

CHAPTER THIRTEEN MATERIAL ASSETS – BUILT SERVICES

13.1 INTRODUCTION

This Chapter presents the likely and significant impacts associated with the material asset (built services) environments associated with the proposed development, namely urban settlements, ownership and access, traffic infrastructure, potable water supply, wastewater discharge, electricity supply, gas supply, telecoms and municipal waste.

The following aspects of the proposed development will affect material assets within the vicinity of the development site:

- Urban Settlements (Also refer to Chapter 6.0)
- Ownership & Access (Also refer to Chapter 12.0)
- Transport Infrastructure (Refer to Chapter 12.0)
- Municipal Waste (Refer to Chapter 14.0)
- Potable Water Supply Infrastructure;
- Waste Water Infrastructure;
- Surface Water Disposal (Also refer to Chapter 9.0 Hydrology – Surface Water & Flooding)
- Electricity;
- Telecommunications.

13.2 ASSESSMENT METHODOLOGY

The potential impact of this development in relation to material assets built services was assessed in accordance with EPA Guidelines (2002) and Advice Notes (2003).

Economic assets of natural origin, which include biodiversity, land & soil and water, are addressed elsewhere in this EIAR, in particular Chapter 7.0, 8.0 and 9.0 respectively. Cultural Assets of a Physical Type and Cultural Heritage of a Social Type are addressed in Chapter 15.0 of this EIAR.

A desktop study was carried out on existing material assets associated with the site of the proposed development. Projections of resource use were undertaken for both the construction and operational phases of the proposed development, and the impacts assessed. Mitigation measures are proposed where appropriate.

13.3 RECEIVING ENVIRONMENT

13.3.1 Urban Settlements

A growing and developing suburban area to the north west of Limerick City, the character of the area is dominated by mid – low density residential development with clusters of commercial development interspersed at nodal locations. The settlement pattern is varied, dominated by individual 'housing estates' with little permeability and connectivity.

Limerick City & County Council

23 AUG 2023

The site is located approximately 3.5km from Limerick City centre and is located and surrounded by an existing and future road network (currently under construction) with easy access to Limerick city centre, the national road network and the TUS (Technological University Shannon) campus formerly LIT.

The general area comprising the masterplan site has a rural feel, notwithstanding significant residential and educational developments immediately to the east. The majority of site is surrounded by green fields apart from one off dwellings on the Pass Road to the east, the Willow Grove development on the southern side of the Cratloe Road, and the County Club Bar adjoining the site to the east. at the Old Cratloe Road - Pass Road junction. Further to the east, developments such as Thomond Village, Clonile and Shannonvale lie next to the site and mark the edge of the built up area of the Limerick suburbs.

The masterplan lands benefits from three different land use zonings, with the primary land use comprising 'New Residential Use'. The objective of this landuse is *"to provide for new residential development in tandem with the provision of social and physical infrastructure"*. The other landuse zonings are positioned fronting onto the Old Cratloe Road, including 'Open Space Use' (surrounding an existing archaeological monument) and a 'Local Centre Use'. Whilst the objective of the open space use is *"to protect, provide for and improve open space, active and passive recreational amenities"*, the objective of local centre use is *"to protect and provide local centre facilities to serve the needs of new/existing neighbourhoods and residential areas"*.

The application site is located wholly on lands zoned for 'New Residential Use'. The purpose of this zoning is intended primarily for new high quality housing development. The quality and mix of residential areas and the servicing of lands is intended as a priority to support balanced communities. It states that new housing and infill developments should include a mix of housing types, sizes and tenures, to cater for all members of society and design should be complimentary to the surroundings and should not adversely impact on the amenity of adjoining residents.

13.3.2 Ownership & Access

The applicant owns the Masterplan site, the subject site (Phase 4) and the adjoining land to the south of proposed Phase 5. The applicant acquired the land in April 2021.

The Masterplan lands will be accessed at three separate locations including, the recently constructed roundabout on the realigned Pass /Meelick Road and two separate standard DMURS compliant property 'T' junctions located on the southern and northern side of the upgraded section of the Old Cratloe Road which has been designed as part of the Coonagh – Knockalisheen Distributor Road Scheme which is expected to be completed by 2025 / 26. The upgraded Old Cratloe Road immediately south of the site and the realigned Meelick Road to the east, will comprise a 6.6m carriageway with footpaths and cycle lanes on both sides.

The subject lands comprising Phase 4 will be accessed via the upgraded Old Cratloe Road. It is estimated that 70% of construction traffic (staff/misc. via cars, etc) will arrive/depart via the proposed roundabout junction to the east and 30% of construction traffic (deliveries via HGV) will arrive/depart via a new proposed junction to the west on the Old Cratloe Road.

Limerick City & County Council

23 AUG 2023

13.3.3 Foul Water

Based on existing record drawings, surveys and site visits it was established that the following foul water drainage infrastructure is located within the vicinity of the site:

- A new foul water network is proposed to be installed as part of the Old Cratloe Road upgrade works south of the development.

It is proposed to provide a single gravity foul sewer system to serve the development proposal. The foul sewerage from the overall development is planned to discharge to the foul network to be installed as part of the Old Cratloe Road upgrade works south of the development. The foul sewer network was designed in accordance with Irish Water Code of Practice July 2020 and to IS EN 12056/ IS EN 752, using hydraulic modelling software WinDes, which uses the Colebrook White equation.

A pre-connection enquiry was lodged with Irish Water (Connection Reference No. CDS22003876) for the development outlining the proposed flows and loads which would be generated by the development. This application was undertaken to determine if there is adequate capacity in the existing public foul sewer network to cater for this development. The proposal was accepted as feasible in principle by Irish Water.

The estimated daily foul loading for the proposed development has been calculated as 21.9 m³/day

13.3.4 Surface Water

Based on existing record drawings, surveys and site visits it was established that the following surface water drainage infrastructure is located within the vicinity of the site:

- An existing watercourse to the west of the Masterplan Site and the proposed development that drains the site that discharges north to an OPW channel.
- A new stormwater network is proposed to be installed as part of the Old Cratloe Road upgrade works south of the development.

A new surface water sewer network shall be provided for the proposed development which will be entirely separate from the foul water sewer network. The design of the storm water network and SUDS allow for 30% climate change and 10% urban creep of the housing area for the developed site. The storm pipe network has been designed in accordance with IS EN 12056, IS EN752 and the Greater Dublin Strategic Drainage Study.

The storm drainage from the roads and footpaths will be collected in gullies and discharged via a traditional storm pipe network. Given the topography of the site and available green spaces, two networks with separate infiltration and storage areas are proposed in Phase 4.

The northern storage area infiltrates and attenuates the surface water flow from the northern section of phase 4 and discharges via a pipe network to the southern storage area a rate of 10 l/s. This storage area is oversized to cater for stormwater flows from the wider Masterplan Site.

