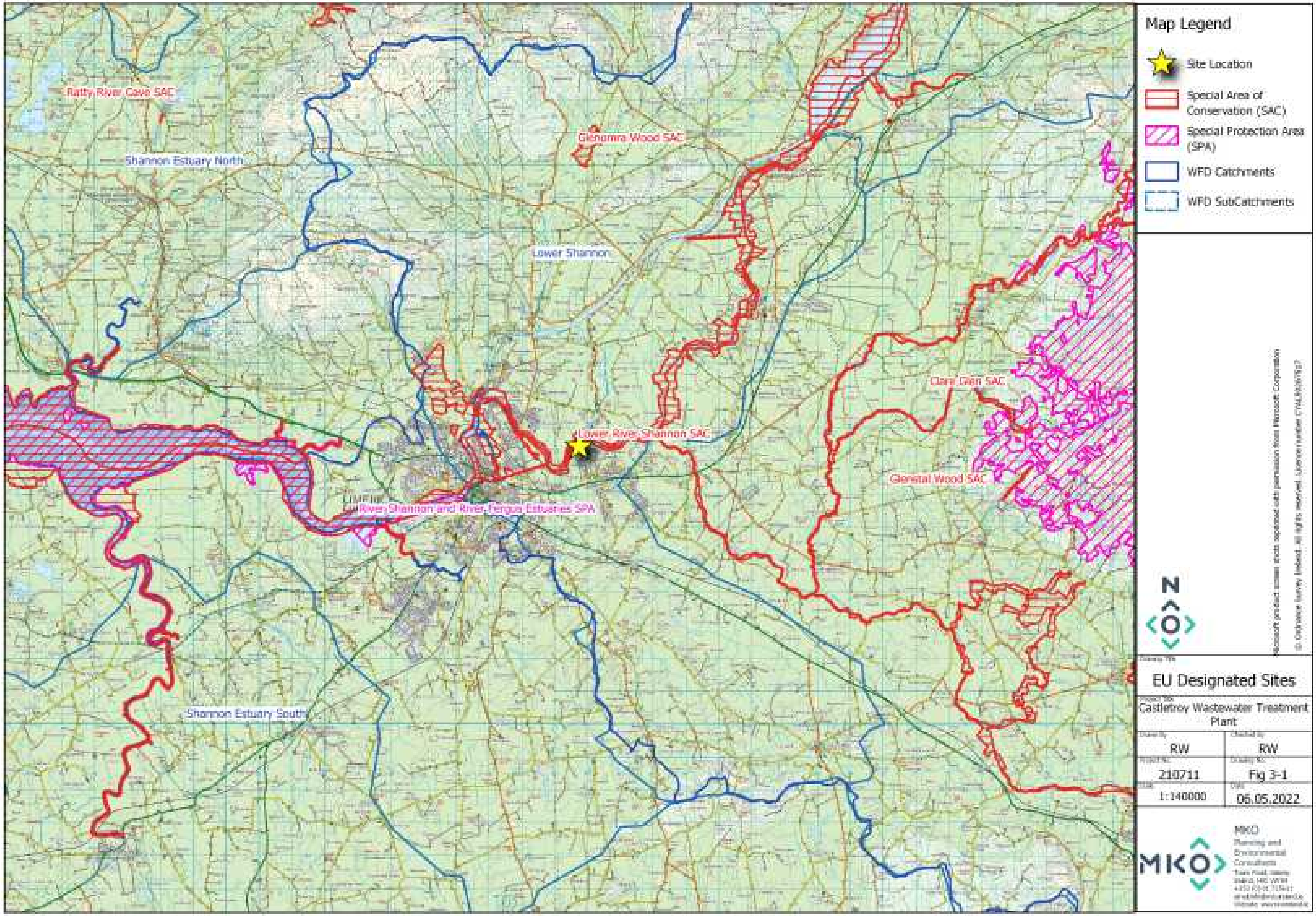
3. IDENTIFICATION OF RELEVANT EUROPEAN SITES

3.1 Identification of the European Sites within the Likely Zone of Impact

The following methodology was used to establish which European Sites are within the Likely Zone of Impact of the proposed development:

- Initially the most up to date GIS spatial datasets for European designated sites and water catchments were downloaded from the NPWS website (www.npws.ie) and the EPA website (www.epa.ie) on the 30/01/2023. The datasets were utilized to identify European Sites which could feasibly be affected by the proposed development.
- All European Sites that could potentially be affected were identified using a source-pathway - receptor model and are shown in Figure 3-1. Information on these sites according to the site-specific conservation objectives is provided in Table 3-1[2].
- The catchment mapping was used to establish or discount potential hydrological connectivity between the site of the proposed development and any European Sites. The hydrological catchments are also shown in Figure 3.1.
- In relation to Special Protection Areas, in the absence of any specific European or Irish guidance in relation to such sites, the Scottish Natural Heritage (SNH) Guidance, '*Assessing Connectivity with Special Protection Areas* (SPA)' (2016) was consulted. This document provides guidance in relation to the identification of connectivity between proposed development and Special Protection Areas. The guidance takes into consideration the distances species may travel beyond the boundary of their SPAs and provides information on dispersal and foraging ranges of bird species which are frequently encountered when considering plans and projects.
- Table 3.1, provides details of all relevant European Sites as identified in the preceding steps and assesses which are within the likely Zone of Impact. The assessment considers any likely direct or indirect impacts of the proposed development, both alone and in combination with other plans and projects, on European Sites by virtue of the following criteria: size and scale, land-take, distance from the European Site or key features of the site, resource requirements, emissions, excavation requirements, transportation requirements and duration of construction, operation and decommissioning were considered in this screening assessment.
- The site synopses and conservation objectives of these sites, as per the NPWS website (www.npws.ie), were consulted and reviewed at the time of preparing this report 30/01/2023.
- Where potential pathways for Significant Effect are identified, the site is included within the Likely Zone of Impact and further assessment is required.

[2] *Office of the Planning Regulator (2021) guidance; 'OPR Practice Note PN01 Appropriate Assessment Screening for Development Management', utilises the Source-Pathway-Receptor model. This Appropriate Assessment Screening Report follows this guidance as well as providing information on European sites located within 15km of the proposed development as recommended in guidance provided by DEHLG (2010).*



Map Legend
Site Location
Special Area of Conservation (SAC)
Special Protection Area (SPA)
WFD Catchments
WFD SubCatchments
Ratty River Cave SAC
Glenomra Wood SAC
Shannon Estuary North
Lower Shannon
Clare Glen SAC
Lower River Shannon SAC
Glenstal Wood SAC
River Shannon and River Fergus Estuaries SPA
Shannon Estuary South
N
EU Designated Sites
Castletroy Wastewater Treatment Plant
RW
RW
210711
Fig 3-1
1:140000
06.05.2022
MKO
Planning and Environmental Consultants

Table 3-1 Identification of Designated sites within the Likely Zone of Impact

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 30/01/2023	Conservation Objectives	Likely Zone of Impact Determination
Special Areas of Conservation (SAC)			
Lower River Shannon SAC [002165] **Distance:** 8m	› [1029] Freshwater Pearl Mussel *Margaritifera margaritifera* › [1095] Sea Lamprey *Petromyzon marinus* › [1096] Brook Lamprey *Lampetra planeri* › [1099] River Lamprey *Lampetra fluviatilis* › [1106] Atlantic Salmon *Salmo salar* (only in fresh water) › [1110] Sandbanks which are slightly covered by sea water all the time › [1130] Estuaries › [1140] Mudflats and sandflats not covered by seawater at low tide › [1150] *Coastal lagoons › [1160] Large shallow inlets and bays › [1170] Reefs › [1220] Perennial vegetation of stony banks › [1230] Vegetated sea cliffs of the Atlantic and Baltic coasts › [1310] *Salicornia* and other annuals colonizing mud and sand › [1330] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae)* › [1349] Bottlenose Dolphin *Tursiops truncatus* › [1355] Otter *Lutra lutra* › [1410] Mediterranean salt meadows (*Juncetalia maritimi*)	Detailed conservation objectives for this site, dated August 2012, were reviewed as part of the assessment and are available at www.npws.ie	This European Site is located approximately 8m from the development site and outside of the site boundary. Furthermore, the Site is separated from the WwTP by a palisade fence, drainage ditch and public walkway. Therefore, there is no potential for direct effects. As described in Section 2.2.2, the current effluent from the WwTP is not currently having an observably negative impact on water quality. As described in Section 2.2.3, the proposed upgrades will accommodate future loadings to the Plant and ensure that the effluent is treated efficiently. The resulting effluent will remain within Environmental Quality Standards (EQS's) for surface water. There will be improved stormwater storage and treatment at the plant as a result of the upgrades. Therefore, there is no potential for significant negative effects on aquatic habitats and species as a result of operation of the development. A potential pathway for likely significant indirect effect was identified in the form of deterioration in water quality via discharge to surface water drains, groundwater pathways, and flood risk during construction of the development.

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 30/01/2023	Conservation Objectives	Likely Zone of Impact Determination
	› [3260] Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation › [6410] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) › [91E0] *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae)*		Following the precautionary principle, an additional pathway for indirect effect was identified via disturbance of otter as a result of construction activities. **The Site is within the Likely Zone of Impact and a Stage 2 Appropriate Assessment is required in respect of this Site.**
Glenomra Wood SAC [001013] **Distance:** 8.3km	› [91A0] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	Detailed conservation objectives for this site, dated June 2018, were reviewed as part of the assessment and are available at www.npws.ie.	There will be no direct effects as the proposed development is located entirely outside the designated site. This European Site is located 8.3km to the north of the development site. Due to the terrestrial nature of the QI habitat and the distance between the development site and the SAC, there is no potential for indirect effects on this site. **No pathway for effect was identified and the site is not within the Likely Zone of Impact. It can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is not required.**

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 30/01/2023	Conservation Objectives	Likely Zone of Impact Determination
Clare Glen SAC [000930] **Distance:** 12km	› [1421] Killarney Fern *Trichomanes speciosum* › [91A0] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	Detailed conservation objectives for this site, dated May 2018, were reviewed as part of the assessment and are available at www.npws.ie.	There will be no direct effects as the proposed development is located entirely outside the designated site. This European Site is located 12km to the east of the development site. Due to the terrestrial nature of the QIs and the distance between the development site and the SAC, there is no potential for indirect effects on this site. **No pathway for effect was identified and the site is not within the Likely Zone of Impact. It can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is not required.**
Glenstal Wood SAC [001432] **Distance:** 12.8km	› [1421] Killarney Fern *Trichomanes speciosum*	Detailed conservation objectives for this site, dated May 2018, were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct effects as the proposed development is located entirely outside the designated site. This European Site is located 12km to the east of the development site. Due to the terrestrial nature of the QI and the distance between the development site and the SAC, there is no potential for indirect effects on this site.

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 30/01/2023	Conservation Objectives	Likely Zone of Impact Determination
			No pathway for effect was identified and the site is not within the Likely Zone of Impact. It can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is not required.
Slieve Bernagh Bog SAC [002312] **Distance:** 14.5km	› [4010] Northern Atlantic wet heaths with *Erica tetralix* › [4030] European dry heaths › [7130] Blanket bogs (* if active bog)	Detailed conservation objectives for this site, dated August 2016, were reviewed as part of the assessment and are available at www.npws.ie.	There will be no direct effects as the proposed development is located entirely outside the designated site. This European Site is located 14.5km to the north of the development site. Due to the terrestrial nature of the QIs and the distance between the SAC and the development site, there is no pathway for significant indirect effect. **No pathway for effect was identified and the site is not within the Likely Zone of Impact. It can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is not required.**

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 30/01/2023	Conservation Objectives	Likely Zone of Impact Determination
Danes Hole, Poulnalecka SAC [000030] **Distance:** 14.7km	› [1303] Lesser Horseshoe Bat *Rhinolophus hipposideros* › [8310] Caves not open to the public › [91A0] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	Detailed conservation objectives for this site, dated July 2018, were reviewed as part of the assessment and are available at www.npws.ie.	There will be no direct effects as the proposed development is located entirely outside the designated site. This European Site is located 14.7km northwest of the proposed development site. Due to the terrestrial nature of the QIs and a lack of connectivity, there is no potential for indirect effects on this site. The Danes Hole, Poulnalecka has been selected as a SAC for Lesser Horseshoe Bat because of the presence of both summer and winter roosts. The proposed development site being approximately 14.7km from the SAC is outside of the 2.5km core foraging range (NPWS, 2018) for this species as mapped in Map 3 of the detailed Conservation Objectives document. Therefore, there will be no indirect effect as a result of disturbance, displacement or loss of foraging habitat. **No pathway for effect was identified and the site is not within the Likely Zone of Impact. It can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is not required.**

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 30/01/2023	Conservation Objectives	Likely Zone of Impact Determination
Special Protection Area (SPA)			
River Shannon and River Fergus Estuaries SPA [004077] **Distance:** 3.8km (8.2km hydrological distance)	› [A017] Cormorant *Phalacrocorax carbo* › [A038] Whooper Swan *Cygnus cygnus* › [A046] Light-bellied Brent Goose *Branta bernicla hrota* › [A048] Shelduck *Tadorna tadorna* › [A050] Wigeon *Anas penelope* › [A052] Teal *Anas crecca* › [A054] Pintail *Anas acuta* › [A056] Shoveler *Anas clypeata* › [A062] Scaup *Aythya marila* › [A137] Ringed Plover *Charadrius hiaticula* › [A140] Golden Plover *Pluvialis apricaria* › [A141] Grey Plover *Pluvialis squatarola* › [A142] Lapwing *Vanellus vanellus* › [A143] Knot *Calidris canutus* › [A149] Dunlin *Calidris alpina* › [A156] Black-tailed Godwit *Limosa limosa* › [A157] Bar-tailed Godwit *Limosa lapponica* › [A160] Curlew *Numenius arquata* › [A162] Redshank *Tringa totanus* › [A164] Greenshank *Tringa nebularia* › [A179] Black-headed Gull *Chroicocephalus ridibundus* › [A999] Wetlands and waterbirds	Detailed conservation objectives for this site, dated September 2012, were reviewed as part of the assessment and are available at www.npws.ie	There will be no direct effects as the proposed development is located entirely outside the designated site. As described in Section 2.2.2, the current effluent from the WwTP is not currently having an observably negative impact on water quality. As described in Section 2.2.3, the proposed upgrades will accommodate future loadings to the Plant and ensure that the effluent is treated efficiently. The resulting effluent will remain within Environmental Quality Standards (EQS's) for surface water. There will be improved stormwater storage and treatment at the plant as a result of the upgrades. Therefore, there is no potential for significant negative effects on SCIs as a result of operation of the development. The SPA is located 8.2km downstream of the WwTP. A potential pathway for likely significant indirect effect was identified in the form of deterioration in water quality via discharge to surface water drains, groundwater pathways, and flood risk during construction of the development.

