3.0 REASONABLE ALTERNATIVES

3.1 INTRODUCTION

This chapter of the Environmental Impact Assessment Report (EIAR) contains a description of the reasonable alternatives that were studied which are relevant to the project and its specific characteristics and provides an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment.

In 2014, Environmental Impact Assessment (EIA) Directive 2011/92/EU was amended by Directive 2014/52/EU and Article 5, relating to the preparation of an EIAR by the developer, was amended to state the following should be included regarding alternatives:

> *"…a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment" (Article 5(1)(d))."*

This is further reinforced in Annex IV the Revised EIA Directive (Information Referred to in Article 5(1) (Information for the EIAR) states that:

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

The Environmental Impact Assessment of Projects - Guidance on the preparation of the Environmental Impact Assessment Report (European Union, 2017) states that reasonable alternatives

> *"must be relevant to the proposed project and its specific characteristics, and resources should only be spent on assessing these alternatives" and that "the selection of alternatives is limited in terms of feasibility. On the one hand, an alternative should not be ruled out simply because it would cause inconvenience or cost to the Developer. At the same time, if an alternative is very expensive or technically or legally difficult, it would be unreasonable to consider it to be a feasible alternative".*

In addition as noted in the Guidelines on the Information to be Contained in EIARs (EPA, May 2022) "Analysis of high-level or sectoral strategic alternatives should not be expected within a project level EIAR" and "that the amended Directive refers to 'reasonable alternatives… which are relevant to the proposed project and its specific characteristics "

The EPA Guidelines on the Information to be Contained in EIARs (May 2022) stipulates in Section 3.4 (consideration of alternatives) that 'The presentation and consideration of the various alternatives investigated by the developer is an important requirement of the EIA process'.

The alternatives may include:

- Do Nothing Scenario
- Alternative locations;

- Alternative layouts;
- Alternative designs;
- Alternative processes; and,
- Alternative mitigation measures

The following text provides information on the consideration of alternatives, including 'do nothing' (Section 3.5), alternative locations (Section 3.6), alternative design and layout, (Section 3.7), and alternative processes (Section 3.8). Alternative mitigation measures are considered where appropriate in the EIAR technical chapters.

3.1.1 Statement of Authority

This chapter has been produced by Dr John Staunton, Senior Project Manager and Environmental Scientist in TOBIN. John has more than 14 years' postgraduate experience in both research and environmental consultancy. John holds a BSc and PhD in Environmental Science and has considerable experience in project managing large scale developments and carrying out associated impact assessments including the preparation of Reasonable Alternatives chapters.

3.2 LEGISLATION, POLICY AND GUIDANCE

The following documents and guidance were reviewed in the preparation of this chapter:

Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022);
Environmental Impact Assessment of Projects - Guidance on the preparation of the Environmental Impact Assessment Report (European Union, 2017);
Transposition of 2014 EIA Directive (2014/52/EU) in the Land Use Planning and EPA Licencing Systems (DoHPCLG, 2017);
Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment; and
Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning and Local Government, 2018).
Draft Advice Notes for Preparing Environmental Impact Statements (EPA, 2015);
Final Draft BAT Guidance Note on the Best Available Techniques for the Waste Sector: Landfill Activities (EPA, 2011);
Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) (EPA, 2003); and
Guidelines on the information to be contained in Environmental Impact Statements (EPA, 2002).

3.3 METHODOLOGY

A desktop study was carried out in order to examine relevant information pertaining to the potential alternatives for the proposed development. The information sources included the documents and guidance listed in Section 3.2 above as well as the following:

- National Waste Statistics: Summary Report for 2020 (EPA, 2022);
- National Waste Statistics: Summary Report for 2019 (EPA, 2021);
- Ireland's Environment – An Integrated Assessment 2020 (EPA, 2020) (known as the State of the Environment Report);
- Waste Action Plan for a Circular Economy (Department of the Environment, Climate and Communications, 2020);
- Kildare County Council Development Plan, 2023–2029;

- Waste industry representatives and Drehid Waste Facility management

Meetings were held with the Regional Waste Management Authorities, the Environmental Protection Agency, Kildare County Council and An Bord Pleanála to discuss the project as the design progressed, to allow these bodies to suggest alternatives and to confirm that the proposal was suitable for the area and for the current situation in Ireland relating to waste. Scoping documents were also sent to wide range of consultees as discussed in Chapter 1 of this EIAR to allow these bodies to provide feedback for the project.

In order to determine the centroid for waste generation (see Section 3.6 below), the source locations for the entire weighbridge data for 2021 at the existing Drehid site (which accepted waste from sources all around Ireland) was analysed to determine the centroid as accurately and realistically as possible. The 'Centroids' GIS tool (in QGIS) was used to determine the data for each county, and this was weighted using the 2021 data for the Mean Coordinate' GIS tool analysis which determined the overall centroid for the country.

When determining the most suitable locations for infrastructure on site, the available historical site investigation and survey data was referred to, additional data was gathered, and the operations management at the Drehid WMF were consulted to determine the most practical, suitable and least sensitive location for the proposed development to allow efficient operations.

3.4 CONSIDERATION OF ALTERNATIVES

In accordance with Directive 2011/92/EU as amended by Directive 2014/52/EU and taking into account the above standards and guidance documents listed, including the Guidelines on the information to be contained in EIAR (EPA 2022) this chapter addresses alternatives under the following headings:

- 'Do Nothing' Option;
- Alternative Locations;
- Alternative Layouts/Design;
- Alternative Processes/Technologies;
- Alternative Mitigation Measures.

Each of these is addressed in the following sections. When considering a landfill development, given the intrinsic link between layout and design, the two will be considered together in this chapter.

3.5 DO NOTHING OPTION

The "Do-Nothing" scenario is not to develop the proposed project and to leave the existing environment at the location of the proposed infrastructure as it is, with no changes made to the currently permitted site activity. The existing permitted waste activities would continue to operate as they are currently permitted until the facility can no longer accept waste, followed by the associated site wind down activities (capping the landfill, etc.) In such a scenario, the prospect of most efficiently dealing with waste would be lost (i.e. continuing the landfill activity where there is an existing waste facility) as another facility would need to be built potentially from scratch elsewhere to replace it, and there would be no existing infrastructure in place to utilise on such an alternative site. The opportunity to contribute to the national need for dealing with waste would also be lost.

The latest EPA waste statistics report [1] identifies that municipal waste generation per person was 645 kg, up from 628 kg in 2019, 600 kg in 2018 and 577 kg in 2017 [2]. This trend highlights the increasing quantity of waste being created by each person in the country for which some form of treatment is required. The EPA's 2020 Summary Report notes that the current disposal capacity available for MSW landfills is 470,000 tonnes but states that *"two of the three operational landfills will approach their maximum lifetime consented capacity by 2027 if additional capacity is not authorised."* In addition in the EPA's State of the Environment Report 2020 [3], the Agency stated *"National municipal landfills and waste-to-energy facilities are operating at capacity and Ireland has some significant waste infrastructure deficits, as evidenced by its high dependence on export markets for treating municipal and hazardous wastes*." The available landfill disposal capacity at the Drehid WMF is authorised until 2028, however based on the current projections, it is anticipated that the void space will be practically exhausted in advance of this date, most likely in 2026. After this date, 120,000 TPA capacity for rMSW disposal will be lost without authorisation of further capacity at the facility. The waste that could be accepted at the proposed facility would need to be either landfilled elsewhere in Ireland or else exported for landfill in another country.