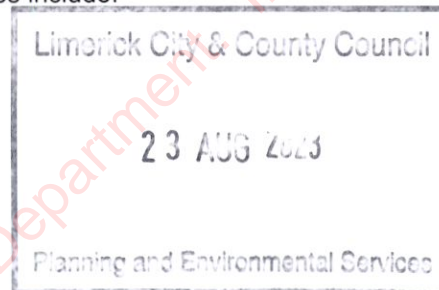
The southern storage area infiltrates and attenuates the surface water flow from the southern section of Phase 4 and also caters for the restricted flow from the Northern storage area and other masterplan areas. Area 2 discharges to the existing watercourse at the western boundary at a rate of 20 l/s for the

Phase 4. This storage area is also oversized to cater for stormwater flows from the wider Masterplan Site.

Surface water run-off from roof areas and hardstanding areas are designed to be collected by a gravity pipe network. Surface water will be collected and discharged via a mixture of traditional and Sustainable Urban Drainage Systems (SuDS). Prior to discharging to the existing open drains, surface water will flow through attenuation tank, class 1 bypass separators and flow control devices. Forward flow from the development will be restricted to either 2l/s/ha for the net drained area of the site or the greenfield runoff rate of the net drained area of the site which is in accordance with Limerick Development Plan 2022-2028. The restricted flows associated with the Phase 4 net drained area lands is limited to 4.5 litres per second, being the existing greenfield run off rate.

The proposed development has been assessed in relation to Sustainable Urban Drainage Systems (SuDS) and a variety of SuDS measures have been adopted to decrease the impact of the development on the receiving environment by reducing surface water run-off and also providing amenity and biodiversity in many cases. The proposed SuDS measures include:

- Rainwater butts
- Permeable paving
- Bypass separator
- Infiltration and storage areas



13.3.5 Water Supply

Based on existing record drawings, surveys and site visits it was established that the following watermain infrastructure is located within the vicinity of the site:

- An existing 200mm diameter watermain is proposed to be upgraded as part of the Old Cratloe Road upgrade works south of the development.

It is proposed to provide a 150mm diameter watermain for the proposed development.

The estimated daily demand for the proposed development has been calculated as 21.9 m³/day

To reduce the water demand on Local Authority water supplies and to reduce the foul discharge from the development, water conservation measures will be incorporated in the sanitary facilities throughout the development, e.g., dual flush toilets, monobloc low volume push taps and waterless urinals.

13.3.6 Natural Gas Supply

Gas Networks Ireland has a capped 125mm PE 80 4 Bar gas supply in the area which will serve the proposed site.

13.3.7 Electrical Supply

ESB have low voltage (LV) lines traversing the site and medium voltage (MV) lines in close proximity which will be used to facilitate several cabinet Kiosk type MV/LV substations. There will be a separate Kiosk substation per 150 units. The LV network will be distributed via underground ducting and ESB Mini pillars.

13.3.8 Information and Communications Technology (ICT)

There are currently telecom services in the area, operated by SIRO or Virgin Media and these will be extended into the site to provide telecoms & broadband services to each home user. A full duct infrastructure to facilitate EIR FTTH (Fibre To The Home) 10Gigabit Broadband will be provided so each unit will have access to the national broadband plan. This infrastructure will ensure the provider can provide current and next generation broadband to each home.

13.4 DESCRIPTION OF EFFECTS

Seven different 'Delivery Phases' of development, as detailed in Chapter 1.0, are proposed to effectively deliver the overall indicative masterplan. This application relates to Phase 4 (54 no. units) as detailed in Chapter 1.0 and 2.0 of this EIAR. Whilst seven different phases are proposed at this point in time, the reality is that some of the phases could be fast-tracked such that two phases advance in construction together. This, however, is very much dependent on market conditions and the specific requirements of contractors. In any case, should different phases cumulatively progress together, the overall impacts are unlikely to be different.

In order to ensure an effective and conclusive environmental assessment consistent with best practise, the assessment of potential effects on the environment also examines the collective cumulative effects of the overall development if all seven development phases, as detailed in Chapter 1.0, were implemented. The examination of the 'all phase' development scenario is consistent with best practice in order to examine a 'worst-case' scenario of the project effects.

It is not envisaged that the proposed development will result in any significant long-term effects on the environment due to the built services associated with the proposed development. There is however likely to be some minor impact experienced, by way of temporary disruption, during the construction phase of this development.

13.4.1 'Do – Nothing' Scenario

The site is appropriately zoned for development and accordingly has been 'planned' for development within the Limerick Development Plan 2022 -2028, to facilitate residential and ancillary commercial use within a local centre. A 'do nothing' impact would result in the subject lands remaining undeveloped and underutilised having regard to its zoning provisions and its location within an urban area.

Continuing with the land in an undeveloped state would be an underutilisation of the site from a sustainable planning and development perspective, particularly considering the serviced nature of the lands, the new road network under construction and its location in proximity to Limerick city centre. The status of the environmental receptors described throughout this EIAR document would likely remain unchanged. The potential for any likely and significant adverse environmental impacts arising from both the construction and operational phases of the proposed development would not arise.

In terms of the likely evolution without implementation of the project as regards natural changes from the baseline scenario, it is considered there would be no change from the baseline scenario in relation to material assets. Further, there would be no additional demand or loading on material assets, built services.

However, similarly the potential for any likely and significant positive environmental impacts arising from both the construction and operational phases of the proposed development would also not arise. The site is largely zoned for residential use purposes within the Development Plan with objectives to promote, the development and creation of sustainable communities on appropriately zoned lands, accessible by public and sustainable modes of transport.

13.4.2 Construction Phase

The new development will require new connections to all service providers as well as to public water supply and waste water networks, which may result in temporary disruption of existing services in the vicinity of the development in order to facilitate the connection.

The surface water runoff to the existing open drains will need to be managed on site during construction. Refer to Chapter 9.0 Hydrology – Surface Water & Flooding for details of proposals on site.

It is anticipated that between 50 – 60 work personnel will be employed on site during peak construction periods. The existence of the construction site and site personnel will result in an increase in the demand for power, water and also result in an increase in foul water discharges.

13.4.3 Operational Phase

The existence of the proposed development will result in an increase in the demand on all required services. Having regard to the potential of the overall masterplan site to accommodate 448 no. units, including the subject site, the potential is for the masterplan to result in a projected population of approximately 1,210 people. This will result in a sizeable new community within the area. This is considered significant, permanent and positive, particularly in the context of current housing demand, but it will place significant additional strains on existing services in the area.

The important consideration is that the potential population generated from the proposed development has already been planned for in the context of the Limerick Development Plan 2022 - 2028 and the projected household growth in Limerick city of an additional 11,054 residential units between 2022 – 2028. The new Limerick Development Plan was adopted in 2022 with adequate planned provision made for supporting services and facilities over the plan period.