European Sites and distance from proposed development	Qualify Interests/Special Conservation Interests for which the European site has been designated (Sourced from NPWS online Conservation Objectives, www.npws.ie on the 30/01/2023	Conservation Objectives	Likely Zone of Impact Determination
			The Site is within the Likely Zone of Impact and a Stage 2 Appropriate Assessment is required in respect of this Site.
Slievefelim to Silvermines Mountains SPA [004165] **Distance**: 11.8km	› [A082] Hen Harrier *Circus cyaneus*	This site has the generic conservation objective: "*To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA"* NPWS (2022) Conservation objectives for Slievefelim to Silvermines Mountains SPA [004165]. Generic Version 9.0. Department of Housing, Local Government and Heritage. available at www.npws.ie. As no detailed Conservation objectives are available for Slievefelim to Silvermines Mountains SPA, the targets and attributes for the relevant species in other European sites were reviewed as a proxy. Links to these conservation objectives are provided below: Wexford Harbour and Slobs SPA: SCI Hen Harrier (*Circus cyaneus*) [A082] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004076.pdf	There will be no direct effects as the proposed development is located entirely outside the designated site. This European Site is located 11.8km to the east of the development site. The proposed upgrade works are located outside of the core foraging range of Hen Harrier (2km core range) (SHN 2016). The site does not support any suitable habitat for hen harrier. Given the absence of habitat and distance from the SPA, no potential for indirect effects as a result of disturbance exist. **No pathway for effect was identified and the site is not within the Likely Zone of Impact. It can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on this European site. Accordingly, a Stage Two Appropriate Assessment is not required.**

3.2 European Sites with the Potential to be Significantly Affected by the Proposed Development

Lower River Shannon SAC [002165] and River Shannon and River Fergus Estuaries SPA [004077] are the only European Sites which were identified as occurring within the likely zone of impact of the proposed development.

3.3 Likely Cumulative Impact of the Proposed Works on European Sites, in-combination with other plans and projects

A search and review in relation to plans and projects that may have the potential to result in cumulative and/or in-combination impacts on European Sites was conducted. This assessment focuses on the potential for cumulative in-combination effects on the European Sites where potential for significant effects was identified in Table 3-1. This included a review of online Planning Registers, development plans and other available information and served to identify past and future plans and projects, their activities and their predicted environmental effects.

The following Plans were reviewed and are provided in Table 3-2:

- Limerick City Development Plan 2022-2028
- Limerick City Council Biodiversity Action Plan
- National Biodiversity Action Plan 2017-2021
- Regional Spatial and Economic Strategy for the Southern Region

Table 3-2 Review of Plans.

Plans	Key Policies/Issues/Objectives Directly Related To European Sites, Biodiversity and Sustainable Development In The Zone of Influence	Assessment of development compliance with policy
Limerick City Development Plan 2022-2028	**Policy EH P1** Protection of Natural Heritage and Biodiversity. It is a policy of the Council to: a) Protect and conserve Limerick's natural heritage and biodiversity, in particular, areas designated as part of the European Sites Natura 2000 network, such as Special Protection Areas (SPAs) and Special Areas of Conservations (SACs), in accordance with relevant EU Directives and national legislation and guidelines. b) Maintain the conservation value of all Natural Heritage Areas and proposed Natural Heritage Areas (pNHAs) for the benefit of existing and future generations.	The proposed development has been designed so that there will be no adverse effect on any European Site including Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA. The Site-Specific Conservation Objectives for the relevant QIs and SCIs of these sites have been reviewed in light of the proposed development. Appropriate mitigation measures have been included in order to ensure the integrity of the Natura 2000 Network.
	Objective EH O1 Designated Sites and Habitats Directive. It is an objective of the Council to ensure that projects/plans likely to have significant effects on European Sites (either individually or in combination with other plans or projects) are subject to an appropriate assessment and will not be permitted under the Plan unless they comply with Article 6 of the Habitats Directive. The Council, will through the planning enforcement process where applicable, seek to restore the ecological functions of designated sites, where they have been damaged through inappropriate development.	The precautionary principle has been applied in the design of the proposed development with precautionary mitigation included to avoid adverse effect on European Sites through water quality deterioration, disturbance and biosecurity during construction and operation.
Limerick City Council Biodiversity Action Plan	To maintain, protect and enhance the biodiversity of Limerick City for future generations and to educate and promote the importance of Limerick City's biodiversity for all.	The design and mitigations included as part of the proposed development are such that there will be no adverse effect on any European Site and the Protected Areas Network.
National Biodiversity Action Plan 2017-2021	Target 6.2 - Sufficiency, coherence, connectivity, and resilience of the protected areas network substantially enhanced by 2020.	

Plans	Key Policies/Issues/Objectives Directly Related To European Sites, Biodiversity and Sustainable Development In The Zone of Influence	Assessment of development compliance with policy
Regional Spatial and Economic Strategy for the Southern Region	**RPO 1** **b.** The RSES seeks to protect, manage, and through enhanced ecological connectivity, improve the coherence of the Natura 2000 Network in the Southern Region. c. RSES support for other plans/ programmes (and initiatives arising) is on the basis of appropriate SEA, SFRA, EIA and AA processes being undertaken in order to ensure the avoidance of adverse effects on European Sites and ensure implementation of mitigation measures where required.	The site-specific conservation objectives for Lower River Shannon SAC, River Shannon and River Fergus Estuaries SPA were comprehensively reviewed in undertaking this assessment. The surveys undertaken in the preparation of this application, the design of the development and the proposed mitigations in place, demonstrate that the proposed project will not adversely affect the Qualifying Interests/Special Conservation Interests associated with any European Site, during construction or operation of development. The proposed upgrades will help Irish Water to meet the aims of the Strategy with regard to improvement in wastewater infrastructure and avoiding adverse impacts on the integrity of the Natura 2000 network.
	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 11 **k.** To plan increasing population growth in all Key Towns on a phased basis in collaboration with Irish Water, the local authority and other stakeholders to ensure that the assimilative capacity of the receiving environment is not exceeded and that increased wastewater discharges from population growth does not contribute to degradation of water quality and avoids adverse impacts on the integrity of water dependent h habitats and species within the Natura 2000 network.	

Plans	Key Policies/Issues/Objectives Directly Related To European Sites, Biodiversity and Sustainable Development In The Zone of Influence	Assessment of development compliance with policy
	RPO124 **Green Infrastructure a**. It is an objective to promote the concept of connecting corridors for the movement of wildlife and encourage the retention and creation of features of biodiversity value, ecological corridors and networks that connect areas of high conservation value such as woodlands, hedgerows, earth banks, watercourses and wetlands. The RSES recognises the necessity of protecting such corridors and the necessity to encourage the management of features of the landscape.	
	RPO 208 **Irish Water and Water Supply** It is an objective to: a. Support the implementation of Irish Water Investment Plans (prepared in five-year cycles) and subsequent investment plans and seek such plans to align the supply of water services with the settlement strategy and objectives of the RSES and Metropolitan Area Strategic Plans for Cork, Limerick, Shannon and Waterford; b. Support the role of Irish Water Investment Plans in taking into account seasonal pressures on critical service infrastructure, climate change implications and leakage reduction in the design of all relevant projects; c. Deliver and phase services, subject to the required appraisal, planning and environmental assessment processes and avoid adverse impacts on the integrity of the Natura 2000 network; d. Local Authority Core Strategies shall demonstrate compliance with DHPLG Water Services Guidelines for Planning Authorities and demonstrate phased infrastructure led growth to meet demands on the water supply, suitability of new	

Plans	Key Policies/Issues/Objectives Directly Related To European Sites, Biodiversity and Sustainable Development In The Zone of Influence	Assessment of development compliance with policy
	and/or existing drinking water sources (for example hydro morphological pressures) and prevent adverse impacts on the integrity of water dependent habitats and species within the Natura 2000 network.	
	RPO 212 **Strategic Wastewater Treatment Facilities** **a**. It is an objective to support investment and the sustainable development of strategic wastewater treatment facilities by Irish Water in the Region arising from initiatives including Investment Plans, Strategic Drainage Area Plans subject to appropriate environmental assessment and the planning process. b. For the management of wastewater, increasing population growth should be planned on a phased basis in collaboration with Irish Water and the local authorities to ensure that the assimilative capacity of the receiving environment is not exceeded and that increased wastewater discharges from population growth does not contribute to degradation of water quality and to avoid adverse impacts on the integrity of the Natura 2000 network.	

3.4 Other Projects

The potential for the proposed works to contribute to a cumulative impact on European Sites was considered. The online planning system for Limerick County Council was consulted on the 30/01/2023. Projects in the area included small-scale single house extensions and the following:

- Repairs to the pontoon and gangway adjacent to the UL Boathouse at Dromroe. The works involve the replacement of the existing decking and the installation of a security gate at the entrance to the pontoon. An Appropriate Assessment(AA) & Natura Impact Statement(NIS) will be submitted to the Planning Authority with the application (pl ref: 22281)
- Permission for development which will consist of a floodlit Sports Pitch including the use of existing soil on site, together with the provision of boundary fence and other ancillary works. A Natura Impact Statement (NIS) will be submitted to the Planning Authority with the application (pl ref: 211221)
- Extension of Duration for pl. ref: 15/697: the construction of a new single storey, PGA Accredited Golf Academy Building incorporating 19 covered driving range bays, two teaching bays, two manufacturing bays, a ball management area, toilets, reception, a shop and ancillary spaces. The associated site works include an outfield area 150m wide and 300m long, a putting green, a pitching area, a chipping green and a chipping area, with perimeter call catch nets and associated landscaping. The site works will also include the relocation underground of the existing overhead 38kv power cables and includes the removal of two existing pylons and the erection of two new steel pylons at the extremities of the diverted cables (A Natura Impact Statement will be submitted with the application. The site is located 235 metres from Plassey Mill and Headrace (a protected structure) and 790 metres from Plassey House (a protected structure). The site is located to the southeast of the existing University Boat House, to the west of the main campus and to the east of the River Shannon Candidate Special Area of Conservation (cSAC, site code 002165) and within the Architectural Conservation Area (ACA) - extended under 21/7002 until 28/02/2026.
- Extension of Duration for 06/4024 for construction of 240 dwellings in three areas/lots: Area 1 consists of 152 no. two storey dwellings, types A-G . Areas 2 & 3 consist of 88 dwellings - three storey duplex dwellings with 34 two bed apartments at ground floor with 34 three bed duplex houses on first and second floor and 20 two storey dwellings and creche. Site entrance to area 1 to be widened and improved. Site entrance to area 2 & 3 is via the existing Woodhaven estate. The proposed development includes all ancillary site works, parking landscape and drainage (pl ref: 217036)
- Permission for construction of 23 no. two-storey residential units and associated infrastructure on lands situated adjacent to the 'Carrowkeel' and 'Woodhaven' residential estates and the Castletroy Urban Greenway. The proposed development includes 17 no. terrace and 6 no. semi detached style residential units, associated landscaping including connection with the Castletroy Urban Greenway, public lighting, surface water attenuation tank, petrol interceptor, connection to public water and foul water infrastructure and vehicular access from Kilmurry Road via existing estate roads (pl ref: 211475)
- Permission for a residential development comprising 96 no. residential units, (16 no. semi-detached houses, 6 no. terrace houses, 2 detached units along with 2 no. 5 storey apartment blocks over basement, comprised of 72 no. apartments and basement parking), bin & bike stores, demolition of existing farm buildings, additional parallel parking along the Castletroy College road, accessed via a new entrance onto the Castletroy College road and all ancillary development works. Ancillary site development works include a new connection to the public water main, foul and surface water drainage, access roads, footpaths, vehicle parking, landscaping, boundary treatments and site development works above and below ground. The planning application is accompanied by a NIS(Natura Impact Statement). (pl ref: 211400)

- Permission for construction of a single storey pre-school building, new site entrance, boundary walls and connection to services with all associated site works (pl ref: 211241)
- Permission was sought for the erection of illuminated signage on the eastern elevation of the existing boat house. The site is located circa 832m from Plassey House (protected structure) and circa 247m from Plassey Mill and Headrace (protected structure). The University of Limerick campus falls within an architectural conservation area. [Pl. Ref. 18440]
- Permission was sought for the demolition of an existing concrete canopy and alterations to the existing East elevation of the Glucksman Library and Information Services Building along with providing a new external sign approx. size 3.2m X 3.2m, to facilitate the relocation of current main entrance located North to further South along the East elevation. The works involve the addition of internal entrance glazed screens and doors with internal alterations to the existing ground floor level at 11.500m OD, of c. 200m2 gross floor area to facilitate the new main entrance relocation and to provide an new media area. Works also to involve the addition of a new single storey extension at 11.500m OD for a new exhibition and meeting area along with a new café entrance of c. 112m2 gross floor area at an overall height of 16.275m OD (Ground Level at 11.500m OD) adjacent to the existing main entrance area, along with some existing internal room alterations at 11.500m OD of c. 100m2 in this area to extend the existing café. The construction of a new three storey infill extension of c.88m2 gross floor area at an overall maximum height of c. 12.975m and at an overall height of 24.475m OD (Ground Level at 11.500m OD). The construction of a new canopy to the East elevation at a maximum height of c. 7.530m and at an overall height of 19.030m OD (Ground LEVEL AT 11.500M OD), an existing stone sculpture relocation, along with new soft and hard landscaping and all associated site engineering works to be provided to the site measuring 0.70 hectares. The University Campus falls within an Architectural Conservation Area (ACA), which contains Protected Structures including Plassey Bridge, Plassey House, Plassey Mill, Plassey Mountain, Milford House and Gate Lodge which are all at least 200mm from the proposed development. [Pl. Ref. 16630]
- Permission was sought for the construction of an external lift to the south of the Foundation Building, University of Limerick, Sreelane, Castletroy, Co. Limerick. The development will consist of a three storey lift enclosure (16.5m2) between the upper plaza level and lower ground floor terrace level with a glazed link to the first floor level of the Foundation Building. The lift enclosure (13.2m high) will be clad in brickwork, concrete spandrel panels and copper roofing to match the existing building. The site is located circa 155m from Plassey House (protected structure) and circa 542m from Plassey Mill and Headrace (protected structure). The University of Limerick campus falls within architectural campus falls within an architectural conservation area. [Pl. Ref. 18396]
- Permission was sought for extension of the existing common room mezzanine at the Millstream Building, University of Limerick, Sreelane, Co. Limerick. The development will comprise of a mezzanine extension of 59.5 sq.m and minor elevational modifications. The site is located circa 153 metres from Plassey House (a protected structure) and circa 509 metres from Plassey Mill and Headrace (a protected structure). The University of Limerick campus falls within an Architectural Conservation Area. [Pl. Ref. 20543]
- Permission was sought for the erection of a temporary pedestrian and vehicular entrance at the end of Drumroe Estate, construct an internal access road to the existing carpark and clubhouse, close up the existing access road as shown on plans and incorporate closed off section of existing roadway into the carpark and all associated site works. [Pl. Ref. 181064]
- Permission was sought for the change of use from light industrial to office use. [Pl. Ref. 21428]

Other Irish Water Projects identified within the vicinity of the Lower River Shannon include:

- Demolition of existing inlet works and pumping station. Construction of a new inlet works, inlet and storm and final effluent pumping stations, storm tank, control building and all ancillary site works (Adare WwTP) (pl ref: 191200), approximately 15km southwest of the development site.
- Demolition of existing sludge bed. Construction of new inlet works, storm tank, picket fence thickener, pumping stations, control buildings and all ancillary site works (Croom WwTP) (pl ref: 191201) approximately 15km southwest of the development site.