The Project Team held pre-application meetings with the RWMPO's in October 2022 where the need for future landfill disposal capacity was discussed along with the provision for contingency capacity as described in Section 2.2.1.1 of Chapter 2 of this EIAR. The RWMPO authorities stated in the meeting on 05 October 2022 that the Drehid WMF is considered to be a nationally important piece of waste infrastructure as confirmed in the draft *National Waste Management Plan for a Circular Economy* which was published for public consultation recently[4].

Furthermore, the chance to generate local employment and investment would not occur and the local economy would remain less diverse.

Any impacts associated with other projects that are planned, permitted or operational in the wider area, as discussed in Chapter 4 of this EIAR (Policy, Planning and Development Context) would still occur. There would be no anticipated cumulative effects with the site of the proposed development in the event that it was not constructed.

Table 3-1: Environmental Impacts of the Do-Nothing Alternative relative to the Chosen Option

Environmental Consideration	Do Nothing Alternative
Human Health and Population	No employment as a result of the development. No long-term sustainable investment in the locality. No long-term availability of a community benefit fund locally after the current facility ceases to operate.
Biodiversity	No potential for construction/operational phase impacts. The current facility will remain operational until it reaches the end

[1] EPA, *National Waste Statistics: Summary Report for 2020* (December 2022)
[2] EPA, *National Waste Statistics: Summary Report for 2019* (2021)
[3] State of the Environment Reports are produced on a four-yearly cycle. Located here: https://www.epa.ie/our-services/monitoring--assessment/assessment/irelands-environment/state-of-environment-report-/

[4] https://www.mywaste.ie/national-waste-plan/

	of its life, and the location of the proposed works is unlikely to significantly change.
Land, Soils and Geology	No potential for construction/operational phase impacts. The current facility will remain operational until it reaches the end of its life, and the location of the proposed works is unlikely to significantly change.
Hydrology and Hydrogeology	No potential for construction/operational phase impacts. The current facility will remain operational until it reaches the end of its life, and the location of the proposed works is unlikely to significantly change.
Material Assets	Neutral - No potential for impacts on material assets in the area around the site, however none of note are anticipated. The opportunity to deal with a significant proportion of waste within Ireland would be lost, and there would be limited control over how the waste is treated/dealt with in other countries.
Air Quality and Climate	No potential for construction/operational phase impacts from the site, however the exportation of waste to other countries for disposal may have an increased carbon footprint.
Noise and Vibration	No potential for additional noise at nearby sensitive receptors. The current levels of site noise would continue until the facility ceases operation by 2028.
Cultural Heritage	No potential impacts on archaeology or local cultural heritage.
Landscape and Visual Impact	Existing landscape and visual amenity in the area will remain largely unchanged (aside from capping the existing landfill). Visibility of the site from nearby receptors is generally quite poor, so this is not anticipated to be significant.
Traffic	Continuation of current traffic volumes associated with the facility on the road network until the current facility ceases operation. Significantly reduced potential for effects thereafter. There would however be effects at another location as the waste will need to be processed and disposed of somewhere.

The do-nothing scenario is discussed further in each EIAR assessment chapter.

3.6 ALTERNATIVE LOCATIONS

As set out in the 2022 EIAR Guidelines published by the EPA *"Clearly in some instances, some of the alternatives described [in Figure 3.4 of the Guidelines] will not be applicable – e.g. there may be no relevant 'alternative location' for the upgrading of an existing road"*. In the case of the Proposed Development at the Drehid WMF, clearly an extension to the existing facility can only take place at the existing facility. The existing Drehid Waste management facility has a significant amount of infrastructure already in place and has seen substantial investment to provide the existing high quality facility. The site will also be considered to be of national importance in the *National Waste Management Plan for a Circular Economy* to be published in early 2023.

In order to confirm that the facility is located in an efficient location, it was decided to check that it is still located close to the centroid of recent waste production. The 'Centroid' is defined as the geographical location that would minimise the distance that waste inputs would have to travel. The determination of the Centroid is based on the analysis of 2021 weighbridge data from an existing national waste facility (Drehid Waste Management Facility) which receives waste from sources all around Ireland. This was seen as the most accurate way to obtain a representation of the centroid for waste generation The purpose of this analysis and the determination of the centroid on that basis was to utilise the most accurate reflection of the sources of waste that would be accepted at the proposed development, and from that to confirm that the distance travelled by each tonne of the inputs to an extension of the Drehid facility was not significantly greater than it should be.

As can be seen in Figure 3.1, the centroid is located between Clane and Sallins, Co. Kildare. The 25 km buffer around this point represents approximately a 30 minute journey for the waste. This shows that the site is located within approximately just 15 minutes of the waste centroid, meaning that the waste transport will be efficient. Furthermore, the location of the site between the M4 and M7 allows for similarly easy access from both main transport routes.

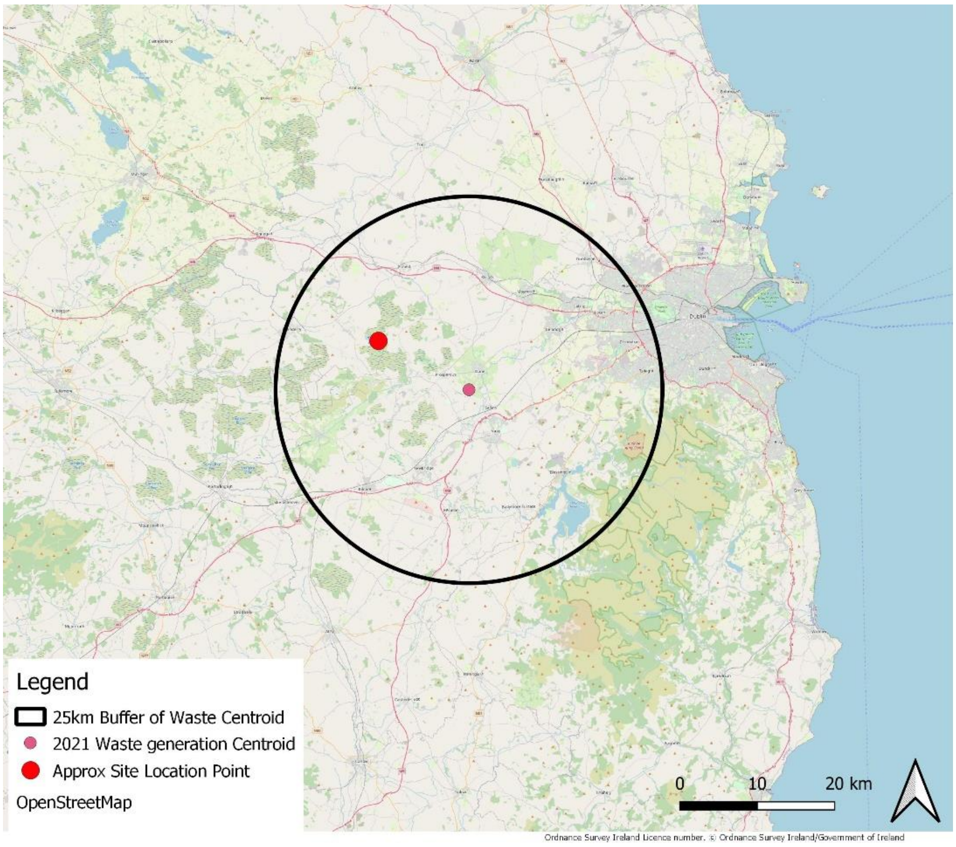

Figure 3.1 Centroid Location with 25km buffer (representing an approx. 30 minute drive time)

In terms of alternative site locations, the EPA's Guidelines on the information to be contained in Environmental Impact Assessment Reports (2022) states the following:

> *"Higher level alternatives may already have been addressed during the strategic environmental assessment of relevant strategies or plans. Assessment at that tier is likely to have taken account of environmental considerations associated, for example, with the cumulative impact of an area zoned for industry on a sensitive landscape. Note also that plan-level/higher-level assessments may have set out project-level objectives or other mitigation that the project and its EIAR should be cognisant of. Thus, these prior assessments of strategic alternatives may be taken into account and referred to in the EIAR"*

It is noted that the existing Drehid WMF is constructed on a site which went through a site selection process including a consideration of alternative sites within the ownership of Bord na Móna as outlined in the earlier planning applications relating to the Drehid WMF (Reg No. 04.371 / PL09.212059). The site emerged as the most suitable site in those exercises, resulting in the construction of the existing facility, and this current application proposes further development of the site.