The existence of the proposed development will increase the impermeable areas of the site and reduce the permeable greenfield nature of the site. However, as outlined in section 13.3.4, surface water SUDS measures, including restricting surf water outflows to predeveloped peak flows, will be implemented in order to reduce the impact on the environment.

13.4.4 Cumulative Impacts

The proposed development will increase the impact on the existing built assets and water services in the area. Having regard to other permitted developments in the area, which are either under construction or where construction has not yet commenced, there is potential for greater impact arising from the demand of additional population working in the area.

The potential cumulative impacts of the proposed development on built services have been considered in conjunction with the ongoing changes in the surrounding area. A planning history review was

undertaken to identify any recently approved or pending developments which may have a cumulative impact with the proposed development. There are no significant developments permitted in the area, which have not yet been constructed, save for the Masterplan site itself which have been detailed in Chapter 1.0 Table 1.1.

The proposed development does need to be considered in conjunction with the works currently underway, delivering the proposed Coonagh to Knockalisheen Distributor Project. This infrastructure project secured consent from An Bord Pleanála in 2021 and was subject to the preparation of an EIAR and Environmental Impact Assessment. This new infrastructure will provide greater connectivity to existing services and facilities in the area.

The individual and combined effects as discussed above when considered holistically are likely to have a negative, not significant and temporary impact on, built services as long as mitigation measures outlined are put in place.

13.5 DESCRIPTION AND SIGNIFICANCE OF IMPACTS

This section provides a description of the specific, direct and indirect, impacts that the proposed development may have during both the construction and operational phases of the proposed development. The existence of the proposed development is likely to result in an increase in the demand on all required services.

13.5.1 Construction Phase

Foul Water

The proposal will involve providing a connection to the existing foul water infrastructure. The connection will be made before the development is occupied. The impact is likely to be neutral, imperceptible and temporary.

The site compound will require a temporary foul connection. The impact is likely to be neutral, imperceptible and temporary.

Surface Water

The proposal will involve providing new surface water outfall to an existing open drain. The proposed surface water drainage network will not interact with the existing surface water drainage network outside the site boundary. The impact is likely to be neutral.

The site compound will require appropriate temporary soakways. Refer to Chapter 9.0 Hydrology – Surface Water & Flooding for further details of surface water management during construction. The impact is likely to be neutral, imperceptible and temporary.

Potable Water Supply

The proposal will involve providing a new connection to the existing potable water supply network. There is potential for some short-term impacts by way of disruption in water supply due to these works to facilitate connecting the development to the existing public water supply network. This could lead to

disruption in water supply to nearby residences and buildings for short periods. The potential impact on the local public water supply network is likely to be negative, not significant and temporary.

The site compound will require a temporary watermain connection. The impact is likely to be negative, not significant and temporary.

Natural Gas Supply

The proposal will involve providing a new connection to the existing Gas Networks Ireland network. There is potential for some short-term impacts by way of disruption in Gas supply due to these works to facilitate connecting the development to the existing public Gas supply network. This could lead to disruption in Gas supply to nearby residences and buildings for short periods. The potential impact on the local Gas supply network is likely to be negative, not significant and temporary.

Electrical Supply

The proposal will involve rerouting of existing LV Lines through the site. There is potential for some short-term impacts by way of disruption in Electricity supply due to these works to facilitate connecting the development to the existing ESB Networks supply network. This could lead to disruption in electricity supply to nearby residences and buildings for short periods. The potential impact on the local ESB network is likely to be negative, not significant and temporary.

Information and Communications Technology

The proposal will involve routing ductwork from the existing network to each building. This will have negligible or no impact to nearby residences and buildings.

13.5.2 Operational Phase

Foul Water

The impact of the proposed development on the public foul sewerage system is likely to be an increase in the quantity of wastewater discharging to the Bunlicky Waste Water Treatment Plant, Dock Road, Limerick.

A pre-connection enquiry was lodged with Irish Water for the development outlining the proposed flows and loads which would be generated by the development. This application was undertaken to determine if there is adequate capacity in the existing public foul sewer network to cater for this development. The proposal was accepted as feasible in principle by Irish Water.

The potential impact of the proposed development on the public foul sewerage system is likely to be negative, slight and long term.

Surface Water

Surface water run-off discharge rates from the development site may be increased because of an increase in impermeable surfaces, shorter flow paths through pipes and reduced roughness co-efficient. However, implementation of SuDS measures and surface water infiltration and attenuation would aim to restrict runoff rates to 2l/s/ha or the pre-development greenfield runoff for the site which is in accordance with Limerick Development Plan 2022-2028. Therefore, the impact is likely to be neutral.

23 AUG 2023

Water Supply

The impact of the proposed development on the public water supply is likely to be an increase in demand on the existing supply.

A pre-connection enquiry was lodged with Irish Water for the development outlining the proposed flows and loads which would be associated with the housing development. This application was undertaken to determine if there is adequate capacity in the existing public watermain network to cater for this development. The proposal was accepted as feasible in principle by Irish Water reference number CDS22003876.

The potential impact of the proposed development on the public water supply network is likely to be negative, slight and long term.

Natural Gas Supply

The impact of the proposed development on the GNI supply is likely to involve an increase in demand as there will additional buildings to be serviced from the network, however in saying this, each of the proposed building types will be constructed to achieve an enhanced Thermal performance and will be Fully Part L compliant, resulting in reduced energy demands for same.

Electrical Supply

The impact of the proposed development on the ESB Networks supply is likely to be an increase in demand on the existing supply. There will be a separate MV/LV substation per 150 units. The potential impact of the proposed development on the electricity supply is likely to be negative, slight and long term.

Information and Communications Technology (ICT)

The impact of the proposed development on the Telecommunications network is likely to be an increase in demand on the existing capacity. There is capacity within the network to supply expected demand. There are numerous ICT utility companies within the area, and the proposed development will provide ducting to accommodate same, ensuring a competitive market is available to all proposed buildings.

13.6 REMEDIAL & MITIGATION MEASURES

13.6.1 Construction Phase

The following mitigation measures are recommended for the construction phase of the development:

BUILT SERV CONST 1 - Provision of Utilities shall be carried out and monitored in accordance with the recommendations and requirements of the relevant statutory bodies (ESB, Gas Networks Ireland, Irish Water, EIR, Limerick City and County Council etc.) and to ensure compliance with health & safety legislation.

BUILT SERV CONST 2 - Prior to the commencement of excavations in public areas, all utilities and public services are to be identified and checked; to ensure that adequate protection measures are implemented to minimise the risk of service disruption.

BUILT SERV CONST 3 - All proposed connections to existing services shall be constructed at off-peak times to minimise disruption to neighbouring properties.

BUILT SERV CONST 4 - Water metering shall be included to record consumption to ensure there are no leaks as a result of the project.

Refer to Chapter 9.0 Hydrology – Surface Water & Flooding for details of surface water mitigation measures proposed on site. With the implementation of these mitigation measures, the severity of the impact of the proposed development on the built services will be minimised, with tie-ins to existing services and installation of new services completed in a satisfactory manner for the relevant service providers.