Other permitted Discharges located along the Lower River Shannon include:

- Primary discharge and stormwater overflow 20km downstream of Castletroy - D0045-01 – Shannon Town
- Stormwater overflow 8.2km upstream of Castletroy: DTEMP0008-01
- Stormwater overflow 9.8km downstream of Castletroy: DTEMP0007-01 Limerick
- Primary discharge and stormwater overflow 43km downstream of Castletroy - D0502-01 Foynes
- Primary discharge 55km downstream of Castletroy - D0504-01 Glin

The existing listed discharges above are of significant distances from the Castletroy discharge. The Waste Assimilative Capacity of the River Shannon at the time of writing, as described in Section 2.2.3, is such that there will be no cumulative effects to the aquatic habitats and fauna of the Lower River Shannon.

The potential for cumulative effects on water quality of the Lower River Shannon as a result of the proposed project in-combination with the downstream discharge from the Bunlicky Wastewater Treatment Plant was also considered. Bunlicky WwTP is 13km downstream of Castletroy. It currently serves a population equivalent of 186,233PE (2020 AER) and is due to undergo a similar development project which will upgrade the treatment capacity of wastewater and sludge processes on the site. Due to the distance downstream and mixing of flow with other tributaries, there will be no cumulative effects from the combination of Castletroy effluent with current or future discharges from the Bunlicky WwTP on aquatic habitats and species of the River Shannon.

Where potential pathways for effect have been identified in Table 3-1, the potential for cumulative effects resulting from the proposed development when considered in combination with other plans and projects, cannot be discounted at this stage and further assessment within an NIS is required.

4. ARTICLE 6(3) APPROPRIATE ASSESSMENT SCREENING STATEMENT AND CONCLUSIONS

The findings of this Screening Assessment are presented following the European Commission's Assessment of Plans and Projects Significantly affecting Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC (EC, 2021) and Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (EC, 2018) as well as the Department of the Environment's Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DoEHLG, 2010).

4.1 Data Collected to Carry Out Assessment

In preparation of the report, the following sources were used to gather information:

- Review of NPWS Site Synopses, Conservation Objectives for the European Sites
- Review of 2019, 2013 and 2007 EU Habitats Directive (Article 17) Reports.
- Review of online web-mappers: EPA, Water Framework Directive (WFD)
- Review of OS maps and aerial photographs of the site of the proposed project.
- Site Visits undertaken on the 6th of April 2022 and 23rd of July 2020 by MKO.

4.2 Concluding Statement

It cannot be excluded beyond reasonable scientific doubt, in view of best scientific knowledge, on the basis of objective information and in light of the conservation objectives of the relevant European sites, that the proposed development, individually or in combination with other plans and projects, would be likely to have a significant effect on Lower River Shannon SAC [002165] and River Shannon and River Fergus Estuaries SPA [004077].

As a result, an Appropriate Assessment is required, and a Natura Impact Statement shall be prepared in respect of the proposed development.

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APPENDIX 2

FLOOD RISK ASSESSMENT

Client:

Irish Water

Project:

Castletroy Wastewater Treatment Plant

Report:

Flood Risk Assessment

BARRY & PARTNERS

Document Control Sheet

Client:	Irish Water
Project Title:	Castletroy WwTP
Document Title:	Flood Risk Assessment
File Name:	20701-JBB-00-XX-RP-Z-00017_Castletroy_WwTP_Flood_Risk_Assessment

Table of Contents ***(incl. Y/N)***	**List of Tables** *(incl. Y/N)*	**List of Figures** ***(incl. Y/N)***	**Pages of Text** ***(No.)***	**Appendices** ***(No.)***
Y	N	Y	23 No.	3 No.

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16/11/22	P03	S3	PH	OOB	PJ	PJ	N/A
18/01/23	P04	S3	PH	OOB	PJ	PJ	N/A

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Introduction

1.1 General

SECTION 1.

J. B. Barry and Partners Limited was commissioned by Irish Water to undertake a site-specific Flood Risk Assessment (FRA) at Castletroy WwTP, Co. Limerick for a planning application for a proposed upgrade of the existing WwTP. The Flood Risk Assessment will inform a Planning Application for the upgrade of an existing wastewater treatment plant. The aim of the FRA is to identify, quantify and communicate to decision makers and other stakeholders the risk of flooding associated with the proposed development.

The FRA has been carried out in accordance with 'The Planning System and Flood Risk Management Guidelines' (hereafter referred to as the FRM Guidelines) published in November 2009 jointly by the then Department of the Environment, Heritage and Local Government, DEHLG, (now the Department of the Environment, Community and Local Government, DECLG) and the Office of Public Works (OPW).

The development site is located at the existing Castletroy WwTP site adjacent to the Lower River Shannon and beside the University of Limerick campus, approximately 3km east of Limerick City as shown in Figure 1 below.

Figure 1: Location of Proposed Development (Source: Google Maps, annotation by J.B. Barry & Partners)

1.2 Proposed Development

The proposed development shall cater for future population growth and industrial development in the area, in line with population projections for Limerick as set out in the National Planning Framework (NPF) Implementation Roadmap and the Southern Region Regional Economic Spatial Strategy (RSES). It will ensure the WwTP continues to comply with requirements of the EPA Wastewater Discharge License, Urban Wastewater Treatment Regulations (UWWTR) and Irish Water Guidelines, while providing appropriate future treatment capacity and stormwater storage for the agglomeration.

The initial upgrade works will cater for the 10-year growth projections up to 77,500 PE including a future IDA load of 5,500 PE. There will also be provision made in the infrastructural development of the plant

(tank sizing and pipework) for the 25-year growth projections of 81,100PE. Although the infrastructure will be in place, a planning review will be required before any uplift above 77,500PE can be instated.

The upgrade design includes provision for 20% Headroom allowance, in line with Irish Water guidelines for large urban settlements. It also includes installation of a new Stormwater storage tank that will significantly reduce the annual rate of spills to the Lower River Shannon and make the WwTP compliant with the criteria outlined in the DoEHLG "Procedures and Criteria for Storm Water Overflows, 1995".

The complete site layout plan drawing is provided in Appendix 1 of the report and the main elements of the proposed development are listed as follows:

- Upgrade to the inlet works (screens and pumps);
- A second grit trap will be constructed adjacent to the existing inlet works to provide redundancy and improve performance of the downstream processes.
- Construction of a 4,500m3 capacity storm tank and storm water return pumping station. This will reduce the frequency and volume of storm overflow events and stored stormwater can be returned to the treatment process when rainfall levels subside. The volume includes a 20% allowance for increased flows as a result of climate change.
- Construction of a new forward feed pumping station.
- Construction of a splitter chamber upstream of the proposed primary treatment system.
- Construction of a primary treatment building which will contain filtration units, control panels and equipment.
- Construction of a primary sludge holding tank.
- Construction of a scum pumping station.
- Upgrade of the secondary treatment process with IFAS technology. The existing aeration tank structure will be retained for the internal upgrade.
- Installation of 2 no. chemical bulk storage tanks for phosphorous removal.
- Construction of a new Picket Fence Thickener (PFT).
- Modification to the internal layout of the existing Sludge Dewatering Building to accommodate upgraded dewatering equipment.
- Construction of a flood event pumping station to allow final effluent discharge during high river levels.
- Construction of plinths to support skips which will be used to store dewatered sludge prior to removal off site.
- Construction of storage tank for ground water abstracted on-site from an existing well. Borehole water will be used to supply wash water for treatment and cleaning processes.
- Construction of interconnecting pipework.

Flood Risk Assessment Methodology

2.1 Methodology

The methodology used for the flood risk assessment for the proposed development is based on 'The Planning System and Flood Risk Management, Guidelines for Planning Authorities' (2009)'. The FRM Guidelines require the planning system at national, regional and local levels to:

SECTION 2.

- Avoid development in areas at risk of flooding, particularly floodplains, unless there are proven wider sustainability grounds that justify appropriate development;
- Adopt a sequential approach to flood risk management when assessing the location for new development based on avoidance, reduction and then mitigation of flood risk; and
- Incorporate flood risk assessment into the process of making decisions on planning applications and planning appeals.

The sequential approach (see Figure 2 of the FRM Guidelines below) in flood risk management requires the following three steps to identify the necessity for the justification test for a development:

- Step 1: Identification of the Flood Zone at the proposed development site (Section 2.23 of the FRM Guidelines);
- Step 2: Identification of the vulnerability of the type of the proposed development (Table 3.1 of the FRM Guidelines); and
- Step 3: Using the matrix of vulnerability versus Flood Zone (Table 3.2 of the FRM Guidelines), identify the necessity for the justification test for the proposed development.

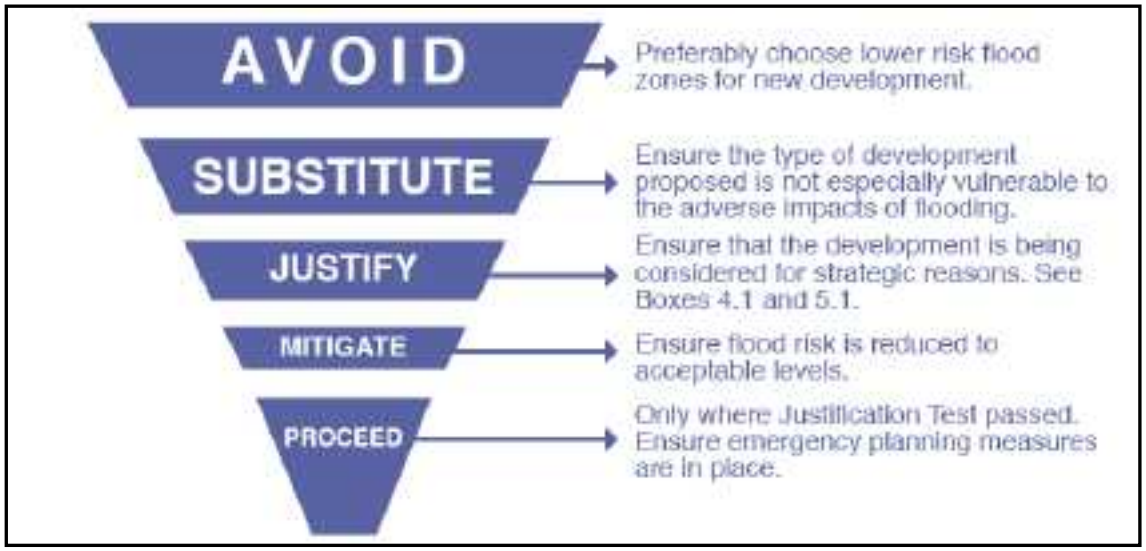

Figure 2: Sequential approach principles in flood risk

While Figure 2 of The FRM Guidelines sets out the broad philosophy underpinning the sequential approach in the flood risk management, Figure 3 of the Guidelines (shown below) describes the mechanism of the sequential approach for use in the planning process.

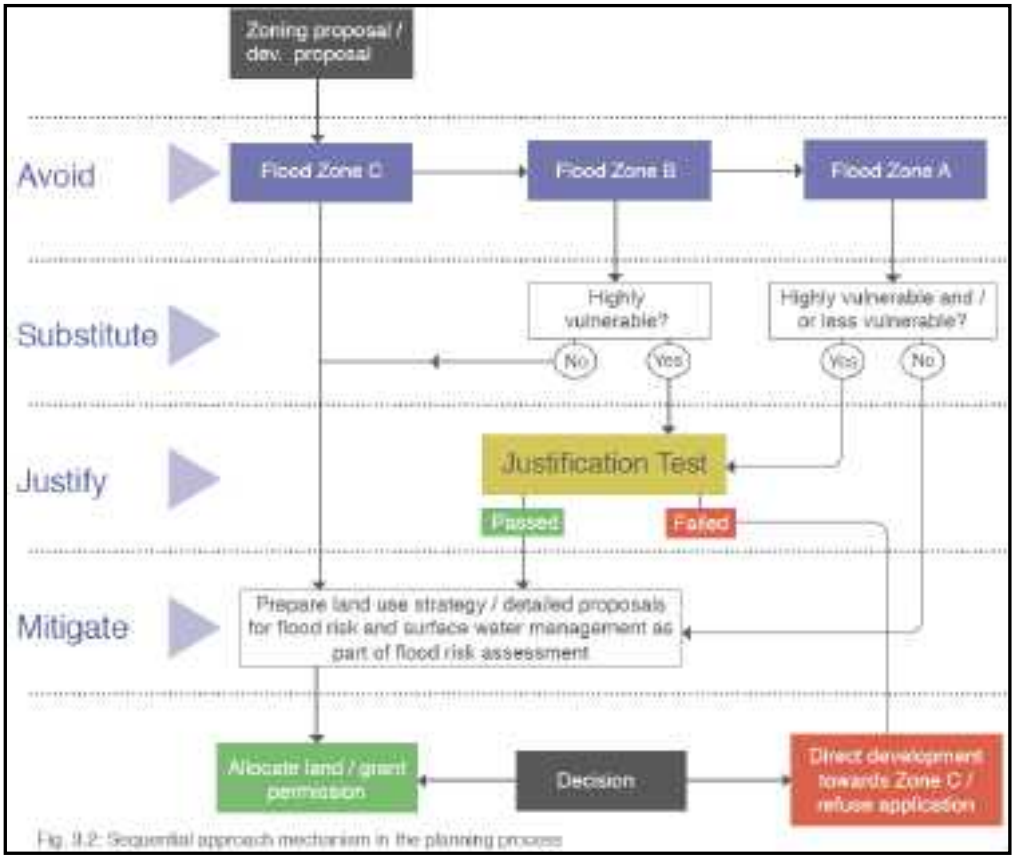

Figure 3: Sequential approach mechanism in the planning process

According to the FRM Guidelines, Flood Zones are graphical areas within which the likelihood of flooding is in a particular range. They are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning. There are three Flood Zones, namely,

- **Flood Zone A** – where the probability of flooding from rivers and the sea is highest (greater than 1% AEP or 1 in 100 year for river flooding or 0.5% or 1 in 200 for coastal flooding);
- **Flood Zone B** – where the probability of flooding from rivers and the sea is moderate (between 0.1% AEP or 1 in 1000 year and 1% AEP or 1 in 100 year for river flooding and between 0.1% AEP or 1 in 1000 year and 0.5% AEP or 1 in 200 year for coastal flooding); and
- **Flood Zone C** – where the probability of flooding from rivers and the sea is low (less than 0.1% AEP or 1 in 1000 for both river and coastal flooding).

Flood Zones A, B and C are based on the current assessment of the 1% AEP and the 0.1% AEP fluvial events and the 0.5% AEP and 0.1% AEP tidal events, without the inclusion of climate change factors. Table 3.1 of the FRM Guidelines (shown below) shows the classification of the vulnerability to flooding of different types of development.

Vulnerability class	Land uses and types of development which include*:
Highly vulnerable development (including essential infrastructure)	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility, and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less vulnerable development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water-compatible development	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).

*Uses not listed here should be considered on their own merits

Table 3.1 Classification of vulnerability of different types of development

Table 3.2 of the FRM Guidelines (shown below) identifies the types of development that would be appropriate for each Flood Zone and those that would be required to meet the Justification Test. Since water and sewage treatment are classified as 'Highly vulnerable development' the section highlighted in Table 3.2 presents the required actions for each flood zone.