3.7 ALTERNATIVE LAYOUTS/DESIGN

3.7.1 Avoidance of Environmental Sensitivities

Within the Bord na Móna landholding at Drehid, Carbury, County Kildare, TOBIN Consulting Engineers, on behalf of Bord na Móna, identified the preferred location (as discussed in Section 3.3) in the townlands of Timahoe West and Coolcarrigan as a suitable and appropriate site for the proposed development. As the proposed development will share elements of infrastructure with the existing Drehid WMF, the application area also includes the townlands of Killinagh Upper, Killinagh Lower, Drummond, Kilkeaskin, Loughnacush, and Parsonstown, wherein existing infrastructure to be shared is located.

Potential locations within the landholding were assessed in an objective manner, with a view to selecting a location which would minimise the impact of the proposed development on the surrounding environment and would be the most sustainable solution. The factors considered included the following:

- Proximity to sensitive receptors (noise/dust/air quality);
- 200 m buffer zone (as per Final Draft BAT Guidance Note on the Best Available Techniques for the Waste Sector: Landfill Activities (EPA, 2011));
- Visual impact;
- Biodiversity;
- Archaeology;
- Hydrogeology;
- Ground conditions and geology; and
- Compatibility with and proximity to existing infrastructure at the Drehid WMF.

The preferred location identified as outlined below, is south of the existing landfill and east of the dedicated access road, as shown in Chapter 1 of the EIAR, on Figure 1.1.

The nearest sensitive receptor (private house located to the northeast of the proposed development footprint) will be a distance of approximately 1 km from the nearest element of the proposed infrastructure to be used within the proposed development, i.e. the access road and the proposed Landfill. There are properties within approximately 55 m of the site entrance, but there are no works proposed at this location.

The preferred location is located further than the minimum distance specified by the EPA in their publication, "Final Draft BAT Guidance Note on the Best Available Techniques for the Waste Sector: Landfill Activities" (December 2011) of 200 m, "distance between the maximum extent of waste disposal activities (actual landfilling) and sensitive receptors". Visual impact for this location is predominantly favourable with the site screened on all sides. This location also benefits from the location of the existing landfill which provides screening of the site. It can therefore be said that the site is the most favourable site in terms of visual impact when compared to any other location within the landholding.

There are no significant ecological factors related to the preferred footprint location that would rule it out from being developed. The fact that the location is directly adjacent to (and partly intertwined with) an existing development would minimise the ecological impacts to developing the infrastructure elsewhere on the landholding. There were no archaeological sites within the footprint of the preferred location. Refer to Chapter 13, Archaeology and Cultural Heritage. There are no significant surface watercourses or hydrogeological features (karst, etc.) within the footprint of the preferred works location, though some drains are present which drain into the Cushaling River, which is adjacent to the area. Detailed site surveys have been carried out, as discussed in Chapter 7 (Soils, Geology and Hydrogeology) and Chapter 8 (Water) of this EIAR to determine the current hydrogeological regime at the site. Peat depths were found during previous and recent site investigations to range from approximately 0.2 m to 2.5 m at the footprint of the preferred location for infrastructure. See Chapter 7 (Soils Geology and Hydrogeology) for further information on ground conditions. This peat depth is not considered to be an obstacle as the landfill footprint as discussed in Chapter 7 (Soils, Geology and Hydrogeology).

3.7.2 Level of Environmental Capacity

From a 'compatibility with the existing infrastructure' perspective, the site is located adjacent to the existing Drehid facility. Therefore, the preferred location provides the most suitable location for development as it provides for the use of all existing ancillary infrastructure and minimises transport distances for waste.

Considering the above information, the proposed location was considered as the preferred site for the proposed development due to:

- the large available land bank;
- the remoteness from dwellings;
- access to national/regional roads;
- natural screening;
- distance from ecologically protected areas;
- distance from archaeologically/architecturally protected sites/structures; and
- the existence of an already permitted and operational WMF within the landholding.

In addition, a baseline assessment (comprising ecological walkover surveys, peat probing, trial pits, etc. – see Chapters 6, 7 and 8 of this EIAR) for this project was completed prior to the development of the design of the facility, which allowed for the optimisation of the siting of the facility, within the overall Bord na Móna landholding. In particular, sensitive areas such as natural watercourses, areas of bog-woodland and potential archaeological sites etc. were avoided. The facility is also sited at a significant distance from the local road network and residential properties, as noted above.

Also, it should be emphasised that the location of the proposed development within the landholding of the Drehid WMF means that much of the necessary waste infrastructure for managing a significant volume of waste will already be in place within the same landholding. This represents a rational clustering of uses and an avoidance of conflicts or nuisance arising from locating such uses adjacent to sensitive receptors. It also avoids additional transport of some wastes, minimising the potential from impacts on traffic and roads.

3.7.3 Alternative layouts

Through the site design evolution a number of changes were made to the site infrastructure layout. These included:

- Movement of the ICW to minimise the sprawl of the works and disturbance to site drainage network.
- Inclusion of a composting and MSW processing facility as an extension to the existing composting facility. This came about based on the decision to not proceed with the previously permitted MBT facility to the south of the currently proposed development.
- Removal from the site layout of internal access road and additional weighbridge to link to the previously permitted MBT facility.

The initially proposed location for the ICW had been slightly south of its currently proposed location. The movement northwards (while at the same time being increased in size) was carried out following project team discussions in order to consolidate the overall spread of the infrastructure and to minimise the potential effects on the hydrological regime. The current and previous locations for the ICW are indicated on Figure 3-2.

The decision to halt the plans for the MBT facility had a number of implications for the proposed facility. Mainly, there would be an unmet demand for additional composting capacity and processing of MSW material collected at kerbsides by Bord na Móna Recycling. It was decided to address this issue by extending the existing composting facility to form a larger MSW processing and composting facility. The cessation of the MBT project also meant that a link road which was going to be proposed to link the MBT and the currently proposed facility would no longer be required, so it was removed from the plans. Its location is indicated in Figure 3-2.

These options are compared in Table 3-2 Below.