13.6.2 Operational Phase

The design and construction of the required services infrastructure in accordance with the relevant guidelines and codes of practice is likely to mitigate any potential impacts during the operational phase of the development. Any additional mitigation measures required for the proposed built services, if required, during the operational phase will be as advised by the relevant service provider. The operational phase of private assets should be monitored by the management company for the relevant buildings.

13.7 RESIDUAL IMPACTS

13.7.1 Construction Phase

Residual impacts on the built services during the construction phase is considered to be temporary and occasional in nature and not significant, where service is unavoidably disrupted to facilitate the construction phase.

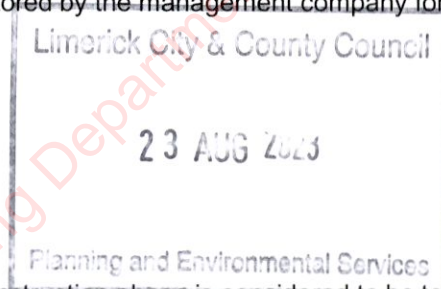
13.7.2 Operational Phase

Residual impacts on built services during the operational phase given the new infrastructure, is considered to be long term with a positive impact to all end users once the appropriate mitigation and monitoring measures are implemented.

13.8 MONITORING

13.8.1 Construction Phase

- Water consumption will be monitored for the development during construction through the use of water meters. This will ensure that any potential leaks as a result of construction are addressed promptly.
- All water mains to be pressure tested and cleaned in accordance with the Irish Water code of practice prior to connecting to the existing potable water supply network. This will ensure that the watermain is leak free, clean and ready to receive water before the development is operational.



- All foul sewers to be pressure tested and cleaned in accordance with the Irish Water code of practice prior to connecting to the existing foul sewer network. This will ensure that the foul sewer is leak free, clean and ready to receive foul effluent before the development is operational.

13.8.2 Operational Phase

- All new infrastructure, which is to serve the proposed development, is to be routinely inspected with any maintenance carried out, as required.
- Any monitoring of the built services required during the operational phase of the proposed project will be as advised by the relevant services providers.

13.9 REFERENCES

Irish Water Code of Practice for Wastewater Infrastructure

Irish Water Code of Practice for Water Infrastructure

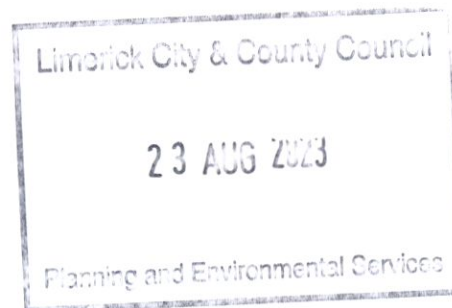
Limerick Development Plan 2022-2028

<https://www.esbnetworks.ie/staying-safe/contractor-safety/digging-and-excavation-work>

<https://www.gasnetworks.ie/corporate/freedom-of-information/make-a-request/>

<https://cbyd.emaps.eircom.ie/Eircom-CBYD/>

Guidelines on the information to be contained in Environmental Impact Assessment Reports, EPA, (2022)



Limerick City & County Council Planning Department. Inspection Purposes Only

Limerick City & County Council
23 AUG 2023
Planning and Environmental Services

CHAPTER FOURTEEN MATERIAL ASSETS – WASTE MANAGEMENT

14.1 INTRODUCTION

This chapter evaluates the impacts, if any, which the proposed development may have on Material Assets as defined in Directive 2014/52/EU, the EPA Guidelines on the Information to be contained in EIAR (2022) and EPA Draft Advice Notes for EIS 2015.

This chapter has also been prepared to address the issues associated with material assets during the construction and operational phases of the proposed development as described in Chapter 2.0 (Project Description & Policy). It has been prepared in accordance with European Commissions Guidelines, Guidance on the preparation of the Environmental Impact Assessment Report (2017), the EPA Guidelines on the Information to be contained in EIAR (2022) and the EU Commission Notice on changes and extensions to projects (2021).

14.1.1 Legislation and Guidance

These documents will ensure the management of wastes arising at the proposed development site in accordance with legislative requirements and best practice standards.

Waste management in Ireland is subject to EU, national and regional waste legislation and control, which defines how waste materials must be managed, transported and treated. The overarching EU legislation is the Waste Framework Directive (2008/98/EC) which is transposed into national legislation in Ireland. The cornerstone of Irish waste legislation is the Waste Management Act 1996 (as amended). European and national waste management policy is based on the concept of 'waste hierarchy', which sets out an order of preference for managing waste (prevention > preparing for reuse > recycling > recovery > disposal) (Figure 14.1).



Figure 14.1 Waste Hierarchy (Source: European Commission)

Limerick City & County Council

23 AUG 2023

Planning and Environmental Services 14

EU and Irish National waste policy also aims to contribute to the Circular Economy by extracting high-quality resources from waste as much as possible. CE is a sustainable alternative to the traditional linear (take-make-dispose) economic model, reducing waste to a minimum by reusing, repairing, refurbishing and recycling existing materials and products. (Figure 14.2).



Figure 14.2 Circular Economy (Source: Repak)

The Irish government issues policy documents which outline measures to improve waste management practices in Ireland and help the country to achieve EU targets in respect of recycling and disposal of waste. The most recent policy document, Waste Action Plan for a Circular Economy – Waste Management Policy in Ireland (WAPCE), was published in 2020 and shifts focus away from waste disposal and moves it back up the production chain. The move away from targeting national waste targets is due to the Irish and international waste context changing in the years since the launch of the previous waste management plan, A Resource Opportunity, in 2012.

One of the first actions to be taken from the WAPCE was the development of the Whole of Government Circular Economy Strategy 2022-2023 'Living More, Using Less' (2021) to set a course for Ireland to transition across all sectors and at all levels of Government toward circularity and was issued in December 2021.

The Circular Economy and Miscellaneous Provisions Act (2022) was signed into law in July 2022. The Act underpins Ireland's shift from a "take-make-waste" linear model to a more sustainable pattern of production and consumption, that retains the value of resources in our economy for as long as possible and that will to significantly reduce our greenhouse gas emissions. The Act defines Circular Economy for the first time in Irish law, incentivises the use of recycled and reusable alternatives to wasteful, single-use disposable packaging, introduces a mandatory segregation and incentivised charging regime for commercial waste, streamlines the national processes for End-of-Waste and By-Products decisions, tackling the delays which can be encountered by industry, and supporting the availability of recycled secondary raw materials in the Irish market, and tackles illegal fly-tipping and littering.

The strategy for the management of waste from the construction phase is in line with the requirements of the EPA's 'Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects' (2021). The guidance documents, Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects and Construction and Demolition Waste Management: A Handbook for Contractors and Site Managers (FÁS & Construction Industry Federation, 2002), were also consulted in the preparation of this assessment.