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

Table 3.2: Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test.

The FRM Guidelines (Chapter 2) outlines the following three stages of flood risk assessment:

Stage 1: Flood risk identification – to identify whether there may be any flooding or surface water management issues relating to the proposed development site that may warrant further investigations.

Stage 2: Initial flood risk assessment – to confirm sources of flooding that may affect the proposed development site, to appraise the adequacy of existing information and to determine what surveys and modelling approach is appropriate to match the spatial resolution required and complexity of the flood risk issues. This stage involves the review of existing studies and hydraulic modelling to assess flood risk and to assist with the development of FRM measures.

Stage 3: Detailed flood risk assessment – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development, of its potential impacts on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. This will typically involve use of an existing or construction of a hydraulic model across a wide enough area to appreciate the catchment wide impacts and hydrological process involved.

2.2 Data Collection

Data required for the flood risk assessment was obtained from various sources, as described below.

- The historic data was obtained from the National Flood Hazard Mapping website www.floodmaps.ie
- The Subsoil and Aquifer vulnerability data was obtained from the Geological Survey of Ireland website www.gsi.ie
- CFRAM Flood Maps were obtained from the OPW website www.floodinfo.ie
- Castletroy Local Area Plan 2019-2025

Existing Hydrological Environment

SECTION 3:

3.1 Salient Hydrological Features

The main hydrological feature of the area is the Lower River Shannon and the River Blackwater, a tributary to the Lower River Shannon. The Lower River Shannon flows in a westerly direction and forms the northern boundary of the site. The confluence with the river Blackwater is immediately downstream of the site. A portion of the Lower River Shannon is diverted through the University of Limerick campus and re-joins the main channel immediately upstream of the development site. Figure 4 below illustrates the main hydrological features associated with the site.

Figure 4: Hydrological Features of the Area (Source: EPA, annotation by J.B. Barry & Partners)

3.2 Existing Geology and Hydrogeology of the Area

The Geological Survey of Ireland (GSI) website provides information on their public online mapping service at www.gsi.ie on subsoil type and aquifer vulnerability. The maps presented in Figure 5 and Figure 6 depict the subsoil type and aquifer vulnerability for the existing/proposed development site. The GSI subsoil mapping Figure 5 indicates that made ground is the predominant ground condition within the environs of the development site with traces of alluvium to the north west of the site due to the proximity to the River Shannon.

Figure 5: GSI Subsoil Mapping (Source: www.gsi.ie, annotation by J.B. Barry & Partners)

Furthermore, the interactive web-mapping site classifies the aquifer vulnerability in this region as having a low vulnerability rating (Figure 6). The GSI state that "Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities". The GSI further describes that the vulnerability of groundwater depends on:

(i) The time of travel of infiltrating water (and contaminants);

(ii) The relative quantity of contaminants that can reach the groundwater; and

(iii) The contaminant attenuation capacity of the geological materials through which the water and contaminants infiltrate

Firstly, the vulnerability rating for an area indicates, and is a measure of, the likelihood of contamination. Secondly, the vulnerability map helps to ensure that a groundwater protection scheme is not necessarily restrictive on human economic activity. Thirdly, the vulnerability map help in the choice of preventative measures and enables developments, which have a significant potential to contaminate, to be located in areas of lower vulnerability.

Figure 6: GSI Aquifer Vulnerability Mapping (Source: www.gsi.ie, annotation by J.B. Barry & Partners)

3.3 Flood Regime of the Area

The National Flood Hazard Mapping Website www.floodmaps.ie shows records of historic floods occurring within the vicinity of the proposed development site (Figure 7) and shows that the site has flooded in the past.

The site was flooded severely in November 2009 due to the Lower River Shannon bursting its banks following unprecedented torrential rainfall. A report undertaken by Limerick County Council which investigates the causes and effects of this flood is included in Appendix 2. The report states "*The WwTP experienced flooding, which was very close to making the plant non-operational. A huge effort was undertaken in preventing the plant from flooding. High electricity cost for running of the pump was incurred as a result.*"

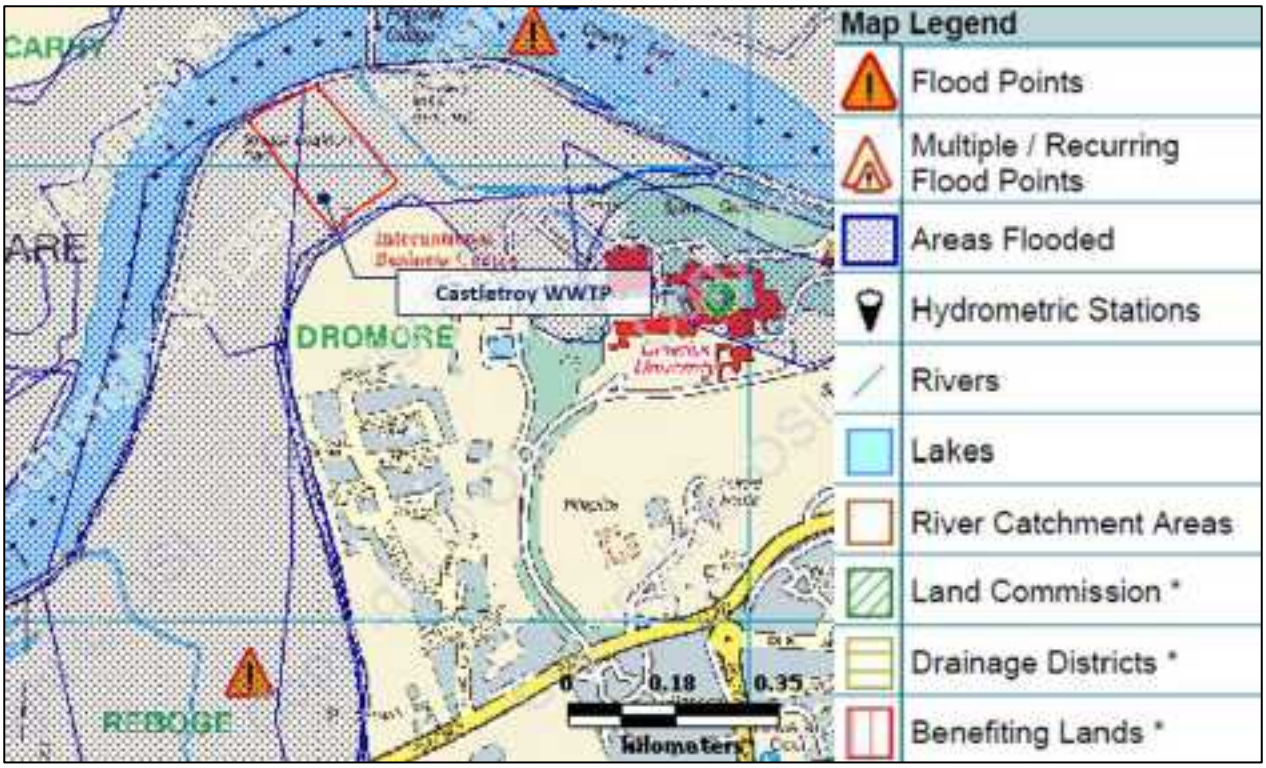

Figure 7: Location of historic flooding in the vicinity of the proposed site (*Source: www.floodmaps.ie; annotation by J.B. Barry & Partners*)

3.4 Existing Flood Studies

3.4.1 CFRAM Study

The objective of the Preliminary Flood Risk Assessment (PFRA) was to identify areas where the risk associated with flooding might be significant. These areas were referred to as "Areas for Further Assessment" (AFA's) and required a more detailed assessment to assess the extent and degree of flood risk more accurately. The detailed assessments which focused on AFA's were undertaken through the CFRAM Study. The Castletroy area was deemed an AFA and therefore detailed flood maps of the area were generated through the CFRAM Study.

Figure 8 below is an extract from the Fluvial Flood Extent Map concerning the proposed development site. This map is included in Appendix 3. Observation of the flood extent map extract indicates that portions of the proposed development site lie within the 0.1% and 1% AEP flood extent of the Lower River Shannon and hence lies within **Flood Zone A** where the risk of flooding is highest.

This extract also provides the flood level of the Lower River Shannon in the vicinity of the proposed development site during the 1% and 0.1% AEP fluvial events. There are 2 nodes to the north of the site which are equidistant to the site boundary and the flood levels at the nodes are presented in Table 1 below. It is reasonable to conclude that the flood levels on the site can be calculated by interpolating between these 2 nodes in a pro rata basis.

Table 1: Fluvial Flood Levels at the Site

Node	1% AEP Flood Level	0.1% AEP Flood Level
09LSH00000	+6.36 mOD	+6.92 mOD
09LSH0082u	+6.38 mOD	+6.94 mOD

Castletroy WwTP	+6.37 mOD	+6.93 mOD

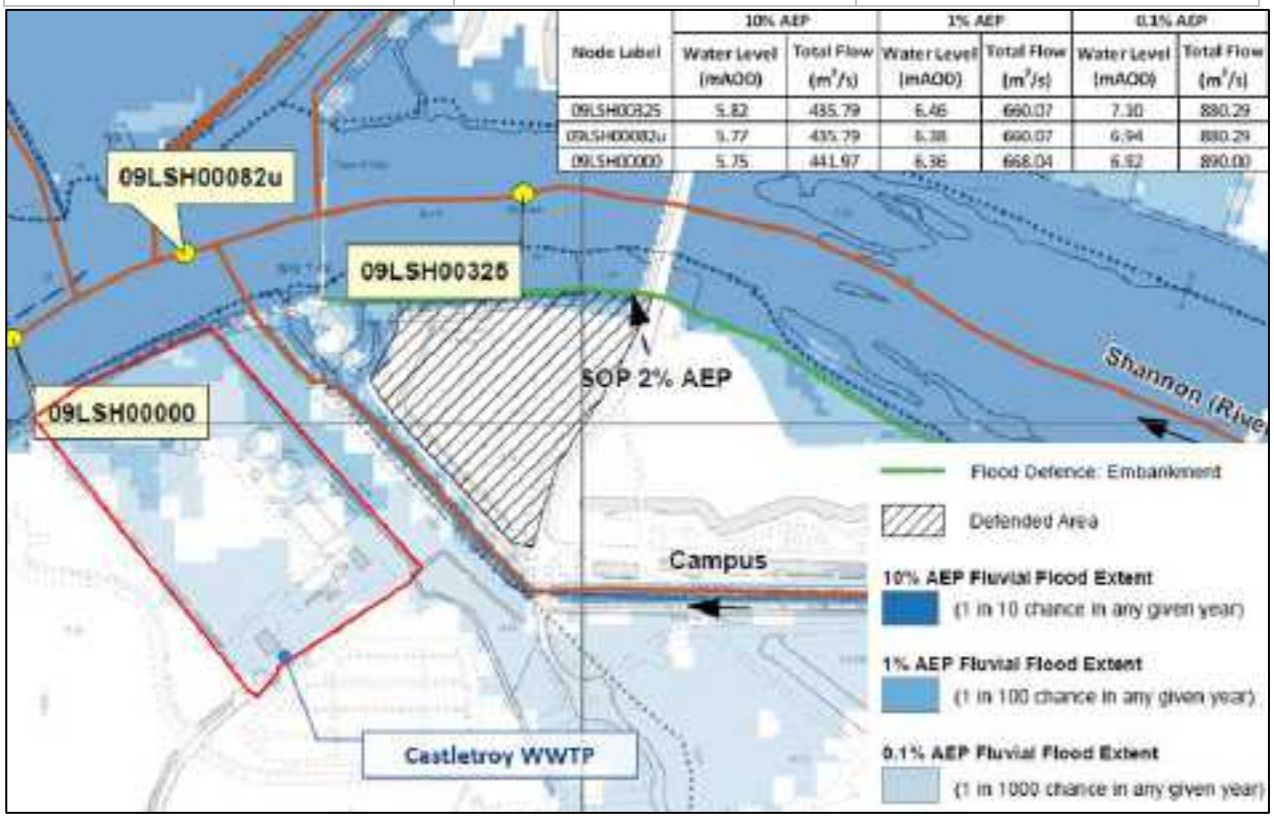

Figure 8: Extract CFRAMS Flood Extent Map

The CFRAM Study also generated Flood Depth maps demonstrating the depth of flood waters during various flood extents. Figure 9 below shows an extract of the 0.1% AEP flood depth map in the vicinity of the site. Observation of this indicates that the depth of water on site during the 0.1% AEP flood ranges from 0m – 1m. The full map is included in Appendix 3.

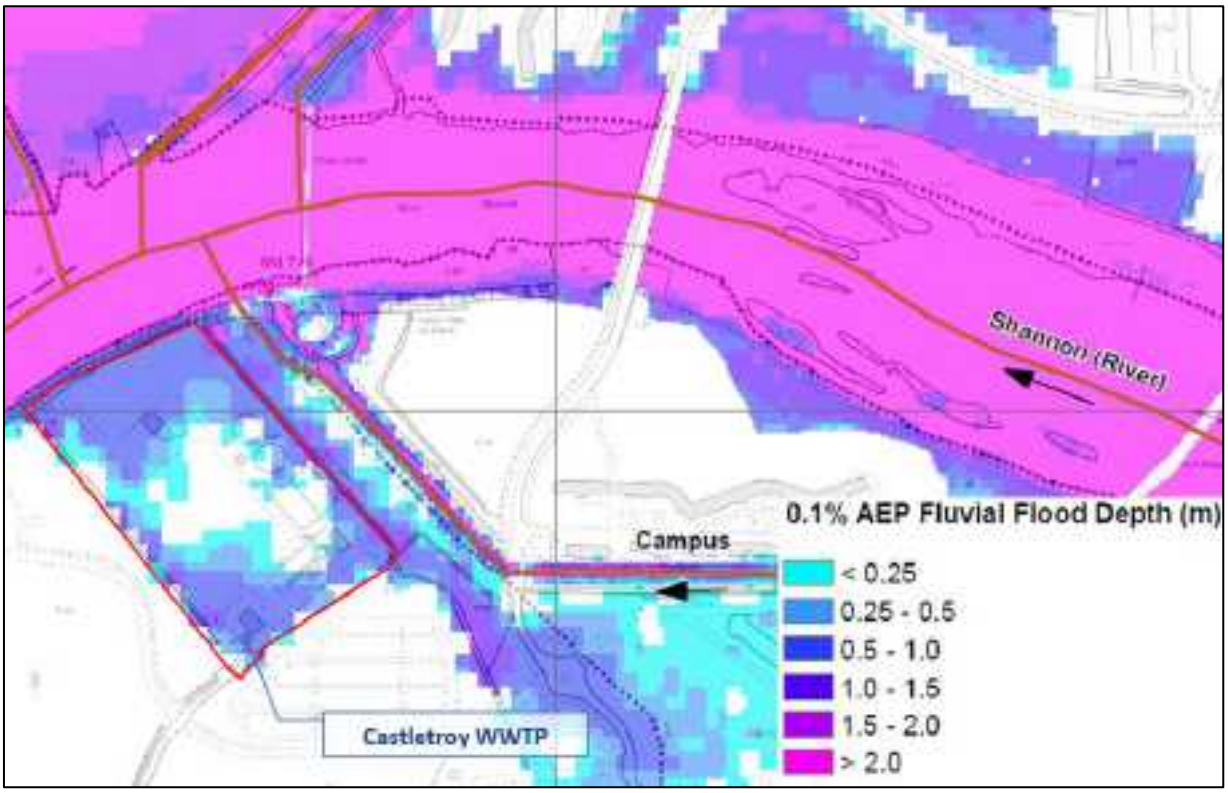

Figure 9: Extract of CFRAMS 0.1% AEP Flood Depth Map

Similarly, Figure 10 below shows an extract of the 1% AEP flood depth map in the vicinity of the site. Observation of this indicates that the depth of water on site during the 1% AEP flood ranges from 0m – 0.25m. The full map is again included in Appendix 3.