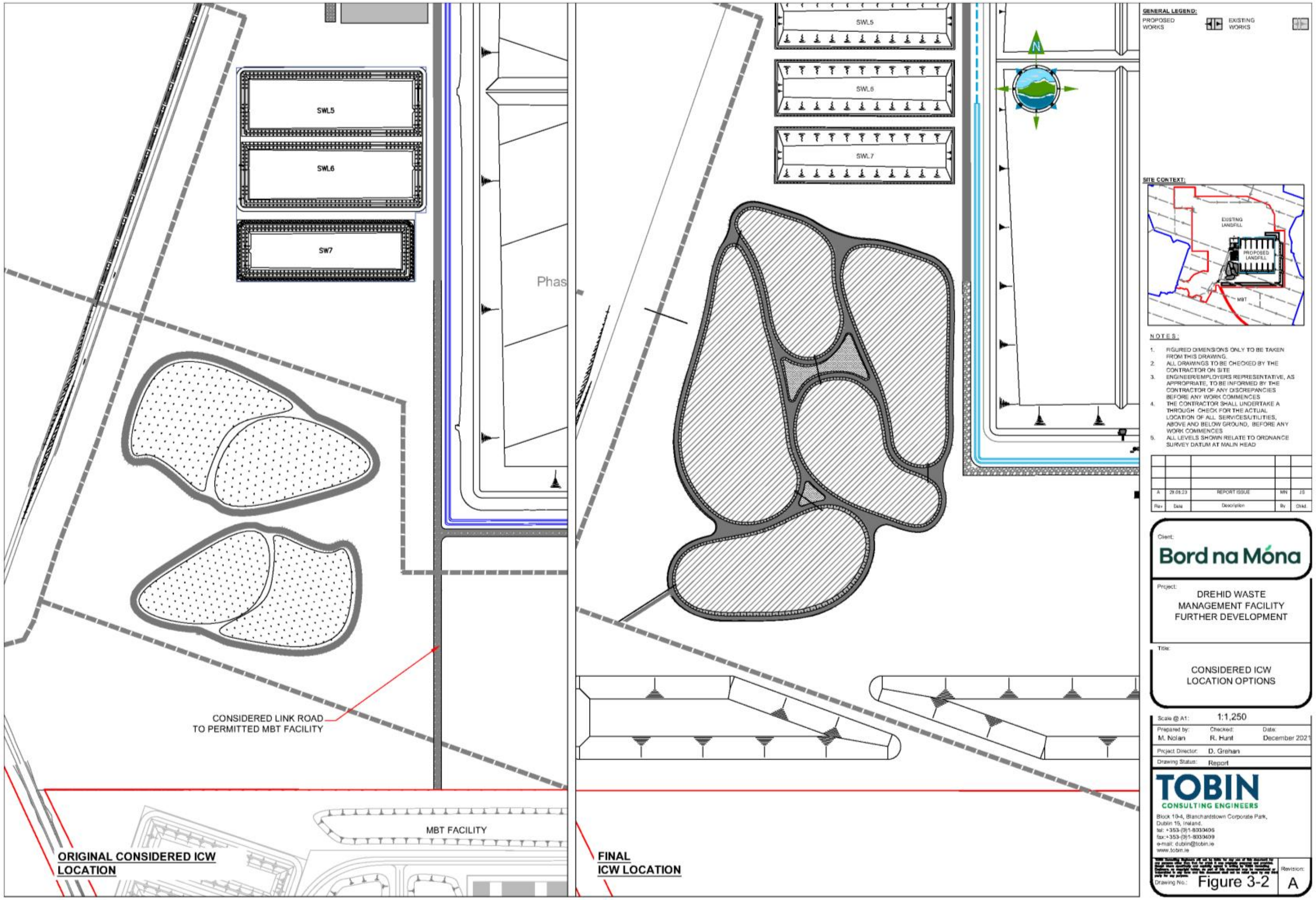

Figure 3.2 comparison of alternative ICW location showing previously considered MBT link road

Table 3-2 Table of environmental effects relative to proposed site layout/design.

Environmental Considerations	Alternative ICW location	No extended facility for composting and processing MSW	Construction of a link road (to the previously permitted MBT facility)
Human Health and Population	No notable difference in effects	Additional movements of waste to/from other facilities would result in increased effects.	No notable difference in effects
Biodiversity	A further sprawling footprint would increase the potential for effects	No notable difference in effects as area is already paved.	Increased footprint of the works area, increasing the effects
Land, Soils and Geology	No notable difference in effects	No notable difference in effects as area is already paved.	Increased footprint of the works area, increasing the effects
Hydrology and Hydrogeology	A further sprawling footprint would increase the alterations to drains and the potential for effects	No notable difference in effects as area is already paved.	Increased footprint of the works area, increasing the effects
Air and Climate	No notable difference in effects	Additional movements of waste to/from other facilities would result in increased effects.	No notable difference in effects
Material Assets	No notable difference in effects	There would be an unfulfilled requirement to process MSW and carry out composting. This would have to be done elsewhere which would add to the transport requirements of the waste.	No notable difference in effects

Landscape and Visual Impact	No notable difference in effects	There would be a reduced potential for effects as the building would not be required.	No notable difference in effects as the road would not be visible from the surrounding receptors
Noise and Vibration	No notable difference in effects	There would be a reduced potential for effects at the site, due to lower levels of machine activity. There would also be a slightly reduced effect relating to transport as waste would no longer be coming to site to be processed, but would still be transported from other waste processing facilities to the landfill.	No notable difference in effects
Cultural Heritage	No notable difference in effects	No notable difference in effects	Increased footprint of the works area, increasing the effects
Traffic	No notable difference in effects	There would be a reduced potential for effects as waste would no longer be coming to site to be processed but would still be transported from other waste processing facilities to the landfill.	No notable difference in effects

The size and scale of the project was determined by the volume of waste that needs to be treated. The alternatives of developing a significantly larger or smaller size/scale facility were considered, but it was determined that a smaller facility would not make a worthwhile contribution to dealing with the volume of waste that is currently produced in Ireland, while a larger facility might not be required in the long term and may have greater effects relating to traffic and transportation. The scale of the facility was discussed with the local authority as well as the Regional Waste Management Authorities (who agreed that the proposed size and scale was acceptable/suitable. These are discussed in Table 3-3.

Table 3-3 Table of environmental effects relative to proposed project size and scale

Environmental Considerations	Smaller scale development	Larger scale development
Human Health and Population	A smaller footprint and reduced site activity would result in reduced potential for effects at Drehid, however the waste would need to be dealt with elsewhere. Therefore, the effects are likely to be neutral overall.	A larger footprint and increased site activity would result in greater potential for effects
Biodiversity	A smaller footprint and reduced site activity would result in reduced potential for effects at this site, however the waste would need to be dealt with elsewhere. Therefore, the effects are likely to be neutral overall.	A larger footprint and increased site activity would result in greater potential for effects
Land, Soils and Geology	A smaller footprint and reduced site activity would result in reduced potential for effects at this site, however the waste would need to be dealt with elsewhere. Therefore, the effects are likely to be neutral overall.	A larger footprint would result in greater potential for effects
Hydrology and Hydrogeology	A smaller footprint and reduced site activity would result in reduced potential for effects at this site, however the waste would need to be dealt with elsewhere. Therefore, the effects are likely to be neutral overall.	A larger footprint and increased site activity would result in greater potential for effects
Air and Climate	A smaller footprint and reduced site activity would result in reduced potential for effects at this site, however the waste would need to be dealt with elsewhere. Therefore, the effects are likely to be neutral overall.	A larger footprint and increased site activity would result in greater potential for effects
Material Assets	Dealing with the waste over multiple smaller landfills or waste processing facilities	A larger footprint and increased site activity would result in greater

	would be a less efficient method for the waste industry. Using a shorter lifespan would not provide the required infrastructure for the industry. The Drehid site is a piece of nationally important waste infrastructure. A smaller footprint and reduced site activity would result in reduced potential for effects at this site on other Material Assets, however the waste would need to be dealt with elsewhere. Therefore, the effects are likely to be neutral overall.	potential for effects at this site. A larger intake volume may not be required in the future as the country presses for reducing the volume sent to landfill.
Landscape and Visual Impact	A smaller footprint and reduced site activity would result in reduced effects for this site, however the waste would need to be dealt with elsewhere. Therefore, the effects are likely to be neutral overall.	A larger footprint and increased site activity would result in greater potential for effects
Noise and Vibration	A smaller scale of site activity would result in reduced effects for this site, however the waste would need to be dealt with elsewhere. Therefore, the effects are likely to be neutral overall.	A larger footprint and increased site activity would result in greater potential for effects
Cultural Heritage	A smaller footprint and reduced site activity would result in reduced potential for effects at this site, however the waste would need to be dealt with elsewhere. Therefore, the effects are likely to be neutral overall.	A larger footprint would result in greater potential for effects
Traffic	A smaller scale of site activity would result in reduced potential for effects at this site, however the waste would need to be dealt with elsewhere. Therefore, the effects are likely to be neutral overall.	Increased site activity would result in greater potential for effects

3.8 ALTERNATIVE PROCESSES/TECHNOLOGIES

The construction of appropriate waste infrastructure is guided by high-level plans, strategies and guidance such as County Development Plans and national plans (e.g. the Waste Action Plan for a Circular Economy[5]). These documents set out appropriate and required waste infrastructure development which is required for achieving the national waste reduction and waste treatment targets.