There are currently no Irish guidelines on the assessment of operational waste generation, and guidance is taken from industry guidelines, plans and reports including the Southern Region Waste Management Plan 2015 – 2021, BS 5906:2005 Waste Management in Buildings – Code of Practice, the LCCC City and County of Limerick (Segregation, Storage and Presentation of Household and Commercial Waste) Bye-Laws (2019) the EPA National Waste Database Reports 1998 – 2019 and the EPA National Waste Statistics Web Resource.

14.2 ASSESSMENT METHODOLOGY

The assessment of the impacts of the proposed development, arising from the consumption of resources and the generation of waste materials, was carried out taking into account the methodology specified in relevant guidance documents, along with an extensive document review to assist in identifying current and future requirements for waste management; including national and regional waste policy, waste strategies, management plans, legislative requirements and relevant reports.

This chapter is based on the proposed development, as described in Chapter 2 (Project Description & Policy) and considers the following aspects:

- Legislative context;
- Construction phase (including demolition, site preparation and excavation); and
- Operational phase

A desktop study was carried out which included the following:

- Review of applicable policy and legislation which creates the legal framework for resource and waste management in Ireland;
- Description of the typical waste materials that will be generated during the construction and operational phases; and
- Identification of mitigation measures to prevent waste generation and promote management of waste in accordance with the waste hierarchy.

Estimates of waste generation during the construction and operational phases of the proposed development have been calculated and are included in Section 14.3.1 of this chapter. The waste types and estimated quantities are based on published data by the EPA in the National Waste Reports and National Waste Statistics, data recorded from similar previous developments, Irish and US EPA waste generation research as well as other available research sources.

Mitigation measures are proposed to minimise the effect of the proposed development on the environment during the construction and operational phases, to promote efficient waste segregation and to reduce the quantity of waste requiring disposal.

A detailed review of the existing ground conditions on a regional, local and site-specific scale are presented in Chapter 8.0 Land & Soils, Geology & Hydrogeology.

14.3 RECEIVING ENVIRONMENT

In terms of waste management, the receiving environment is in the jurisdiction of Limerick City and County Council (LCCC) as the local authority responsible for setting and administering waste management activities in the area. This is governed by the requirements set out in the Southern Region Waste Management Plan 2015-2021 and the Waste Action Plan for a circular economy – Waste Management Policy in Ireland. Currently the southern region and other regional waste management plans are under review and the Regional Waste Management Planning Offices expect to publish the final plan in 2022.

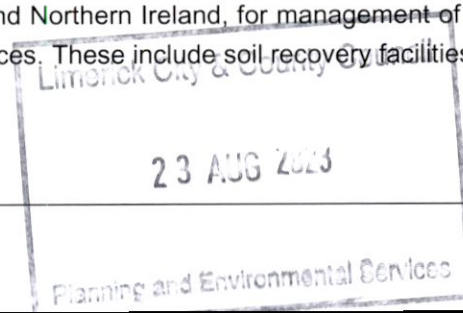
The Southern Region Waste Management Plan sets out the following targets for waste management in the region:

- A 1% reduction per annum in the quantity of household waste generated per capita over the period of the plan;
- Achieve a recycling rate of 55% of managed municipal waste by 2025; and
- Reduce to 0% the direct disposal of unprocessed residual municipal waste to landfill (from 2016 onwards) in favour of higher value pre-treatment processes and indigenous recovery practices.

The Plan sets out the strategic targets for waste management in the region and sets a specific target for C&D waste of “70% preparing for reuse, recycling and other recovery of construction and demolition waste” (excluding natural soils and stones and hazardous wastes) to be achieved by 2020. Ireland achieved 84 per cent material recovery of such waste in 2019, and therefore surpassed the 2020 target and is currently surpassing the 2025 target. The National Waste Statistics update published by the EPA in November 2021 identifies that Ireland’s current against “Preparing for reuse and recycling of 50% by weight of household derived paper, metal, plastic & glass (includes metal and plastic estimates from household WEEE)” was met for 2020 at 51% however they are currently not in line with the 2025 target (55%).

The LCCC Limerick Development Plan 2022-2028 also sets out policies and objectives for the LCCC area which reflect those set out in the regional waste management plan.

In terms of physical waste infrastructure, LCCC no longer operates any municipal waste landfill in the area. There are a number of waste permitted and licensed facilities located in the Southern Waste Region, in the surrounding counties and over Ireland and Northern Ireland, for management of waste from the construction industry as well as municipal sources. These include soil recovery facilities, inert



C&D waste facilities, hazardous waste treatment facilities, municipal waste landfills, material recovery facilities, waste transfer stations and two waste-to-energy facilities.

However, these sites may not be available for use when required or may be limited by the waste contractor selected to service the development in the appropriate phase. In addition, there is potential for more suitably placed waste facilities or recovery facilities to become operational in the future which may be more beneficial from an environmental perspective.

The ultimate selection of waste contractors and waste facilities would be subject to appropriate selection criteria proximity, competency, capacity and serviceability.

14.3.1 Site Area

The characteristics of the proposed development that are relevant in terms of waste management are primarily construction related including site clearance and topsoil stripping; and earthworks. A cut and fill exercise was undertaken for the entire masterplan site and Phase 4 based on existing site levels minus 300mm for topsoil versus the finished site levels and minus 300mm for an average imported fill build-up to roads, footpaths and slabs. Assumed bedrock level based on desktop studies and available SI information. Not included in the figures is excavation relating to the provision of attenuation areas, services and the excavation of foundations are these are considered to be typical of any construction project.

Masterplan Area

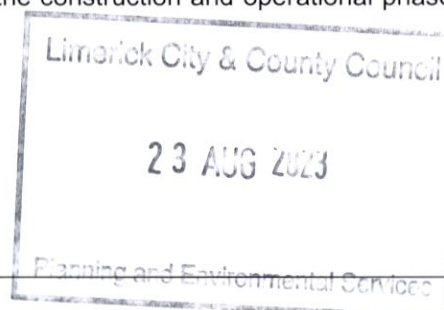
For the overall Masterplan Site, it has been determined that circa 33,500m³ of subsoil material will need to be excavated to facilitate the proposed development and that imported fill of 25,500m³ is required. The quantum of fill required will be reduced by reusing bedrock as Class 1 material any other existing site won materials as appropriate. Top soil stripping will result in circa 42,000m³ of material although it is envisaged that circa 15,000m³ of this will be reused.

Subject Site

For the Phase 4 subject site it has been determined that circa 9,300m³ of subsoil material will need to be excavated to facilitate the proposed development and that imported fill of 9,500m³ is required. The quantum of fill required will also be reduced by reusing bedrock as Class 1 material any other existing site won materials as appropriate. Top soil stripping will result in circa 7,500m³ of material although it is envisaged that circa 3,000m³ of this will be reused.