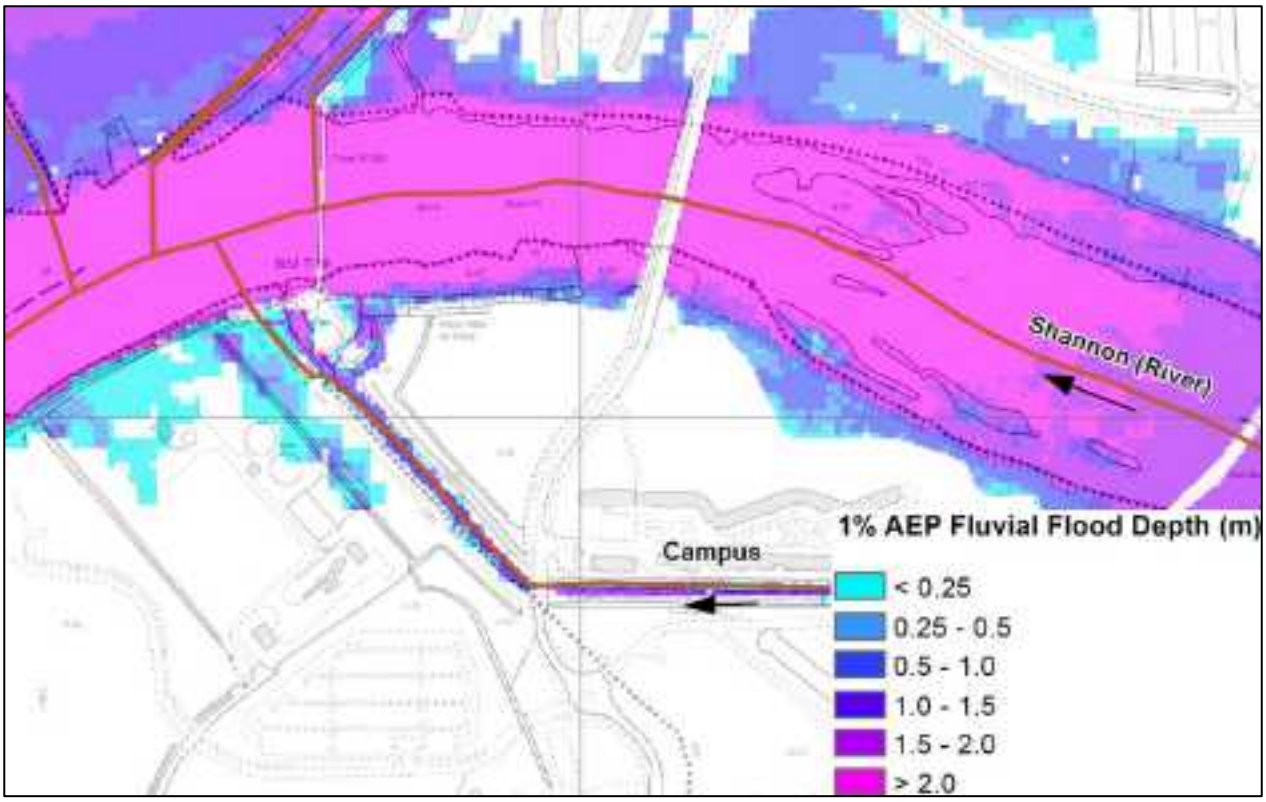

Figure 10: Extract of CFRAMS 1% AEP Flood Depth Map

3.4.2 National Indicative Fluvial Maps

The National Indicative Fluvial Flood maps are 'predictive' flood maps showing indicative areas predicted to be inundated during a theoretical fluvial flood event with an estimated probability of occurrence. The data layer is available on www.floodmaps.ie.

According to the layer information, the maps may be used in the Stage I Flood Risk Assessment (Flood Risk Identification) to identify areas where further assessment would be required if development is being considered within or adjacent to the flood extents shown on the maps. Similarly, the maps may be used to identify whether flood risk might be a relevant issue when considering a planning application, or when discussing a potential application at pre-planning stage.

Indicative fluvial maps are not available for the area of interest.

3.4.3 Limerick Development Plan 2022-2028

The Limerick Development Plan 2022-2028 came into effect on 29th July 2022 and aims to form a coherent development strategy to 2028 and beyond. The approach to flooding, flood risk management and water management is set out in 'Chapter 9 Climate Action, Flood Risk and Transition to Low Carbon Economy' of the Plan. Flood maps are included in 'Volume 2 Settlements' of the Plan and the Strategic Flood Risk Assessment is included in 'Volume 4 Environmental Reports'.

Figure 11 is taken from 'Volume 2a Settlements' and shows the flood map for Limerick City and suburbs. Flood Zone A and B are shown on the map as well as land zoning.

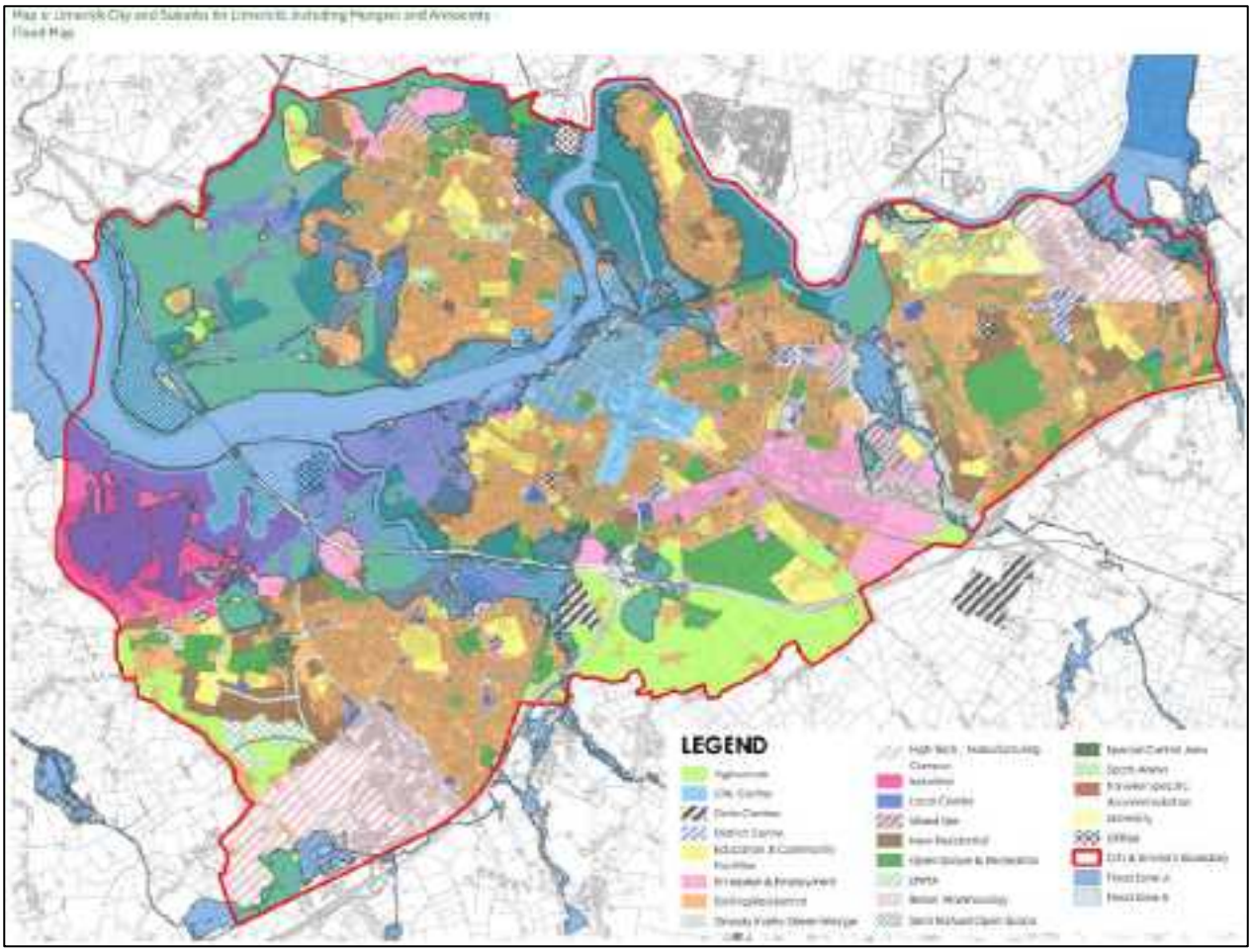

Figure 11: Limerick City and Suburbs (in Limerick), including Mungret and Annacotty -Flood Map

Strategic Flood Risk Assessment

In the preparation of the Plan, in accordance with The Planning System and Flood Risk Management, Guidelines for Planning Authorities, a Strategic Flood Risk Assessment (SFRA) was prepared by Limerick City and County Council to assess flood risk within the plan area. The SFRA is set out in Volume 4 of the Plan. The precautionary approach has largely been employed to land use zoning to avoid directing development towards areas at risk of flooding.

Areas identified as being at risk of flooding, which were put forward for land use zoning, were subject to assessment through a justification test, to determine its suitability for inclusion and have only been considered, where they were determined to be within or adjoining the core of the City Centre. No Justification Test for development of Castletroy WwTP was included in the SFRA due to the existing nature of the site.

The site is shown in Figure 8 to be partially located within Flood Zone A and Flood Zone B. The remainder of the site within located in Flood Zone C.

Flood Risk Assessment

SECTION 4:

4.1 Introduction

As outlined in Section 2 of this report the FRM guidelines identifies three stages of Flood Risk Assessment namely;

- Stage 1: Flood Risk Identification
- Stage 2: Initial Flood Risk Assessment
- Stage 3: Detailed Flood Risk Assessment

4.2 Flood Risk Identification

According to the FRM Guidelines, flood risk identification is the process for deciding whether a plan or project requires further investigation. This is a desk based exercise based on existing information. All the existing information is described in Section 3 and the identification of flood risk from each of the five sources of flooding (coastal, fluvial (river), groundwater, pluvial (rainfall) and from artificial drainage systems) is considered.

Coastal Flood Risk

The development site is not located beside the coast and the Lower River Shannon is not tidally influenced at this location, therefore the proposed development site lies outside of the 0.1% AEP coastal flood event and hence is located within **Flood Zone C** for Coastal flood risk, where the risk of flooding is low.

Fluvial Flood Risk

The CFRAMS maps in Appendix 3 all indicate that a portion of the site lies within the 1% AEP fluvial flood extent. Therefore, the proposed development site lies within Fluvial **Flood Zone A** – high flood risk.

Groundwater Flood Risk

The aquifer vulnerability map (refer to Figure 6) classifies the site as having a low vulnerability rating which indicates a low water table and hence a low risk of groundwater related flooding. There is no historical evidence of groundwater flooding at the site and the PFRA Map indicates a low risk of groundwater related flooding. There is no indication on the maps of any springs or wells on this site.

GSI Groundwater Flooding Probability Maps do not highlight flooding in the area. There is no historical evidence of groundwater flooding at the sites. Groundwater risk is therefore not considered to be significant.

Pluvial Flood Risk

There have been no recorded instances of pluvial flooding events at the site. Pluvial flood risk is therefore not considered to be significant. Notwithstanding this, it is important to consider appropriate mitigation measures. During extreme rainfall events the application of SuDS principles will ensure surface water is managed sufficiently and sustainably discharged to the drainage network.

Artificial Drainage Systems Flood Risk

It was noted that there have been instances of surcharging at the final inspection chamber causing localised flooding on site. The existing v-notch weir at the final effluent inspection chamber does not operate correctly due to surcharging at high river level. A flood event pumping station and raising of the final effluent inspection chamber are proposed as part of the project to overcome this issue.

4.3 Flood Risk Assessment

The Flood Risk Assessment has identified that there is a flood risk to the site. Under the sequential approach identified in the FRM Guidelines a three-step approach is required to confirm the appropriateness of the development in terms of flood risk.

Step 1: Identification of the Flood Zone at the proposed development site

Using the Flood Zone criteria from the FRM Guidelines and as defined in Section 2 previously, the flood zones for each of the sites were determined.

- **Flood Zone A** – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 year for river flooding or 0.5% or 1 in 200 for coastal flooding);
- **Flood Zone B** – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 100 year and 1% or 1 in 1000 year for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 year for coastal flooding); and
- **Flood Zone C** – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding).

As discussed in Section 4.2 above, the proposed development site lies partially within both **Flood Zone A** and **Flood Zone B** – where risk of flooding is high and moderate respectively.

Step 2: Identification of the vulnerability of the type of the proposed development (Table 3.1 of the FRM Guidelines)

The different types of proposed infrastructure are then assigned a vulnerability classification according to the definitions in 'Table 3.1 – Classification of vulnerability of different types of development' of the FRM Guidelines.

As described in Section 1.2 above, the proposed development consists of wastewater treatment infrastructure. This is classified as 'highly vulnerable development'.

Step 3: Using the matrix of vulnerability versus Flood Zone (Table 3.2 of the FRM Guidelines), identify the necessity for the justification test for the proposed development

The proposed development site is located in Flood Zone A and Flood Zone B and is categorised as Highly Vulnerable Development. Table 3.2 of the FRM guidelines and Figure 3.2 – Sequential approach mechanism in the planning process (FRM guidelines) stipulates that a justification test is required for such a development. Figure 12 below highlights the matrix of vulnerability versus flood zone.

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

Table 3.2: Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test.

Figure 12: Matrix of Vulnerability versus Flood Zone to illustrate appropriate development

The proposed development is an upgrade to an existing wastewater treatment plant, the nature of which requires it to be located near a watercourse. Section 5.28 of the FRM Guidelines states that minor development, such as small extensions to houses, and most changes of use of existing buildings and or

extensions and additions to existing commercial and industrial enterprises, are unlikely to raise significant flooding issues, unless they obstruct important flow paths, introduce a significant additional number of people into flood risk areas or entail the storage of hazardous substances. Since such applications concern existing developments, the sequential approach cannot be used to locate them in lower-risk areas and the Justification Test will not apply.

While some minor developments are proposed, several new structures are proposed within the site. A Justification Test has been undertaken on the overall development to assess the flood risk and demonstrate that the proposed development would not have an adverse impact on flooding within the site and that the risk to neighbouring lands will not increase.

4.3.1 Justification Test

According to the FRM Guidelines, the Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of particular developments that are being considered in areas of moderate or high flood risk (Flood Zones A and B; respectively).

The FRM Guidelines outlines in Box 5.1 (shown in the five criteria, namely Criterion 1, 2(i), 2(ii), 2(iii), and 2(iv), all of which must be satisfied under the Justification Test as it applies to development management. These justification criteria have been addressed in the following paragraphs.