3.8.1 Landfill Facility

This section provides an overview of the alternative options considered for the proposed landfill treatment of waste. The composition of the waste which is anticipated to be accepted at the proposed landfill will be similar to that of the existing landfill. It will have generally been subject to prior separation/sorting so that any recyclable or otherwise useful fractions will have been removed, and the waste that remains can not be reused or recycled. There are a number of main alternatives to the provision of landfill void space in Ireland:

- The provision of additional incineration (energy recovery) capacity in Ireland
- Exporting waste for treatment (landfilling or incineration) outside of Ireland.
- Increasing levels of waste prevention, reduction, reuse and recycling

These are discussed below:

3.8.1.1 Incineration in Ireland

According to the EPA's latest National Waste Statistics Report for 2019[6] approximately 3.1 million tonnes of municipal waste was generated in 2019, an increase from the 2.9 million tonnes in 2018. Of this, approximately 37% was recycled, 46% was incinerated (waste to energy) and 15% was landfilled during 2019. A large majority of plastic packaging waste (approximately 69%) was also incinerated. Figure 3.3 shows the amount of waste being handled each year, and the rates of each treatment used from 2001 to 2019. This shows that incineration has recently become the most common method to treat waste. The non-hazardous ash remaining after the incineration process, while smaller in volume than the original waste, still needs to be disposed of in a landfill however.

The two incinerators currently operating in Ireland are in Poolbeg, Dublin and Carranstown, Co. Meath. They have a total combined licensed capacity of 835,000 tpa of non-hazardous municipal waste and are operating at capacity[7]. There are three additional cement kilns which are authorised to accept solid recovered fuel to burn as an alternative to fossil fuels. Given the above, there is currently no available capacity to increase the amount of waste that can be sent for incineration prior to landfill, at least in the short to medium term. The time required to get a waste-to-energy facility from initial concept to being operational can be substantial, and in the meantime, it is essential that Ireland is focused on maximising waste prevention, reduction,

[5] https://www.gov.ie/en/publication/4221c-waste-action-plan-for-a-circular-economy/

[6]https://www.epa.ie/publications/monitoring--assessment/waste/national-waste-statistics/EPA_Nat_Waste_Stats_Report_2019_web.pdf

[7]https://www.epa.ie/publications/monitoring--assessment/assessment/state-of-the-environment/irelands-environment-2020----chapter-9---waste.php

reuse and recycling. The use of facilities such as the proposed MSW processing facility will be crucial in achieving this in the short to medium term, reducing the amount of waste that is sent to landfill. Landfills will be required to serve as a final destination for those fractions of waste that cannot otherwise be reused or recycled as well as for residual waste from the waste-to-energy process. Therefore, although it should only be used when other avenues are exhausted, landfill void space is required in the short, medium and long term future in Ireland. The alternative of building an additional incineration/waste to energy facility is discussed in Table 3-4 below.

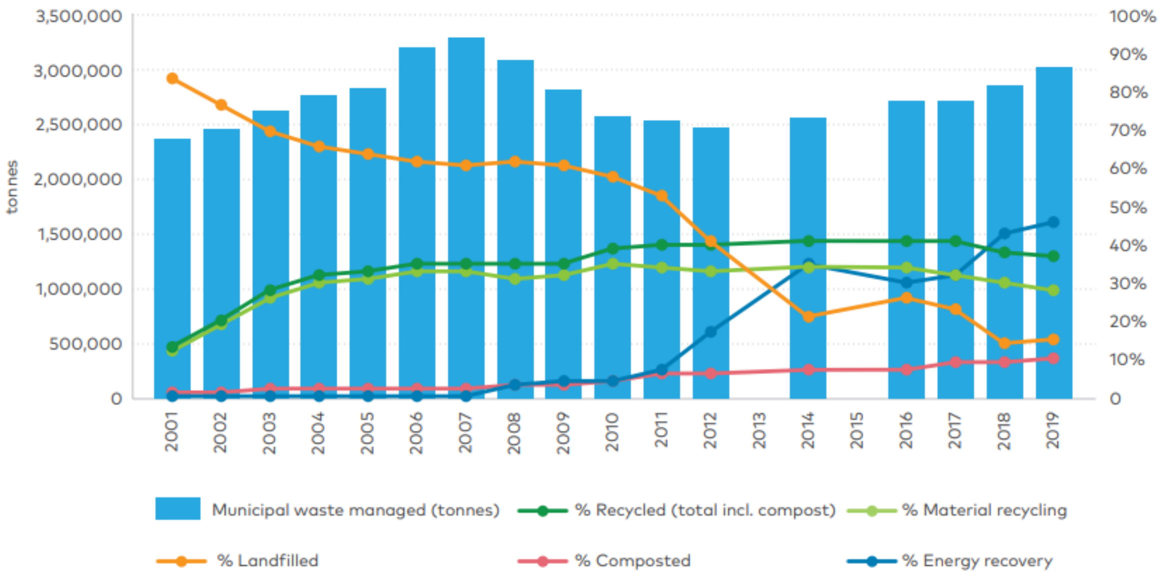

Figure 3.3 Municipal Waste Management in Ireland from 2001 to 2019 (Extracted from EPA National Waste Statistics Report for 2019).

Table 3-4: Table of environmental effects relative to proposed landfill technology

Environmental Considerations	Incineration/Waste to Energy
Human Health and Population	Similar impacts to local communities in terms of noise, traffic, etc. There would be a potentially higher impact in terms of air quality due to the emissions and waste storage. Landfill would be required elsewhere to dispose of remaining material following the incineration process.
Biodiversity	Neutral. A waste to energy facility is likely to require a smaller footprint than a landfill, reducing the amount of habitat loss at the site, however a grid connection is also likely to be required, which would increase the impacts.
Land, Soils and Geology	Neutral. A waste to energy facility is likely to require a smaller footprint than a landfill, thereby resulting in a likely reduced effect, however a grid connection is also likely to be required, which would increase the impacts.
Hydrology and Hydrogeology	Neutral. A waste to energy facility is likely to require a smaller footprint than a landfill, thereby resulting in a likely reduced effect, however a grid connection is also likely to be required, which would increase the impacts.
Air and Climate	Increased potential to impact air quality from stack emissions.

Material Assets	There would still be a requirement to create landfill space in the country, so this would not address this problem.
Landscape and Visual Impact	A waste to energy facility would be more visible from the surrounding areas and would have a more significant landscape impact when in operation. If removed after operational life, this would be reversed.
Noise and Vibration	Neutral. Similar site activities will have similar noise impacts in transport and handling of waste for the site.
Cultural Heritage	Neutral. A waste to energy facility is likely to require a smaller footprint than a landfill, thereby resulting in a likely reduced effect, however a grid connection is also likely to be required, which would increase the impacts.
Traffic	Neutral. Similar site activities in transport and handling of waste for the site.