14.4 DESCRIPTION OF EFFECTS

Impacts on waste management will occur during both the construction and operational phases of the proposed development.



14.4.1 Construction Phase

During the construction phase, waste will be produced from surplus materials such as broken or off-cuts of timber, plasterboard, concrete, tiles, bricks, etc. Waste from packaging (cardboard, plastic, timber) and oversupply of materials may also be generated. The appointed Contractor will be contractually required to ensure that oversupply of materials is kept to a minimum and opportunities for reuse of suitable materials is maximised.

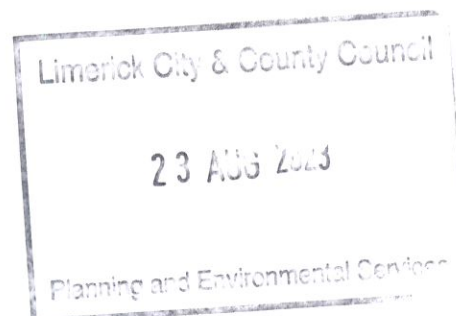
There will be waste materials generated from the excavation of soil, stones, gravel and clay to facilitate site clearance, site levelling, construction of new building foundations and installation of services. It is currently envisaged that circa 25% of the subsoil cut could be reused on site thereby reducing waste generated from the development and reducing the quantum of imported fill required. Within the masterplan site it is envisaged that circa 8,375m³ of subsoil material will be reused and within the Phase 4 application site it is envisaged that circa 2,400m³ of subsoil material will be reused, thereby reducing the movement of waste from the site.

Removal and reuse / recycling / recovery / disposal of the material will be carried out in accordance with the Waste Management Act 1996 (as amended), the Waste Management (Collection Permit) Regulations 2007 (as amended) and the Waste Management (Facility Permit & Registration) Regulations 2007 (as amended). The volume of waste requiring recovery / disposal will dictate whether a Certificate of Registration (COR), permit or licence is required for the receiving facility. Alternatively, the material may be classed as by-product in accordance with Regulation 15 (By-products) (Previously Article 27 and referred to as Article 27 in this report) of European Union (Waste Directive) Regulations 2011-2020).

In order to establish the appropriate reuse, recovery and / or disposal route for the soils and stones to be removed off-site, it will first need to be classified. Waste material will initially need to be classified as hazardous or non-hazardous in accordance with the EPA publication Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous (2019).

Waste will also be generated from construction phase workers e.g. organic / food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables and, potentially, sewage sludge from temporary welfare facilities provided on-site during the construction phase. Waste printer / toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated in small volumes from site offices.

Table 14.1 provides an estimate of the main waste types likely to be generated during the construction phase of the proposed Phase 4 development.



Waste Type	Tonnes	Reuse		Recycle/Recovery		Disposal	
		%	Tonnes	%	Tonnes	%	Tonnes
Mixed C&D	55	10	5	80	44	10	5
Timber	46	40	19	55	26	5	2
Plasterboard	17	30	5	60	10	10	2
Metals	13	5	1	90	12	5	1
Concrete	10	30	3	65	6	5	0
Other	25	20	5	60	15	20	5
Total	166						

Table 14.1 Estimated off-site reuse, recycle and disposal rates for construction waste

14.4.2 Operational Phase

A strategy for segregation (at source), storage and collection of all wastes generated within the buildings (houses & commercial units) during the operational phase including dry mixed recyclables (DMR), organic waste and mixed non-recyclable waste (MNR) is proposed as well as a strategy for management of waste glass, batteries, WEEE, chemicals, textiles, waste cooking oil and furniture.

The proposed development will give rise to additional waste generation arising from an increase in population in the area.

The handling of waste within the site will be through a bin management system, with the location of bins serving apartments provided within dedicated waste storage areas (WSA's) identified on the drawings and bins serving houses located within their curtilage. As required, the residents and tenants will need to bring these segregated wastes from their units to their allocated Waste Storage Areas (WSAs).

It is an objective to ensure that the proposed development contributes to the targets outlined in the Southern Region Waste Management Plan 2015 – 2021, Waste Action Plan for a Circular Economy – Waste Management Policy in Ireland and the LCCC "City and County of Limerick (Segregation, Storage and Presentation of Household and Commercial Waste) Bye-Laws (2019)".

14.4.3 Cumulative Impacts

As has been identified in the receiving environment section cumulative development primarily relate to the Masterplan Site along with existing development already built and in operation. These have all contributed to characterisation of the baseline environment. As such any further environmental impacts that the proposed development may have in addition to these already constructed and operational, have been assessed in the preceding sections of this chapter.

Construction Phase

There are existing residential and commercial developments close by, along with the planning permission granted for Phase 1 although currently on third party appeal to An Bord Pleanála. In a worst-case scenario, multiple developments in the area could be developed concurrently or overlap in the construction phase, including construction of the Coonagh – Kinockalisheen Road.

Limerick City & County Council

23 AUG 2023

Due to the high number of waste contractors in the LCC region, as provided from the National Waste Collection Permit Office and the EPA, there would be sufficient contractors available to handle waste generated from a large number of these sites simultaneously, if required. Similar waste materials would be generated by all of the developments.

Other developments in the area will be required to manage waste in compliance with national and local legislation, policies and plans which will mitigate against any potential cumulative effects associated with waste generation and waste management. As such the cumulative effect will be short-term, imperceptible and neutral.

Operational Phase

There are existing residential and commercial developments close by, along with the potential development arising from the Masterplan Site, as discussed above. All of the current and potential developments will generate similar waste types during their operational phases. Authorised waste contractors will be required to collect waste materials segregated, at a minimum, into recyclables, organic waste and non-recyclables. An increased density of development in the area is likely improve the efficiencies of waste collections in the area.

Other developments in the area will be required to manage waste in compliance with national and local legislation, policies and plans which will mitigate any potential cumulative impacts associated with waste generation and waste management. As such the cumulative effect will be long-term, imperceptible and neutral.

14.5 LIKELIHOOD OF SIGNIFICANT EFFECTS

This section details the potential waste effects associated with the proposed development.

14.5.1 Do-Nothing Impact

If the proposed development were not to go ahead (i.e. in the Do-Nothing scenario) there would be no excavation or construction or operational waste generated at this site. There would, therefore, be a neutral effect on the environment in terms of waste.

The site is zoned for development, and it is likely that in the absence of this subject proposal that a development of a similar nature would be progressed on the site that accords with national and regional policies and therefore the likely effects would be similar to this proposal.