Box 5.1 Justification Test for development management
to be submitted by the applicant

When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2, the following criteria must be satisfied:

1. The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines;
2. The proposal has been subject to an appropriate flood risk assessment that demonstrates:
   (i) The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;
   (ii) The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;
   (iii) The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and
   (iv) The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.

The acceptability or otherwise of levels of residual risk should be made with consideration of the type and foreseen use of the development and the local development context.

Note: See section 5.27 in relation to major development on zoned lands where sequential approach has not been applied in the operative development plan.

Figure 13: Box 5.1 extract from the FRM Guidelines

Criterion 1: The subject land has been designated for this particular use

The Limerick Development Plan 2022 -2028 (LDP) came into effect on the 29th of July 2022 and is the principal planning strategy document for the development of Limerick City and County. The subject site is zoned for 'Utilities' as previously designated under the revoked Castletroy Local Area Plan 2019-2025. The relevant policies and objectives are therefore summarised below.

The strategic vision of the LDP is as follows: '*Limerick – A Green City Region on the Waterfront - By 2030, Limerick will become a green City region on the Shannon Estuary connected through people and places. This will be achieved through engagement, innovation and resilient urban development and self-sustaining rural communities*'.

This is underpinned by 10 interlinked strategic objectives. Strategic Objective 1 sets out to: "*Grow Limerick's economy and create opportunity through maximising the potential for development through the promotion and enhancement of the competitive advantages of Limerick, including its strategic location, connectivity and accessibility to international markets, a skilled workforce and a high quality of life...*".

Alongside this, Strategic Objective 7 aims to: "*Protect, enhance and ensure the sustainable use of Limerick's key infrastructure, through the provision of support to utility providers including water supplies and wastewater treatment facilities, energy supply including renewables, broadband and transportation. This plan will also foster the linkages to transition from linear model to a circular model which keeps resources in use for as long as possible*".

Objective IN 06 Water Services states that it is an objective of the Council to:

a) Support Irish Water in the provision of water and wastewater infrastructure and services in accordance with the Service Level Agreement, until such time as the Agreement is terminated.

b) Collaborate with Irish Water in the protection of water supply sources to avoid water quality deterioration and reduce the level of treatment required in the production of drinking water, in accordance with Article 7(2) of the WFD. Protection and restoration of drinking water at the source can have co-benefits for biodiversity and climate change.

c) Liaise with Irish Water during the lifetime of the Plan to secure investment in the pro-vision, extension and upgrading of the piped water distribution network and wastewater pipe network across Limerick City and County, to serve existing population and future population growth and sustain economic growth, in accordance with the requirements of the Core and Settlement Strategies.

e) Ensure that development proposals connecting to the public water and/or wastewater networks, now or in the future comply with Irish Water Standard Details and Codes of Practice. Where relevant ensure developments comply with the EPA Code of Practice for Domestic Waste Water Treatment Systems 2021.

Section 8.5.3 of the LDP notes that:

Irish Water's current wastewater treatment capacity register for County Limerick dated March 2022, states that there is capacity available in 41 no. of the 53 no. waste water treatment plants (WwTPs). These include Bunlicky and Castletroy WwTPs, which serve the Limerick City Metropolitan Municipal District. These WwTPs require some upgrading and it is envisaged by Irish Water that with the completion of these upgrades, there will be sufficient spare capacity to accommodate the projected growth in Limerick City and Suburbs (in Limerick), Mungret and Annacotty as set out in the RSES and the Core Strategy, over the lifetime of the Plan, subject to planning and other approvals.

Objective IN O9 Public Waste Water states that it is an objective of the Council to:

a) Ensure adequate and appropriate wastewater infrastructure is available to cater for existing and proposed development, in collaboration with Irish Water, to avoid any deterioration in the quality of receiving waters and to ensure that discharge meets the requirements of the Water Framework Directive.

Chapter 12 of the LDP sets out the land use zoning strategy. The objective in relation to the 'Utilities' zoning that pertains to the subject site is to:

'To provide for the infrastructural needs of transport and other utility providers'.

The stated purpose of this zoning *'…provides for and preserves land for the provision of services such as electricity and gas networks, telecommunications, the treatment of water and wastewater etc'.*

At a local level, until 29th of July 2022, the future planning of the Castletroy area was governed by the provisions of the Castletroy Local Area Plan 2019-2025. However, with the adoption of the LDP the Local Area Plan (LAP) has now lapsed. The LAP, however, does note generally that the provision of adequate water supply and wastewater treatment utilities is crucial to the continued expansion of Castletroy.

The Clare County Development Plan 2017-2023, as varied and extended, sets out an overall strategy for the proper planning and sustainable development of the functional area of Clare County Council over its life. The vision for the area is shaped by key defined goals which includes Goal VII – to support *"strong economic growth and a high quality of life for all residents through the provision of efficient and robust physical infrastructure whilst having regard to environmental responsibilities and complying with European and National legislation".*

The proposed development is located within the site boundary of an operational wastewater treatment plant. It is considered that development of the wastewater treatment plant to provide appropriate wastewater infrastructure fulfils Criterion 1 of the Justification Test.

Criterion 2: The proposal has been subject to an appropriate flood risk assessment

To satisfy the four sub-criteria (namely 2(i), 2(ii), 2(iii), 2(iv)) under this criterion, as set out in Box 5.1 of the FRM Guidelines, a detailed flood risk assessment has been undertaken.

A detailed and appropriate flood risk assessment has been undertaken under the four sub-criteria of Criterion 2 of the Justification Test, as described below:

- Sub-criterion 2 (i) – Detailed flood risk assessment
- Sub-criterion 2 (ii) – Flood risk mitigation measures
- Sub-criterion 2 (iii) – Residual risks
- Sub-criterion 2 (iv) – Wider planning objectives

Each sub criterion is addressed in the following sections.

Sub Criterion 2(i) – Detailed Flood Risk Assessment

As mentioned above, a portion of the proposed development lies within the 1% and 0.1% AEP floodplain of the River Shannon. Development on a floodplain has the potential to increase flood risk elsewhere by:

- Increasing the rate and volume of runoff from reduced permeable areas
- A decrease in the volume of available flood storage

It is an objective of the Council (Objective CAF O20) to require a Site-Specific Flood Risk Assessment (FRA) for all planning applications in Flood Zones A and B and consider all sources of flooding (for example coastal/tidal, fluvial, pluvial or groundwater), where deemed necessary. The detail of these Site-Specific FRAs (or commensurate assessments of flood risk for minor developments) will depend on the level of risk and scale of development. A detailed Site-Specific FRA should quantify the risks, the effects of selected mitigation and the management of any residual risks. The assessments shall consider and provide information on the implications of climate change with regard to flood risk in relevant locations.

The findings of the CFRAM study were used to inform site design and layout and the need for other mitigation measures. It was not deemed necessary to undertake additional hydraulic modelling to inform the detailed flood risk assessment.

CFRAM flood extent mapping was georeferenced into GIS software to assess the impact of the proposed structures on the flood area. Proposed structures are denoted in red in Figure 14 and were used to

calculate the area of each structure within Flood Zone A and B. The impact of the overall development on the loss of flood plain could therefore be assessed.

Figure 14: Flood Extent Map with proposed infrastructure

The areas of the proposed development located in Flood Zone A and Flood Zone B was calculated and are shown in Table 2 below.

Table 2: Area of structures located in Flood Zone A and Flood Zone B

		Flood Zone A		Flood Zone B
Structure	**Unit**	**10% AEP**	**1% AEP**	**0.1% AEP**
Storm Tank	m^2	0	0	388
Splitter Chamber	m^2	0	0	55
Filtration Building	m^2	0	0	121
Forward Feed Pumping Station	m^2	0	0	53
Odour Control Unit (Primary Treatment)	m^2	0	0	28
Pumping Station (borehole)	m^2	0	0	13
Primary Sludge Holding Tank	m^2	0	0	50
Grit Trap	m^2	0	0	0
Chemical Bulk Tanks (2 no.)	m^2	0	0	71
Picket Fence Thickener	m^2	0	0	43
Odour Control Unit (Sludge Building)	m^2	0	0	46
Sludge Skip Plinths (3 no.)	m^2	0	35	16
Flood Event Pumping Station	m^2	0	38	0
Total Area	**m^2**	**0**	**73**	**884**

A similar exercise was undertaken using CFRAM Flood Depth mapping with the purpose of calculating the impact of the proposed structures on flood storage volumes. The process was undertaken using the 1% Flood Depth map shown in Figure 15 in relation to the proposed infrastructure.

Figure 15: Flood Depth Map (1% AEP) with proposed infrastructure

The area of all proposed structures within each flood depth extent was calculated using GIS software. The results are shown in Table 3 below using the minimum, maximum and average flood depths for each range from the CFRAM map.

Table 3: Impact on Flood Storage Volume (1% AEP)

		Flood Depth					
		Min	Max	Avg	Min	Max	Avg
Structure	**Unit**	**0.00**	**0.25**	**0.13**	**0.25**	**0.50**	**0.38**
Storm Tank	m^2	0	0	0	0	0	0
Splitter Chamber	m^2	0	0	0	0	0	0
Filtration Building	m^2	0	0	0	0	0	0
Forward Feed Pumping Station	m^2	0	0	0	0	0	0
Odour Control Unit (Primary Treatment)	m^2	0	0	0	0	0	0
Pumping Station (borehole)	m^2	0	0	0	0	0	0
Primary Sludge Holding Tank	m^2	0	0	0	0	0	0
Grit Trap	m^2	0	0	0	0	0	0
Chemical Bulk Tanks (2 no.)	m^2	0	0	0	0	0	0
Picket Fence Thickener	m^2	0	0	0	0	0	0
Odour Control Unit (Sludge Building)	m^2	33	33	33	0	0	0
Sludge Skip Plinths (3 no.)	m^2	38	38	38	0	0	0
Flood Event Pumping Station	m^2	39	39	39	0	0	0
Total Area	m^2	110	110	110	0	0	0
Total Volume	**m^3**	**0**	**28**	**14**	**0**	**0**	**0**

It can be seen from Table 3 that a maximum of 28m^3 flood storage volume will be removed from site due to the proposed infrastructure during a 1% AEP flood event. As recommended in the FRM Guidelines, a volume of flood plain equal to that lost to the proposed development should be created. Further, the equal volume should apply at all levels between the lowest point on the site and the design flood level. Compensatory storage is proposed to be provided along the western of the site as shown in Appendix 3.

The use of appropriate drainage measures will mitigate the impacts of additional surface runoff from new infrastructure. Excess surface runoff arising from the development site will be attenuated and discharged at the greenfield discharge rate. Therefore, it is considered that there will be no increased surface runoff from the development in comparison to that of pre-development condition.

With this, it is considered that the proposed development satisfies sub-criterion 2(i) of the Justification Test.

Sub Criterion 2(ii) – Flood Risk Mitigation Measures

As discussed in Section 4.2, the main risk of flooding at the site is from fluvial flooding. It was identified that a portion the site is at risk of flooding due to the 1% AEP fluvial flood extent from the adjacent River Shannon.

It is observed from Figure 8 and Appendix 3 that the 1% AEP fluvial flood levels at node '09LSH00000' and '09LSH0082u' are **+6.36mOD** and **+6.38mO** respectively. From Table 1 it was concluded that the flood levels on the site can be calculated by interpolating between these 2 nodes in a pro rata basis. This results in a 1% AEP flood level of **+6.37mOD**.

According to the FRM Guidelines, the minimum floor level for a new development should be set above the 1% AEP fluvial flood level and should include an allowance for climate change and freeboard. With a freeboard allowance of 0.40m and an allowance of 0.20m for the effects of climate change, this gives the minimum required finished floor level (FFL) (in accordance with the FRM Guidelines) of the development as **+6.97mOD**. This FFL is also higher than the 0.1% AEP fluvial flood level of **+6.93mOD** as shown in Table 1. The top of all tanks and structures will also be constructed above the design flood level of +6.97mOD.

With this, the proposed development satisfies Sub-criterion 2(ii) of the Justification Test.

Sub Criterion 2(iii) – Residual Risks

With the implementation of flood risk mitigation measures recommended above, it is considered that the risk of flood damage to the proposed infrastructure and to operators will be minimised.

The proposed development will have no direct access to any nearby watercourse with the boundary of the site being fenced off from the Lower River Shannon. It is considered that the proposed development satisfies sub-criterion 2(iii) of the Justification Test.

Sub Criterion 2(iv) – Wider Planning Objectives

CAF O2 Partnership with Service Providers of the LDP states that is an objective of the Council to work with other bodies and organisations, as appropriate, to help protect critical infrastructure, including water and wastewater, within Limerick, from risk of flooding. Any subsequent plans shall consider, as appropriate any new and/or emerging data, including, when available, any relevant information contained in the CFRAM Flood Risk Management Plans and as recommended in the SFRA for the Plan.

Section 1.4.1 of Volume 2a includes the following text under *Water Services Infrastructure*:

"The Castletroy Wastewater Treatment Plan is also operating within its design capacity of 45,000 P.E. At present there is significant spare capacity available at Bunlicky WwTP however the spare capacity at Castletroy WwTP is limited. Projects are underway to increase capacity at both Bunlicky and Castletroy WwTPs and will be completed within the lifetime of the Plan, subject to statutory approvals."

Further, the section also notes that Irish Water is preparing a Drainage Area Plan (DAP) to be completed in 2024 for the Limerick City and Castletroy agglomerations. Limerick City and County Council will collaborate with Irish Water to ensure planned growth in the strategic growth areas and elsewhere in the city is taken account of in this study.

The development will address the above measures in a manner that is compatible with the wider planning objectives in relation to the proposed development. Therefore, it is considered that the development also satisfies Sub-criterion 2(iv) of the Justification Test.

Conclusions and Recommendations

5.1 Summary of Results

A flood risk assessment for the proposed upgrade of Castletroy WwTP, Limerick has been undertaken in accordance with the methodology recommended in the FRM Guidelines. The following is a summary of the flood risk assessment:

SECTION 5:

- The proposed development consists of the upgrade of the existing Castletroy WwTP. New infrastructure will be required to be constructed within greenfield areas of the existing site. The type of development is defined as 'Highly Vulnerable Development (including essential infrastructure)'.
- The Lower River Shannon forms the northern boundary of the site.
- The National Indicative Fluvial Maps indicates that portions of the existing site partially lies within Flood Zone A and B. The national flooding website www.floodmaps.ie shows records of historic flooding at the site.
- The CFRAMS map indicates that a portion of the current site lies within Flood Zone A and Flood Zone B. The map indicates that the 1% AEP fluvial flood level at the site is +6.37mOD and 0.1% AEP fluvial flood level is +6.93mOD.
- The proposed storm water tank will be constructed on the open green area of the site which is largely classified as Flood Zone C. The remainder of this structure is in Flood Zone B.
- The new primary treatment building, splitter chamber, primary sludge holding tank, odour units, picket fence thickener, forward feed pumping station, and borehole pumping station and storage tank will be constructed in Flood Zone B.
- The sludge storage skips and flood event pumping station will be constructed in both Flood Zone A and B.
- All highly essential infrastructure will be constructed at an elevation higher than the 1% AEP flood level with a suitable freeboard. The design flood level will be +6.97mOD.
- The proposed development is expected to cause minimal loss of flood plain storage and will be compensated for elsewhere on the site. Limited space is available near the watercourse to provide compensatory storage within Flood Zone C. Therefore, storage will be provided with Flood Zone A and B.
- Following the procedures as set out in the FRM Guidelines, it was deemed that the site satisfied all criteria and thus satisfied the Justification Test.
- The flood event pumping station proposed as part of the development will provide resilience to the operation of the plant during periods of high river levels by ensuring treated final effluent can be discharged to the watercourse.