3.8.1.2 Exporting of waste

Ireland currently relies on the exporting of large volumes of waste for final treatment, with 40% of municipal waste being exported (totalling 1.2 million tonnes) in 2019, up from 35% in 2018. In addition, 20% of waste which was treated by composting/AD being sent to Northern Ireland[8]. The EPA highlighted in their National Waste Statistics Report for 2019 that urgent action is needed to increase Ireland's self sufficiency in treating our own waste, highlighted by the 5% increase in municipal waste exports in 2019. Exporting such volumes of waste, even for energy recovery, is less efficient than dealing with the waste within the country. The number of landfills in Ireland has fallen from 120 no. in 1992, to 28 no. in 2009, 4 no. in 2019 and just 3 no. in 2021 (including the current one at Drehid). In the event that new landfill space is not made available, the waste would need to be exported.

The current waste recovery and disposal sites are operating at capacity, and with landfilling capacity set to reduce as licenses expire, it is important that Ireland ensure that there are sufficient landfill capacity available within the state to handle the waste that is produced here. The reduction of landfill void space will simply increase the amount of waste being exported, and moving the problem elsewhere should not be considered as a viable alternative when there is a potential to treat the waste within the state. Table 3-5 provides an assessment of waste export as an alternative to the proposed development.

Table 3-5: Table of environmental effects relative to proposed landfill technology

Environmental Considerations	Waste export
Human Health and Population	Effects associated with the current facility would continue until the existing Drehid WMF ceases operation. The effects associated with the proposed development would not occur, however there would be an increase in effects in areas surrounding the ports/harbours being used for export, as well as in the destination country.

[8]https://www.epa.ie/publications/monitoring--assessment/waste/national-waste-statistics/EPA_Nat_Waste_Stats_Report_2019_web.pdf

Biodiversity	Effects associated with the current facility would continue until the existing Drehid WMF ceases operation. The impacts associated with the proposed development would not occur, however there may be effects elsewhere (near ports, or in the destination country).
Land, Soils and Geology	Effects associated with the current facility would continue until the existing Drehid WMF ceases operation. The impacts associated with the proposed development would not occur, however there may be effects elsewhere (near ports, or in the destination country).
Hydrology and Hydrogeology	Effects associated with the current facility would continue until the existing Drehid WMF ceases operation. The impacts associated with the proposed development would not occur, however there may be effects elsewhere (near ports, or in the destination country).
Air and Climate	Effects associated with the current facility would continue until the existing Drehid WMF ceases operation. The effects associated with the proposed development would not occur, however there would be an increase in effects in areas surrounding the ports/harbours being used for export, as well as in the destination country.
Material Assets	There would still be a requirement to create landfill space in the country, so exporting the waste would not address this problem. Exporting the waste would not be in line with current national plans and policies.
Landscape and Visual Impact	Effects associated with the current facility would continue until the existing Drehid WMF ceases operation. The impacts associated with the proposed development would not occur, however there may be effects elsewhere (near ports, or in the destination country).
Noise and Vibration	Effects associated with the current facility would continue until the existing Drehid WMF ceases operation. The impacts associated with the proposed development would not occur, however there may be effects elsewhere (near ports, or in the destination country).
Cultural Heritage	Effects associated with the current facility would continue until the existing Drehid WMF ceases operation. The impacts associated with the proposed development would not occur, however there may be effects elsewhere (near ports, or in the destination country).
Traffic	Effects associated with the current facility would continue until the existing Drehid WMF ceases operation. The effects associated with the proposed development would not occur, however there would be

	an increase in effects in areas surrounding the ports/harbours being used for export, as well as in the destination country.

3.8.1.3 Increasing waste prevention, reduction, reuse and recycling

Ideally, the volume of waste being produced would be significantly reduced so that there would be less to deal with, however achieving even the current targets for 2025 and 2030 will be very difficult to achieve without affecting significant change nationally. Waste prevention, reduction, reuse and recycling rates are affected by factors such as national policy, infrastructure, cost and education. It is considered that determining the best methodology for achieving this is out of the scope of this report, however it is nonetheless considered that improving these actions significantly is an essential part of a sustainable circular waste economy.

Interestingly, there is an argument that an increased supply of incineration facilities may deter an efficient recycling process, as is the case in parts of Europe[9]. This would be supported by the data shown in Figure 3-3 (which is extracted from the National Waste Statistics Report for 2019 (EPA, 2021), which shows an inverse correlation between the rates of incineration and waste recycling in recent years in Ireland. Therefore, it can be argued that future investments should be focused on waste prevention, reduction, reuse and recycling as the main alternatives to disposal. However, this will be a gradual process, and there is a current critical need for the provision of additional waste treatment capacity in Ireland (including landfill), as supported by the fact that 40% of municipal waste was exported for final treatment in 2019. The proposed development will help to fulfil this current requirement as well as provide a longer term (25 years) landfill for the inevitable fractions of waste that cannot be reused, recycled, or have energy recovered as well as the non-hazardous residual waste from the incineration process.

A previously permitted Mechanical Biological Treatment (MBT) facility located just to the south of the proposed development location was designed to address this need to increase the level of waste recycling by processing waste to extract material that could be recycled for other purposes. Enabling works had been started for this facility but due to significant inflation in construction and energy costs in recent years (as a result of the Covid pandemic and the war in Ukraine) coupled with the planning grant due to expire in 2023, a decision was made not to proceed with the project. As a result, this facility will no longer be built. This has left a requirement for some treatment of MSW which is collected locally from wheelie bins by Bord na Móna Recycling refuse vehicles. This need will be filled by the currently proposed MSW processing and Composting facility which is much smaller (than the previously permitted MBT facility to the south). This is intended to treat the waste collected in the surrounding regions by the company and extract recyclable material as far as is practical, and also carrying out a composting process to treat the organic fraction of the waste. This will contribute to the reduction of locally generated waste going to landfill. This proposed facility will also remove metals from the waste, removing the need for an additional separate facility to do so.

Waste prevention, reduction, reuse and recycling should be considered as a key part of the solution rather than an alternative to provision of waste treatment infrastructure.

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[9] https://epub.wupperinst.org/frontdoor/deliver/index/docId/5917/file/5917_Wilts.pdf

3.8.1.4 Landfill related Technologies

The technologies used for landfilling waste has evolved over a number of decades, but the proposed development will utilise all of the modern best practices to ensure there is a minimum potential for adverse environmental effects. These technologies include the use of suitable liners beneath and above the waste, capping with soil (and planting of vegetation on this), capture of leachate for appropriate treatment, capture of gas released by the landfill (with subsequent generation of electricity from this gas), capture and treatment (with an appropriately designed ICW) of site runoff and installation of fire suppression water supply systems. Omitting any or all of such design features and technologies was not considered to be reasonable for the proposed development, given the proven benefits of using them, and their widely accepted use in the waste industry internationally.

The use of a deep landfill or hazardous waste landfill is not being considered for the Drehid WMF. Therefore, the technologies and processes used for this type of landfill are not required.

3.8.2 Composting Facility

This section provides an overview of the alternative technologies considered for biological treatment processes.

One of the main aspects of the proposed development is the expansion of the capacity of the existing composting facility. Composting and anaerobic digestion were considered for the stabilisation of the organic fraction to satisfy EPA requirements.