14.5.2 Construction Phase

The proposed development will generate a range of non-hazardous and hazardous waste materials during site excavation and construction. General housekeeping and packaging will also generate waste materials, as well as typical municipal wastes generated by construction employees, including food waste. Waste materials will be required to be temporarily stored in the construction site compound or adjacent to it, on-site pending collection by a waste contractor. If waste material is not managed and stored correctly, it is likely to lead to litter or pollution issues at the development site and in adjacent areas. The indirect effect of litter and pollution issues is the presence of vermin, impacts on local

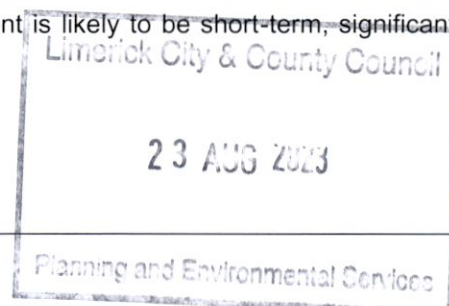
biodiversity and the potential for downstream impacts on proximate watercourses and designated sites in areas affected. In the absence of mitigation, the effect on the local and regional environment is likely to be short-term, significant and negative.

The use of non-permitted waste contractors or unauthorised waste facilities could give rise to inappropriate management of waste, resulting in indirect negative environmental impacts, including pollution. It is essential that all waste materials are dealt with in accordance with regional and national legislation, as outlined previously, and that time and resources are dedicated to ensuring efficient waste management practices. In the absence of mitigation, the effect on the local and regional environment is likely to be long-term, significant and negative.

Wastes arising will need to be taken to suitably registered / permitted / licenced waste facilities for processing and segregation, reuse, recycling, recovery, and / or disposal, as appropriate. There are numerous licensed waste facilities in the Southern Region which can accept hazardous and non-hazardous waste materials, and acceptance of waste from the development site would be in line with daily activities at these facilities. At present, there is sufficient capacity for the acceptance of the likely C&D waste arisings at facilities in the region. The majority of construction materials are either recyclable or recoverable. However, in the absence of mitigation, the effect on the local and regional environment is likely to be short-term, significant and negative.

There is a quantity of material which will need to be excavated to facilitate the proposed development. A detailed review of the existing ground conditions on a regional, local site-specific scale are presented in Chapter 8.0 Land & Soils, Geology & Hydrogeology. The project engineers have estimated the quantity of excavated material that will be generated to be circa 7,500m³ of topsoil, circa 16,000m³ of clay/gravel and circa 4,000m³ of bedrock. It is currently envisaged that all the excavated bedrock, circa 3,000m³ of topsoil and circa 4,000m³ of the clay/gravel will retained and reused on site. The remainder of the topsoil (circa 4,500m³), and clay/gravel excavated (circa 12,000m³), will be reused on site where possible but it is currently anticipated that it will require removal offsite for reuse, recovery and/or disposal. If material is removed off-site, it could be reused as a by-product (and not as a waste). If this is done, it will be done in accordance with Regulation 15 (By-products) (Previously Article 27 and referred to as Article 27 in this report) of European Union (Waste Directive) Regulations 2011-2020, which requires that certain conditions are met and that by-product notifications are made to the EPA via their online notification form. Excavated material will not be removed from site until approval from the EPA has been received. The potential to reuse material as a by-product will be confirmed during the course of the excavation works, with the objective of eliminating any unnecessary disposal of material. It is envisaged that c 16,500m³ of selected imported fill as hardcore will be required for under building ground floor slabs, roads, paths and services excavations as well as for use within the attenuation storage and infiltration areas.

Correct classification and segregation of the excavated material is required to ensure that any potentially contaminated materials are identified and handled in a way that will not impact negatively on workers as well as on water and soil environments, both on and off-site. However, in the absence of mitigation, the effect on the local and regional environment is likely to be short-term, significant and negative.



14.5.3 Operational Phase

The potential impacts on the environment of improper, or a lack of, waste management during the operational phase would be a diversion from the priorities of the waste hierarchy which would lead to small volumes of waste being sent unnecessarily to landfill. In the absence of mitigation, the effect on the local and regional environment is likely to be indirect, long-term, significant and negative.

The nature of the development means the generation of waste materials during the operational phase is unavoidable. Networks of waste collection, treatment, recovery and disposal infrastructure are in place in the region to manage waste efficiently from this type of development. Waste that is not suitable for recycling is can be sent for energy recovery. There are also facilities in the region for segregation of municipal recyclables which is typically exported for conversion in recycled products (e.g. paper mills and glass recycling).

If waste material is not managed and stored correctly, it is likely to lead to litter or pollution issues at the development site and in adjacent areas. The knock-on effect of litter issues is the presence of vermin in affected areas. However, in the absence of mitigation, the effect on the local and regional environment is likely to be indirect, long-term, significant and negative.

Waste contractors will be required to service the proposed development on a scheduled basis to remove waste. The use of non-permitted waste contractors or unauthorised facilities could give rise to inappropriate management of waste and result in negative environmental impacts or pollution. It is essential that all waste materials are dealt with in accordance with regional and national legislation, as outlined previously, and that time and resources are dedicated to ensuring efficient waste management practices. However, in the absence of mitigation, the effect on the local and regional environment is likely to be long-term, significant and negative.

14.6 REMEDIAL AND MITIGATION MEASURES

The concept of the 'waste hierarchy' is employed when considering all mitigation measures. The waste hierarchy states that the preferred option for waste management is prevention and minimisation of waste, followed by preparing for reuse and recycling / recovery, energy recovery (i.e. incineration) and, least favoured of all, disposal.

14.6.1 Construction Phase

The following mitigation measures will be implemented during the construction phase of the proposed development:

14.6.1.1 Mitigation by Avoidance / Design

WM CONST 1 - Cut and fill on the site has been minimised through the design process. . The quantum of fill required on site shall be reduced by reusing bedrock as Class 1 material any other existing site won materials as appropriate.

Limerick City & County Council

23 AUG 2023

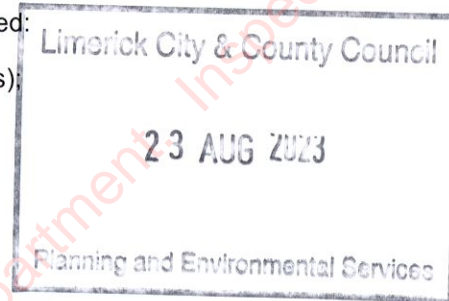
14.6.1.2 Mitigation by Prevention

WM CONST 2 - Prior to commencement, the appointed Contractor(s) will be required to prepare a Resource Waste Management Plan (RWMP) in agreement with LCCC, detailing specific measures to minimise waste generation and resource consumption, and provide details of the proposed waste contractors and destinations of each waste stream. The Contractor will be required to fully implement the RWMP throughout the duration of the proposed construction phase.

WM CONST 3 - A Resource Manager will be appointed by the main Contractor(s) to ensure effective management of waste during the demolition, excavation and construction works. All construction staff will be provided with training regarding the waste management procedures.

WM CONST 4 - Building materials will be chosen with an aim to 'design out waste'. On-site segregation of waste materials will be carried out to increase opportunities for off-site reuse, recycling and recovery. The following waste types, at a minimum, will be segregated:

- Concrete rubble (including ceramics, tiles and bricks);
- Plasterboard;
- Metals;
- Glass; and
- Timber.