5.2 Conclusions and Recommendations

It is recommended to construct new development where feasible within Flood Zone C of the current site, and that all highly essential infrastructure be constructed at an elevation higher than the 1% AEP flood level with a suitable freeboard and an allowance for the effects of climate change. This will protect the proposed development against flooding and to preserve the existing flood plain as to avoid flooding elsewhere.

Where it is not possible to locate new infrastructure in Flood Zone C due to physical or hydraulic constraints, it is recommended that compensatory storage is provided for floodplain lost during the 1% AEP flood so as not to increase flood risk elsewhere. The FRM Guidelines states that to provide compensatory storage, a volume of flood plain equal to that lost to the proposed development should be created and to ensure that flood flow routes are protected.

Appendix 1:

Site Layout Drawing

Appendix 2:

OPW Summary Local Area Reports

Appendix 3:

CFRAMS Maps

APPENDIX 3

INVASIVE SPECIES MANAGEMENT PLAN

Invasive Species Management Plan

Castletroy Wastewater Treatment Plant Upgrade Works, Limerick

DOCUMENT DETAILS

Client:	**Irish Water**
Project Title:	**Castletroy Wastewater Treatment Plant Upgrade Works, Limerick**
Project Number:	**210711**
Document Title:	**Invasive Species Management Plan**
Document File Name:	**ISMP F2 – 2023.03.01 - 210711**
Prepared By:	**MKO** **Tuam Road** **Galway** **Ireland** **H91 VW84**

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Rev	Status	Date	Author(s)	Approved By
01	Final	22/08/2022	RW	PR
02	Final	01/03/2023	RW	PR

Table of Contents

1. INTRODUCTION

1.1 Background

MKO were commissioned by JB Barry Consulting Engineers on behalf of Irish Water to carry out an Invasive Species Survey and Management Plan in relation to proposed upgrade works for Castletroy Wastewater Treatment Plant, Co. Limerick. The project involves upgrades to wastewater treatment infrastructure within the site as well as a new stormwater storage tank. The location of the site is shown in Figure 1.1. The WwTP is located approx. 20m from the Lower River Shannon SAC.

As part of site surveys carried out by MKO on the 6th of April 2022 and 23rd of July 2020, it was noted that there were infestations of Third Schedule species Himalayan Balsam (*Impatiens glandulifera*) and Giant Hogweed (*Heraceluem mantegazzianum)* within the site, particularly around the perimeters of the site. As a result, it was necessary to prepare a site-specific invasive species management plan to prevent the spread of Third Schedule invasive species during the proposed upgrade works.

The objectives of this report are summarised below:

- Provide general best practice guideline measures for the control and management of invasive species; and,
- Provide detailed recommendations for the treatment of invasive species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011).

1.2 Legislative Framework

Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011) include legislative measures to deal with the dispersal and introduction of invasive alien species.

Non-native species subject to restrictions under Regulations 49 and 50 are included in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011). High impact invasive species on this list include, among others, Japanese Knotweed, Giant Hogweed, Giant Knotweed, Giant Rhubarb, Himalayan Balsam, Himalayan Knotweed, Bohemian Knotweed and Rhododendron. Vector materials which aid in the spread of these species include soil or spoil taken from places infested with Japanese Knotweed (*Fallopia japonica*), Giant Knotweed (*Fallopia sachalinensis*) or their hybrid Bohemian Knotweed (*Fallopia x bohemia*). Two vector materials are referred to in the regulations (Third Schedule Part 3), one is blue mussel seed and the second is:

''Soil or spoil taken from places infested with Japanese knotweed, Giant knotweed or their hybrid Bohemian knotweed''.

Regulation 49

"any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow in any place specified in relation to such plant in the third column of Part 1 of the Third Schedule, any plant which is included in Part 1 of the Third Schedule, shall be guilty of an offence."

Regulation 50

"a person shall be guilty of an offence if he or she has in his or her possession for sale, or for the purposes of breeding, reproduction or propagation, or offers or exposes for sale, transportation, distribution, introduction or release

(a) an animal or plant listed in Part 1 or Part 2 of the Third Schedule, (b) anything from

which an animal or plant referred to in subparagraph

(a), can be reproduced or propagated, or

(c) a vector material listed in Part 3 of the Third Schedule,"

1.3 Guidance Documents

The following guidance documents and literature sources were consulted during the preparation of this report:

- NRA (2010). *Guidelines on management of noxious weeds and non-native invasive plant species on national roads*. National Roads Authority.
- Crushell, P., Foss, P., Hurley, C. & O'Loughlin, B. (2011). *County Kerry Invasive Species Survey 2011 - Pilot Mapping Study of the River Lee Catchment, Tralee*. Report prepared for Kerry County Council and The Heritage Council.
- Stokes et al. (2004). Stokes, K., O'Neill, K. & McDonald, R.A. (2004) *Invasive species in Ireland*. Unpublished report.
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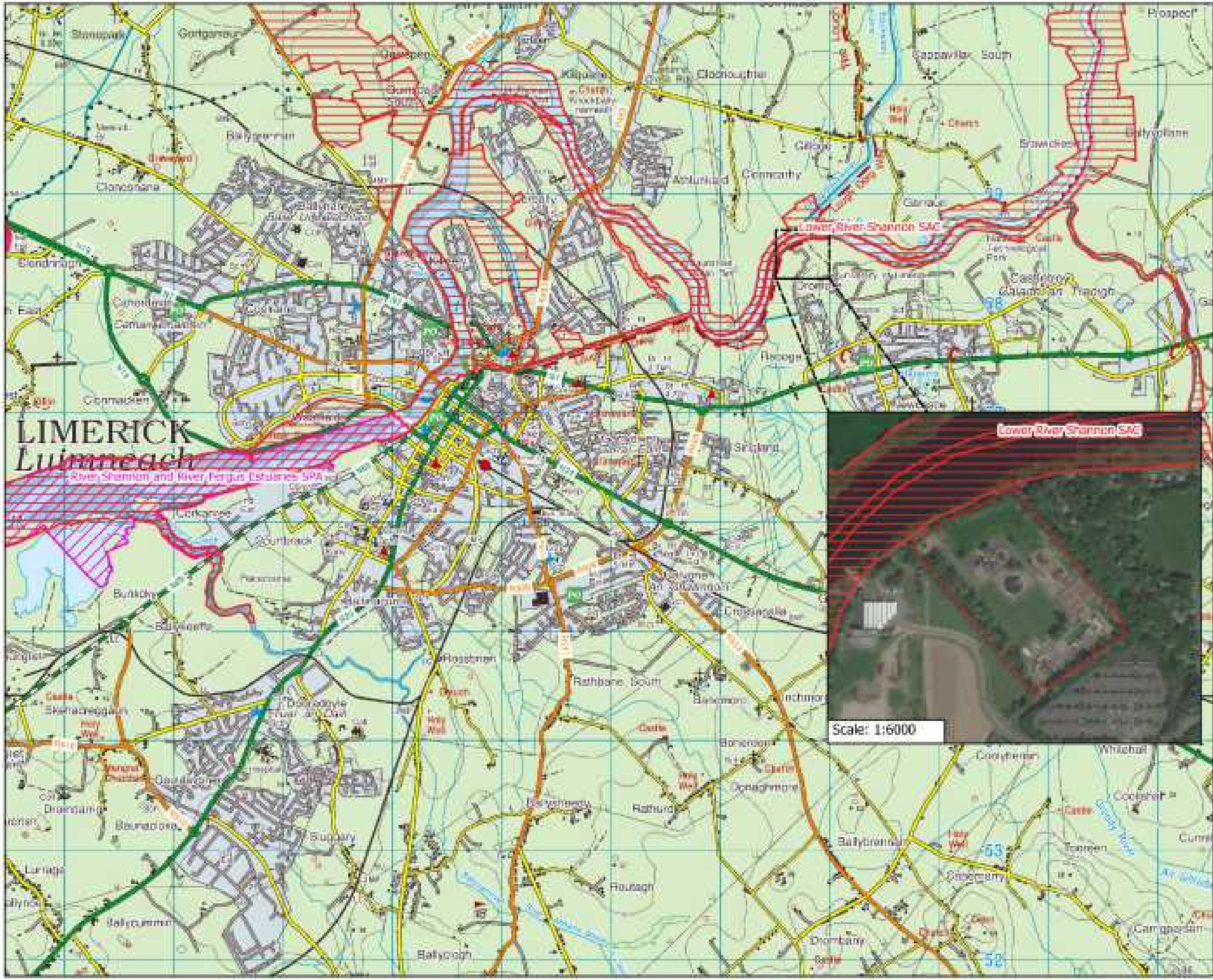
- Department of Environment (2013). *An Invasive Alien Species Strategy for Northern Ireland*. www.doeni.gov.uk
- Inland Fisheries Ireland (2016) Best Practice for Control of Himalayan Balsam (*Impatiens glandulifera*)
- Irish Water (2016) Guidance on the Management of Himalayan Balsam (IW-AMT-GL-002)
- Irish Water (2016) Guidance on the Management of Giant Hogweed (IW-AMT-GL-001)
- Property Care Association (2015) Guidance Note – Management of Himalayan Balsam
- www.invasivespeciesireland.com



Map Legend

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

Site Location

Castletroy Wastewater Treatment Plant	
AvdGM	RW
210711	Fig 1-1
1:45000	23.03.22

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2. HIMALAYAN BALSAM RECORDED

Himalayan Balsam (*Impatiens glandulifera*) is an ornamental plant that was introduced to Ireland in the 19th century. This plant can produce thousands of seeds and has thrived in Ireland due to its warmer climate. Due to its rapid growth Himalayan Balsam shades out most native plant species and can leave banks bare when it dies back in wintertime. This in turn can lead to the erosion of soil and siltation of watercourses and fish spawning grounds. The plant has pink or white flowers which appear in June – October. Himalayan Balsam has shallow roots, and explosive seed pods that can expel seeds up to 7m from the parent plant. As a result, a standard exclusion zone of 7m is applied when working in proximity to this plant.

During walkover surveys of Castletroy WwTP, Himalayan Balsam was found growing extensively outside of the boundary of the site, along the River Shannon and adjacent areas. The infestation will ultimately require management at a catchment level and the focus for Irish Water would be on best-practice avoidance and biosecurity measures to avoid further spread from within the Wastewater Treatment Plant. Due to the existence of the plant outside of the WwTP boundary, annual control of the plant within the site is recommended.

The invasive species Himalayan Balsam was concentrated along the north of the site boundary, which is close to the River Shannon, where it is originating outside of the site boundary and encroaching across the palisade fence (Plate 2-1). An infestation exists within the boundary in the northwest corner, adjacent to the existing final effluent and storm overflow chamber and the drain which delineates the western boundary (Plate 2-2, Plate 2-3)(Figure 2-1). Some individual plants and an infested area were also identified along the east and beside the existing aeration system (Plate 2-4). An infested area was also identified to the southeast of the site.

A map showing the location of Himalayan Balsam recorded is shown in Figure 2-1.

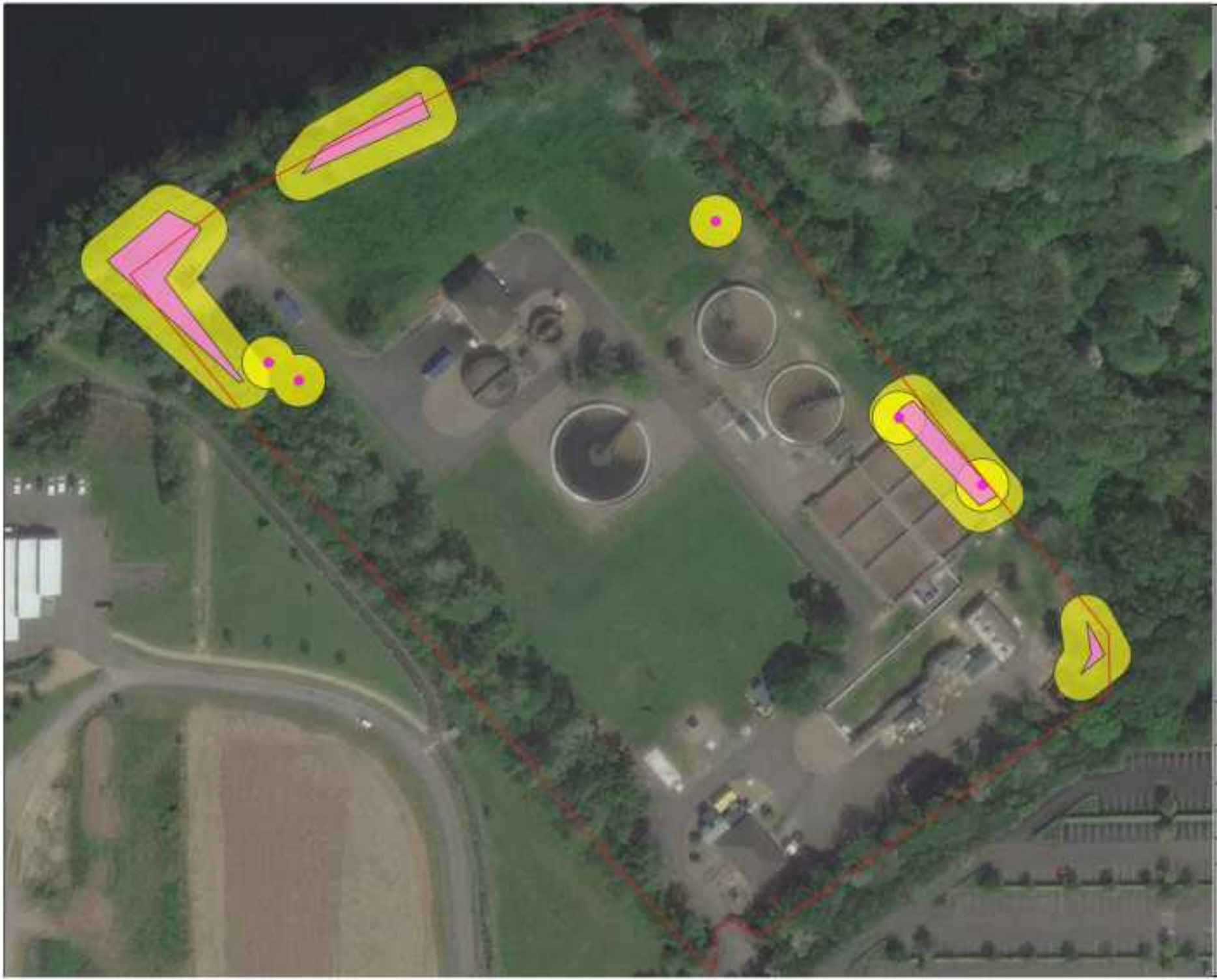
Plate 2-1 Himalayan Balsam at the northern boundary encroaching into the site from external lands.