Composting and anaerobic digestion are natural processes of decomposition that take place under controlled conditions in the presence and absence of oxygen respectively. In the case of anaerobic digestion, methane gas is generated which is converted to green electricity where the electricity can be exported to the national grid.

The following sections outline the consideration of the alternative biological treatment process for the proposed development.

3.8.2.1 Anaerobic Digestion (AD) Processes

AD can be developed in the form of a wet AD process or a dry AD process. A wet AD process generally requires a feedstock with a maximum dry solids content of 20%, while a dry AD process can process feedstock with a higher dry solids content.

The wet AD process involves the pumping of liquid substrate into large digester vessels where anaerobic conditions are maintained. The feedstock within the digester vessels is continually agitated to promote its uniform degradation into biogas. Wet AD is ideally suited for slurries (cattle manures/pig manures with low solids content – less than 20%) as opposed to solid waste organic fines with high solids content (typically greater than 40%). Wet AD of solid waste organic fines typically requires the conversion of feedstock into a “pumpable” liquid substrate.

Unlike the wet AD process, the biomass substrate in dry AD does not need to be mechanically stirred or pumped through pipes, and therefore the process is not susceptible to problems of blockage in the system. The digestion process is not affected by any undigestible pieces of inert material in the substrate as they can be easily removed from the digestate in a subsequent process. In comparison to wet AD, dry AD typically involves the placement of the feedstock into horizontal concrete vessels by means of a loading shovel. When the vessel is filled, a gas tight door is closed and the anaerobic digestion process commences.

In considering AD, consideration was had of the fiscal incentives for the development of AD – namely the Renewable Energy Feed in Tariff (REFIT). Regrettably, the current fiscal incentives in the Republic of Ireland make it difficult to create a compelling or indeed viable, economic argument for the development of AD for the processing of mechanical and organic fines generated from the recycling of MSW waste. Therefore, coupled with the fact that the current facility is a composting facility, Bord na Móna consider that composting is the most viable option for the proposed development.

This alternative process of AD is compared in Table 3-6 Below.

Table 3-6: Table of environmental effects relative to proposed composting process

Environmental Considerations	Anerobic Digestion process
Human Health and Population	There would be an increased cost for waste treatment, so the end customers are likely to have financial effects
Biodiversity	No notable difference in effects
Land, Soils and Geology	No notable difference in effects
Hydrology and Hydrogeology	No notable difference in effects
Air and Climate	No notable difference in effects
Material Assets	There would be an increased cost for waste treatment
Landscape and Visual Impact	No notable difference in effects
Noise and Vibration	No notable difference in effects
Cultural Heritage	No notable difference in effects
Traffic	No notable difference in effects

<u>Composting Processes</u>

The most obvious and simple form of composting is the straightforward compost heap, where organic waste is simply left in a pile where natural processes take their course and compost is produced. The development of different, more industrialised forms of compost production systems has been driven by a desire to manipulate one or more of the process parameters in order to optimise the composting process in terms of emissions control (particularly odour), quality, production time or space requirements.

The classification of every composting system is beyond the scope of this assessment; hence for the purpose of this section, composting systems have been classified into four categories as follows:

- Outdoor Systems;
- Indoor Windrow Systems;
- Tunnel Systems; and
- Continuous Flow Systems.

The last three categories listed can generically be referred to as enclosed or in-vessel systems where the process conditions including air supply, moisture content and temperature can be controlled and all potential emissions (air and effluent) can be contained, collected and treated.

<u>Outdoor Systems</u>

Outdoor systems are generally simple in design and construction. The two main types of system applied are the windrow system and the static pile system. In the windrow system, feedstock is placed in rows and turned periodically, usually by mechanical equipment. Oxygen is supplied primarily by natural ventilation resulting from the buoyancy of hot gases in the window, and by gas exchange during turning. In the static pile system, no agitation or turning of the static bed occurs during the composting cycle. An air distribution system is applied underneath the composting material to allow either forced (blown air) or induced aeration (sucked air). In practice, intermediate systems, e.g. aerated windrows or periodically turned static piles, are common.

Process and emission control possibilities for outdoor systems are limited, apart from induced static pile systems, where the process air might be transported through a biofilter. Since prevailing weather conditions directly affects operations, the composting process usually takes several months.

Of particular relevance is the fact that outdoor systems do not comply with the requirements of the Department of Agriculture, Food and the Marine for the processing of Animal By-Products. An enclosed system is required to achieve the requirements imposed by Animal By-Products Regulations.

Indoor Windrow Systems

Indoor windrow systems can be very simple in design and construction. In this arrangement, the feedstock is formed into windrows within an enclosed building. In addition, air control systems and machinery for the turning and movement of the composting mass can be utilised, which make indoor windrow systems more sophisticated and provide for significantly more process control. The indoor windrow system therefore allows for the flexibility to begin operations at a relatively low process control level and eventually to modify the system to provide for a higher level of process control.

The operational capacity of an indoor windrow system is quite flexible, within a specific range, as the height and length of the windrow and rate of aeration can be adjusted according to the required throughput.

Indoor windrow systems require the odour abatement system to process all the air space within the building in comparison to enclosed tunnel systems where only the process air within the tunnel requires intensive treatment.

Tunnel Composting Systems

Tunnel composting involves the composting of organic waste in fully enclosed concrete tunnels. Each composting tunnel typically comprises of a sealed concrete structure provided with an insulated loading door on the front end and an insulated unloading door on the back. The concrete floor includes a piped aeration system. Air is forced, from the floor, vertically upwards and through the composting mass. Process air is collected in the headspace between the roof of the tunnel and the composting mass. This collected air is either re-circulated within the composting mass or directed to the odour abatement system for treatment.

The enclosed nature of the tunnel composting system facilitates optimum and focused use of aerated air thereby facilitating extensive process control. As the tunnels are fully enclosed, optimum temperatures and levels of humidity can be maintained throughout the entire composting mass. High rates of aeration are typically a feature of tunnel composting systems. The above mentioned attributes facilitate high rates of biological stabilisation.

Various process parameters including aeration rates, air moisture and oxygen levels can be controlled from a central process computer. In addition, due to the modular layout of tunnel systems, several units can be operated independently, which provides for significant flexibility in the operational phase.

Continuous Flow Composting Systems

In continuous flow composting systems, the organic waste flows horizontally or vertically through a reactor while the forced aerated composting process occurs. As fresh feedstock is loaded into one end of the system, processed material is discharged out the far end. Continuous flow composting systems allow adequate control of the process conditions. However, since the retention time in the reactor is relatively short (typically 12-14 days) an extensive post-composting step is required.

Continuous flow systems are typically produced in a manufacturing environment prior to being transported to a WMF. Continuous flow systems are typically manufactured from metals, plastics and composites and are therefore considered to be less robust than other composting systems that comprise of concrete. Continuous flow systems are typically suited to small scale applications where the system can be delivered to site in modular form thereby facilitating a relatively short construction phase.

3.8.2.2 Selected Composting Technologies

In deciding on the composting technologies to be proposed for the biological treatment stage, cognisance was had of the EPA's stabilisation requirement (as set out in waste licences for landfill facilities) for biodegradable municipal waste, where stabilisation means the reduction of decomposition properties of the waste to such an extent that offensive odours are minimised and that the respiration activity after four days is less than 7mgO2/gDM.

As outlined previously, an outdoor system does not allow for the provision of process and emission control measures, which could therefore lead to odour nuisances at or near the facility. The composting process is dependent on the prevailing weather conditions leading to extended composting time requirements. In addition, it is considered that the consistency of the output cannot be guaranteed using an outdoor system. As such, an outdoor system was considered not suitable.