**14.6.1.3 Mitigation by Reduction**

WM CONST 5 - A quantity of soil, stone, gravel and clay will need to be excavated to facilitate the proposed development. Correct classification and segregation of the excavated material is required to ensure that any potentially contaminated materials are identified and handled in a way that will not impact negatively on workers as well as on water and soil environments, both on and off-site.

WM CONST 6 - Left over materials (e.g. timber off-cuts, broken concrete blocks / bricks) and any suitable construction materials shall be re-used on-site, where possible; (alternatively, the waste will be sorted for recycling, recovery or disposal).

WM CONST 7 - All waste materials will be stored in skips or other suitable receptacles in designated areas of the site. Any hazardous wastes generated (such as chemicals, solvents, glues, fuels, oils) will also be segregated and will be stored in appropriate receptacles (in suitably bunded areas, where required).

WM CONST 8 - All waste leaving site will be reused, recycled or recovered, where possible, to avoid material designated for disposal and will be transported by suitably permitted contractors and taken to suitably registered, permitted or licenced facilities.

WM CONST 9 - All waste leaving the site will be recorded and copies of relevant documentation maintained. If any of the material is to be reused on another site as by-product (and not as a waste), this will be done in accordance with Article 27 of the EC (Waste Directive) Regulations (2011). EPA approval will be obtained prior to moving material as a by-product. However, it is not currently anticipated that Article 27 will be used.

14.6.2 Operational Phase

The following mitigation measures will be implemented during the operational phase of the proposed development:

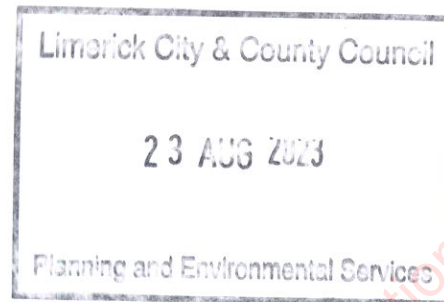
14.6.2.1 Mitigation by Avoidance / Design

No mitigation proposed

14.6.2.2 Mitigation by Prevention

No mitigation proposed

14.6.2.3 Mitigation by Reduction



RES & WM OPER 1: All waste materials will be stored in colour coded bins or other suitable receptacles in designated, easily accessible locations. Bins will be clearly identified with the approved waste type to ensure there is no cross contamination of waste materials.

RES & WM OPER 2: All waste collected from the development will be reused, recycled or recovered where possible, with the exception of those waste streams where appropriate facilities are currently not available.

RES & WM OPER 3: All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licensed facilities.

14.7 RESIDUAL IMPACTS

The implementation of the mitigation measures outlined in Section 14.6 will ensure that targeted rates of reuse, recovery and recycling are achieved at the site of the proposed development during the construction and operational phases. It will also ensure that EU, national and regional legislative waste requirements with regard to waste are met and that associated targets for the management of waste are achieved.

14.7.1 Construction Phase

A carefully planned approach to waste management as set out in Section 14.6.1 of this chapter, and adherence to the RWMP the construction phase will ensure that the predicted effect on the environment will be short-term, imperceptible and neutral.

14.7.2 Operational Phase

When the mitigation measures are implemented and a high rate of reuse, recycling and recovery is achieved, the predicted impact of the operational phase on the environment will be long-term, imperceptible and neutral.

14.8 MONITORING

The management of waste during the construction phase will be monitored by the Contactor's appointed Resource Manager to ensure compliance with the above-listed mitigation measures, and relevant waste management legislation and local authority requirements, including maintenance of waste documentation.

14.8.1 Construction Phase

The objective of setting targets for waste management is only achieved if the actual waste generation volumes are calculated and compared. This is particularly important during the excavation and construction works, where there is a potential for waste management objectives to become secondary to other objectives, i.e. progress and meeting construction schedule targets. A Resource Manager shall be appointed, who will have responsibility for monitoring the actual waste volumes being generated and ensuring that contractors and sub-contractors are segregating waste as required. Where targets are not being met, the Resource Manager will identify the reasons for this and work to resolve any issues. Recording of waste generation during the construction phase of the proposed development will enable better management of waste contractor requirements and identify trends. The data should be maintained to advise on future developments.

14.9 REFERENCES

Waste Management Act 1996 (No. 10 of 1996) as amended.

Environmental Protection Agency Act 1992 as amended.

Litter Pollution Act 1997 (S.I. No. 12 of 1997) as amended.

Southern Waste Region, Southern Region Waste Management Plan 2015 – 2021 (2015).

Department of Environment and Local Government (DoELG) Waste Management – Changing Our Ways, A Policy Statement (1998).

European Commission, Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (2017).

Environmental Protection Agency (EPA) 'Guidelines on the information to be contained in Environmental Impact Assessment Reports' (2022).

Forum for the Construction Industry – Recycling of Construction and Demolition Waste.

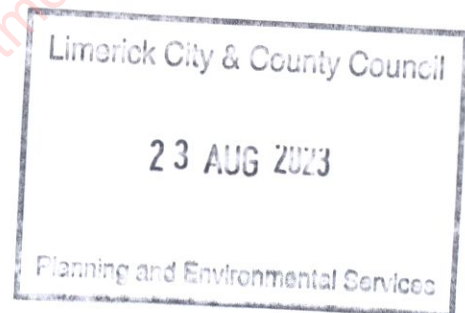
Department of Communications, Climate Action and Environment (DCCA), Waste Action Plan for the Circular Economy - Ireland's National Waste Policy 2020-2025 (Sept 2020).

DCCA, Whole of Government Circular Economy Strategy 2022-2023 'Living More, Using Less' (2021).

Circular Economy and Miscellaneous Provisions Act 2022.

Environmental Protection Agency (EPA) 'Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects' (2021).

Department of Environment, Heritage and Local Government, Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (2006).



FÁS and the Construction Industry Federation (CIF), Construction and Demolition Waste Management – a handbook for Contractors and site Managers (2002).

Limerick City and County Council (LCCC), *Limerick Development Plan 2022-2028* (2022).

Limerick City and County Council (LCCC) City and County of Limerick (Segregation, Storage and Presentation of Household and Commercial Waste) Bye-Laws (2019).

BS 5906:2005 Waste Management in Buildings – Code of Practice.

Planning and Development Act 2000 (No. 30 of 2000) as amended.

Environmental Protection Agency (EPA), Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous (2015).

Council Decision 2003/33/EC, establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC.

EPA, European Waste Catalogue and Hazardous Waste List (2002).

EPA, National Waste Database Reports 1998 – 2016.

US EPA, Characterisation of Building Uses (1998).

EPA and Galway-Mayo Institute of Technology (GMIT), EPA Research Report 146 – A Review of Design and Construction Waste Management Practices in Selected Case Studies – Lessons Learned (2015).