Plate 2-2 Infestation to the northwest of the site adjacent to the existing final effluent and storm outfall chamber.

Plate 2-3 Infestation to the northwest of the site adjacent to the existing final effluent and storm outfall chamber.

Plate 2-4 Individual plants present adjacent to the existing aeration system.

Plate 2-5 Infestation outside of the site boundary along the public river walkway to the north.


Map Legend
Site Boundary
Himalayan Balsam (polygon)
Himalayan Balsalm point data
7-meter Buffer
N
Himalayan Balsam
Castletroy Wastewater Treatment Plant
RW
PR
210711
Fig 2-1
1:1300
24.06.22
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3. HIMALAYAN BALSAM MANAGEMENT PLAN

There are a number of options for the treatment of Himalayan Balsam including both chemical and mechanical. Due to the nature of the proposed works it will be necessary to achieve immediate eradication of the plant within proposed works areas in order to reduce the extent of infestation in advance of construction works. Hand-pulling the plant from proposed works areas is identified as the most appropriate control option for Himalayan Balsam at the site. The material will be kept within the site and left to dry out and die. Uprooted plants will be stockpiled and covered with jute material in order to block out light and degrade, since uprooted plants can potentially re-root form nodes in moist conditions. Infested areas within the site will be fenced off with a buffer of 7 meters and avoided where possible.

The following sections outline the steps that will be followed in order to achieve removal of the plant within the works areas and prevent any potentially contaminated material being removed off site.

3.1 Interim Before Construction Phase

Hand-pulling the plant from infested areas within the site in advance of construction phase is identified as the most appropriate control option for this species at the site.

- Himalayan Balsam hand-pulling will be supervised by a qualified ecologist and will be undertaken between the end of April to May 2023, when plants are visible but before seed pods have developed.
- To manually remove, stems will be gripped about 0.5m above the ground and carefully pulled.
- The uprooted material will be stockpiled within the site and covered with jute material in order to block out light and degrade. The stockpile will be located within an area of the site where it will be undisturbed. Indicative stockpile areas are shown in Figure 5-2.
- Post control monitoring will be carried out four weeks after the control operations to assess the need for further control in advance of construction.
- Any hand-pulling which needs to take place from June onwards will be carried out by a qualified ecologist using a plastic bag to carefully cover the seed heads.

3.2 Construction Phase

3.2.1 Pre-commencement

- A pre-commencement invasive species survey will be undertaken in advance of construction.
- Any persistent plants within works areas will first be removed by hand under supervision of the ecologist prior to works commencing and/or machinery and personnel accessing the area. This will avoid unnecessary disturbance to seed pods and potential dispersal of seed. Balsam plants will be removed by placing a plastic bag over the head of the plant to create a seal and pulling. Pulled plants will be stockpiled under jute material within the site in an area unlikely to be disturbed.
- Any current or previously mapped infested areas which can be avoided by the works will be fenced off to a 7-meter buffer.
- Throughout much of the site, it will not be possible to avoid areas that are contaminated with Himalayan Balsam. All works within 7m of Himalayan Balsam will be supervised by a suitably qualified ecologist.

- A Toolbox Talk will be given by the ecologist in relation to the management of Himalayan Balsam within the site.
- The entire site will be treated as a contaminated zone. A bio-secure zone will be set up at the entrance to the site. The bio-secure zone will comprise heras panels and/or posts and geotextile membrane in order to form a contained area for brush down of personnel and machinery to take place. Warning signage will be erected to direct personnel through the bio-secure zone prior to leaving the contaminated construction site. Clothes and shoes will be brushed down within the bio-secure area to prevent any seed being carried off site. Any material gathered here will be collected and kept within the site. The biosecure zone is shown on Figure 5-2.
- As well as personnel, any machinery will be fully brushed down prior to moving away from the works. Power washing may also be carried out, however, all washings generated during clean down will need to be fully contained and discarded within the site away from any watercourse. It is recommended that power washing be avoided due to proximity to watercourses and potential for contaminated material to escape.
- On completion of the works biosecurity measures will be removed under the supervision of the Ecologist.

3.2.2 Excavations

- Contaminated areas where pipework is to be laid can be excavated and back-filled using the original excavated soil, resulting in this soil being left in-situ.
- Any other excavated soil to be isolated and contained within the site, either within the compound area or as a bunded stockpile such as indicated on Figure 5-2, and re-used in landscaping and infilling.
- It is envisaged that no soil is to be removed from the site but is to be reinstated within the site, thus negating the need for transport off-site, further risk of spread, and licencing requirements. Should potentially contaminated spoil be required to be removed from the site, it will be transported to a suitably licenced waste facility and will require a licence from the NPWS prior to its transportation.

3.3 Post-Construction

- Post control monitoring will be carried out four weeks after the control operations to assess the need for further control and additionally on at least an annual basis, since seeds can persist in soil for up to 3 years, and since the infestation extends beyond the boundary of the WwTP.
- Uprooted areas and areas of bare soil post-construction will be re-seeded with native seed or replanted with extirpated native species, for habitat enhancement and in order to increase native competition and reduce the potential for re-establishment of Himalayan Balsam in these areas.

4. GIANT HOGWEED RECORDED

Giant Hogweed (*Heracleum mantegazzianum*) has been identified as one of the highest risk non-native invasive species in Ireland. It was introduced from the Caucasus region to Victorian gardens as an ornamental plant in the 19th Century. Since then, it has escaped into the wild and has scattered throughout the country. Giant hogweed grows in rich, moist soil and is commonly found along streams, ditches, roadsides and wet meadows. In its native range it has adapted to develop thousands of seeds in order to persist in colder climates, however, this has resulted in it becoming invasive in our milder climate where seeds can germinate more readily. Seeds spread by wind, water, animal and human influence and can remain viable in the soil for up to 15 years.

Giant hogweed is considered to be a significant danger to public health. The stems, edges and undersides of the leaves are coated with fine hairs containing phototoxic sap. The slightest contact with human skin can cause severe dermatitis in the presence of sunlight. Effects may include welts, rashes, and blistering. The sap can also cause temporary or permanent blindness following contact with eyes. Animals grazing Giant hogweed may be susceptible to poisoning or digestive disorders. The reaction can be activated by UV radiation only 15 minutes after contact, with a sensitivity peak between 30 minutes and 2 hours after contact. After a period of about 24 hours skin may redden and blister, followed by an inflammatory reaction after 3 days. Approximately one week later, hyperpigmentation of the skin occurs on the affected areas which can last for months and the skin may remain sensitive to UV light for years. **Due to the serious health risks associated with Giant hogweed, it is recommended that all methods of control are carried out by trained and experienced personnel.**

During walkover surveys of Castletroy WwTP, most recently the 6th of April 2022, Giant Hogweed was found growing extensively outside of the boundary of the site, along the River Shannon and adjacent areas. The infestation will ultimately require management at a catchment level and the focus for Irish Water would be on best-practice avoidance and biosecurity measures to avoid further spread from within the Wastewater Treatment Plant.

Giant Hogweed was found along most of the perimeter of the WwTP, however its growth was most extensive along the northwest (Plate 4-1) and western boundary (Plate 4-2), where it was found often extending from the palisade fence boundary across grassland, and was seen to have invaded wooded areas and grassland along the western boundary. Scattered infestations and individual plants are also found along the south-eastern (Plate 4-3) and eastern boundary, with one plant recorded amongst trees in the centre of the site.

A map showing the location of Giant Hogweed infestations recorded is shown in Figure 4-1.

Plate 4-1 Infestation of Giant Hogweed along the northwestern boundary.

Plate 4-2 Infestation along the drain to the west of the site.

Plate 4-3 Infestation within the southeast corner of the site.


Map Legend
Site Boundary
Giant Hogweed point data
Giant Hogweed Infestation extent
4-meter Buffer
N
Giant Hogweed
Castletroy Wastewater Treatment Plant
RW
PR
210711
Fig 4-1
1:1300
24.06.22
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5. GIANT HOGWEED MANAGEMENT PLAN

There are a number of options for the treatment of Giant Hogweed including both chemical and mechanical. Due to the nature of the proposed works it will be necessary to achieve immediate eradication of the plant within proposed works areas via spraying in order to reduce above-ground plant biomass in advance of construction works.

Soil within 4m of plants which have flowered and set seed is likely to contain vast quantities of seed and disturbance to these areas will be avoided unless required as part of a treatment/control measure. Seeds are typically concentrated in the top 50cm of soil. Infested areas within the site which can be avoided by the construction works will be fenced off with a buffer of 4 meters.

Everyone operating in areas infested with Giant Hogweed will be made aware of the health risks associated with this plant. Infestations will be fenced off including a 4m buffer zone and a warning notice erected. All parts of the plant must be avoided. Any person involved in control or treatment is at risk from direct contact or contact with small fragments of plant or sap released into the works area. Workers must wear protective synthetic water-resistant clothing. Gloves with long sleeves and protective goggles must also be worn. Care must be taken not to touch any exposed skin with gloves covered in sap. If skin is accidentally exposed then the affected area should be carefully washed with soap and water, then covered to prevent UV light reaching the area and medical advice sought.

A professional specialist contractor must be employed for treating any Giant Hogweed infestations and must carry out a detailed risk assessment prior to undertaking any survey/treatment/control measures.

The following sections outline the steps that will be followed in order to achieve removal of the plant within the works areas and prevent any potentially contaminated material being removed off site.

5.1 Interim Before Construction Phase

Immediate commencement of in-situ spraying of Giant Hogweed is identified as the most appropriate control option for this species at the site. Due to the proximity of watercourses around the site and the SAC, a suitable herbicide which is approved for use near watercourses will be required.

- An invasive species specialist with experience in Giant Hogweed and the appropriate PPE will be employed for eradication of the plant from within the WwTP.
- Herbicide treatment will only be carried out by suitably qualified personnel/contractors with strict reference to the product label, local land use, health and safety considerations, compliance with relevant legislation and adherence to Irish Water's Biocide Strategy and Policy.
- A Risk Assessment with regard to the hazards of working with and in proximity to the plant will be provided by contractors.
- Treatment has been carried out in 2022. Follow-up treatment will be carried out in May 2023 in order to treat any seedlings which may have germinated after first treatment.

5.2 Construction Phase

5.2.1 Pre-commencement

- A pre-commencement invasive species survey will be undertaken in advance of construction.
- Do not allow vehicle/machinery/personnel access to the infested area until the infestation has been treated by a Giant Hogweed Specialist and deemed not to present a health risk.

- Any current or previously mapped infested areas which can be avoided by the works will be fenced off to a 4-meter buffer, as per Figure 5-1 where possible.
- Where works within 4m of Giant Hogweed are unavoidable - these will be supervised by a suitably qualified ecologist.
- A Toolbox Talk will be given by the ecologist in relation to the management of Giant Hogweed within the site.
- The entire site will be treated as a contaminated zone. A bio-secure zone will be set up at the entrance to the site. The bio-secure zone will comprise heras panels and/or posts and geotextile membrane in order to form a contained area for brush down of personnel and machinery to take place. Warning signage will be erected to direct personnel through the bio-secure zone prior to leaving the contaminated construction site. Clothes and shoes will be brushed down within the bio-secure area to prevent any seed being carried off site. Any material gathered here will be collected and kept within the site. The location of the biosecure zone is shown in Figure 5-2.
- As well as personnel, any machinery will be fully brushed down prior to moving away from the works. Power washing may also be carried out, however, all washings generated during clean down will need to be fully contained and discarded within the site away from any watercourse. It is recommended that power washing be avoided due to proximity to watercourses and potential for contaminated material to escape.
- On completion of the works biosecurity measures will be removed under the supervision of the Ecologist.

5.2.2 Excavations

- Contaminated areas where pipework is to be laid to be excavated and back-filled using the original excavated soil, resulting in this soil being left in-situ.
- Any other excavated soil to be isolated and contained within the site, within the compound or within bunded stockpiles, and re-used in landscaping and infilling. Stockpile locations and associated bunding are shown in Figure 5-2.
- It is envisaged that no soil is to be removed from the site but is to be reinstated within the site, thus negating the need for transport off-site, further risk of spread, and licencing requirements. Should potentially contaminated spoil be required to be removed from the site, it will be transported to a suitably licenced waste facility and will require a licence from the NPWS prior to its transportation.

5.3 Post-Construction

- Ongoing monitoring for Giant Hogweed with follow-up spraying will be necessary in order to control Giant Hogweed within the site, particularly as it is pervasive in areas outside of the site.
- Uprooted areas and areas of bare soil post-construction will be re-seeded with native seed or replanted with extirpated native species, for habitat enhancement and in order to increase native competition and reduce the potential for re-establishment of Giant Hogweed in these areas.

It is not envisaged that excavated material will require removal from the site. However, if this is required it will need to completed under licence from the NPWS. Information required by the Wildlife Licensing Unit includes:

- Methods of removal;
- Methods of transport;
- Biosecurity measures;
- Copy of Management Plan;
- Timeframe for completion of works; and
- Documentary evidence that chosen landfill facility will accept the material.

In addition to this, if the Giant Hogweed material to be disposed of at a licenced waste facility has been treated through chemical means it may need to be classified as hazardous waste and transported and disposed to a fully licenced hazardous waste facility in accordance with Waste Collection Permit Regulations (S.I. No.820/2007 & Amended SI.No.87/2008) and European Communities (Shipments of Hazardous Waste exclusively within Ireland) Regulations, S.I. No.324/2011.


Map Legend
Site Boundary
Giant Hogweed point data
Giant Hogweed Infestation extent
4-meter Buffer
Himalayan Balsam Point data
Himalayan Balsam Polygon
7-meter Buffer
N
Microsoft product screen shots reprinted with permission from Microsoft Corporation.
© Ordnance Survey Ireland. All rights reserved. Licence number CYAL50007517
Drawing Title
Invasive Species Buffer Zones and Site Layout
Project Title
Castletroy Wastewater Treatment Plant
Drawn By
RW
Checked By
PR
Project No.
210711
Drawing No.
Fig 5-1
Scale
1:1,300.002869
Date
24.06.22
MKO
Planning and Environmental Consultants


Map Legend
Site Boundary
Flood Bund
Double silt fence
Compound
Biosecurity Area
Contaminated stockpile
Flood bund
N
Biosecurity Measures- Indicative Layout
Castletroy Wastewater Treatment Plant
RW
RW
210711
Fig 5-2
1:1,400
01.03.2023
MKO

6. CONCLUSIONS

The bespoke invasive species management measures outlined in the document have been designed to follow the guidance outlined in Section 1.3. Careful implementation of the prescribed management measures will ensure that the works are conducted within the confines of legislation as outlined in Section 1.2.

This Management Plan has provided a record of baseline conditions and locations of invasive species within the wastewater treatment plant site. The outlined measures have been chosen in order to initiate immediate action on infestations within the site so that plant biomass is significantly reduced before construction commences, thereby reducing contaminated waste generated during works and reducing the potential for spread of invasive species. In addition, the outlined measures reduce the need for removal of contaminated material outside of the site, further reducing the risk of spread.

It should be noted that this management plan provides for the treatment of invasive species only within the works site boundary. Any invasive species that are located outside the construction footprint will be left undisturbed and will not be the subject of any treatment as part of the current proposal.

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