Continuous flow systems were considered unfeasible due to the scale of the proposed composting facility upgrade where the biological treatment process will be required to process a total of 35,000 tonnes of organic fines per annum. Continuous flow systems are best suited to small volumes of waste. Furthermore, they would require an additional treatment post-composting.

Owing to the high aeration rates and process control provided by tunnel composting systems and the resultant high rates of biological stabilisation, it was decided to use a tunnel composting system (as per the existing composting facility) for the composting process for the proposed additional capacity. In addition, odour control in the (two phases) composting process is the most critical with respect to odour emissions, since easily biodegradable components (e.g. sugars, proteins and fats) are degraded at a high rate, thus causing gaseous by-products. The two phases will occur within the concrete composting tunnels in the main processing area of the facility. Material will initially be loaded into a tunnel for approximately two weeks (Phase 1), after which it is moved to another tunnel for a further two week period (Phase 2).

The use of fully enclosed composting tunnels, within a fully enclosed building, for the above biological treatment process, provides double containment features in respect of odour abatement. The whole composting plant operates under negative pressure in order to minimise the escape of any potential fugitive odour emissions. It is also proposed to construct a new air filtration system and ventilation stacks adjacent to the existing composting building to cater for odours from the increased volume of waste.

These composting technology options are compared in Table 3-7 Below.

Table 3-7: Table of environmental effects relative to proposed composting technology

Environmental Considerations	Outdoor System	Indoor Windrow System	Continuous Flow System
Human Health and Population	Increased odour nuisance from outdoor treatment	No notable difference in effects	No notable difference in effects
Biodiversity	No notable difference in effects	No notable difference in effects	No notable difference in effects
Land, Soils and Geology	No notable difference in effects	No notable difference in effects	No notable difference in effects
Hydrology and Hydrogeology	No notable difference in effects	No notable difference in effects	No notable difference in effects
Air and Climate	Increased odour nuisance from outdoor treatment	No notable difference in effects	No notable difference in effects
Material Assets	Reduced consistency in waste treatment	No notable difference in effects	No notable difference in effects
Landscape and Visual Impact	Outdoor systems would have an increased effect for the area immediately around the site	No notable difference in effects	No notable difference in effects
Noise and Vibration	Outdoor systems would have an increased effect for the area immediately around the site	No notable difference in effects	No notable difference in effects
Cultural Heritage	No notable difference in effects	No notable difference in effects	No notable difference in effects
Traffic	No notable difference in effects	No notable difference in effects	No notable difference in effects

Soil and Stones and C&D Waste (rubble) Processing Facility This section provides an overview of the alternative processes and technologies considered for the treatment processes for soil and stones. A significant proportion of waste that is produced in Ireland is comprised of clean soil and stone and rubble from construction and demolition. The proposed development will process this waste to remove suitably sized clean material that can be used as an engineering material for the proposed landfill and associated infrastructure. This would prevent the site needing to import virgin aggregates for the purpose, reducing the environmental impact. There are however a number of alternative options that are available, including:

- Placement of the soil and stones, and construction & demolition rubble waste into the landfill, and importing virgin engineering material
- Processing of the waste off site, and transporting the engineering material and residual waste material separately to the landfill for use and disposal respectively

These options are compared in Table 3-8 Below.

Table 3-8: Table of environmental effects relative to proposed soil and stone processing facility

Environmental Considerations	Placement of soil and stones, and construction & demolition rubble in landfill with use of virgin material for engineering purposes	Processing the waste off site and transporting separately to the site for use/disposal
Human Health and Population	Increased effects due to larger volume of traffic near Drehid and also near the source quarry.	Increased effects due to larger volume of traffic near Drehid and also near the alternative processing facility.
Biodiversity	Slightly reduced effect as processing building (and proposed operations therein) would not be required at Drehid, however some additional effects are likely near the source quarry due to increased activity.	Slightly reduced effect as processing building (and proposed operations therein) would not be required at Drehid, however additional effects are likely near the alternative processing facility.
Land, Soils and Geology	Slightly reduced effect as processing building (and proposed operations therein) would not be required at Drehid, however some additional effects are likely near the source quarry due to increased activity.	Slightly reduced effect as processing building (and proposed operations therein) would not be required at Drehid, however additional effects are likely near the alternative processing facility.
Hydrology and Hydrogeology	Slightly reduced effect as processing building (and proposed operations therein) would not be required at Drehid, however some additional	Slightly reduced effect as processing building (and proposed operations therein) would not be required at Drehid, however additional effects

	effects are likely near the source quarry due to increased activity.	are likely near the alternative processing facility.
Air and Climate	Slightly reduced effect as processing building (and proposed operations therein) would not be required at Drehid, however some additional effects are likely near the source quarry due to increased activity. Additional material movements would result in additional greenhouse gas emissions.	Slightly reduced effect as processing building (and proposed operations therein) would not be required at Drehid, however additional effects are likely near the alternative processing facility. Additional material movements would result in additional greenhouse gas emissions.
Material Assets	Increased effect due to faster depletion of nearby quarries, and failing to reuse material.	Increased effect due to the need to build additional waste facilities.
Landscape and Visual Impact	Slightly reduced effect as processing building would not be required at Drehid, however some additional effects are likely near the source quarry due to increased activity.	Slightly reduced effect as processing building would not be required at Drehid, however some additional effects are likely near the alternative processing facility.
Noise and Vibration	Increased effects due to larger volume of traffic near Drehid and also near the source quarry. Reduced noise onsite at Drehid, but increased noise at source quarry.	Increased effects due to larger volume of traffic near Drehid and also near the alternative processing facility. Reduced noise onsite at Drehid, but increased noise at alternative processing facility.
Cultural Heritage	Slightly reduced effect as processing building would not be required at Drehid, however some additional effects are likely near the source quarry due to increased activity.	Slightly reduced effect as processing building would not be required at Drehid, however additional effects are likely near the alternative processing facility.
Traffic	Increased effects due to larger volume of traffic near Drehid and also near the source quarry.	Increased effects due to larger volume of traffic near Drehid and also near the alternative processing facility.

3.9 ALTERNATIVE MITIGATION MEASURES

The mitigation measures proposed in relation to the elements of the project are detailed in the chapters to follow and are also summarised in Chapter 16 Schedule of Mitigation Measures. The mitigation measures proposed are considered to be proven and best practice. The level of mitigation proposed is determined to be proportionate to the potential impact. On this basis, the chosen mitigation measures are those that are considered to have the least environmental effects.

The most significant mitigatory measures considered in this chapter have been those which avoid developing on or minimising effects on environmentally sensitive areas and local population.

3.10 CONCLUSIONS

A description of the reasonable alternatives in terms of project design, technology, location, size and scale has been studied by the developer. The options which are relevant to the proposed project and the specific characteristics of a large scale waste facility in an lowland rural area have been discussed. The overriding reason for selecting the chosen options is to minimise the environmental impact of the proposed development while making the most efficient waste facility possible. For each alternative, a comparison of the environmental effects has been provided, showing the reasons for the chosen option being favoured relative to the others.

As discussed above, the siting and design of the proposed development has evolved through the consideration of alternatives and allowing for stakeholder input into the process. This included initial consideration of the need for waste facilities, the site selection process, the consideration of different viable alternative processes to deal with waste, and alternative layouts, scales, and processes.

Reasonable alternatives were considered with specific regard to the characteristics of the project. Comparisons of environmental effects were noted. The alternatives chosen focused on mitigation by design in order to avoid potential impacts on the environment.

When weighed against all of the alternatives and constraints/facilitators outlined in this chapter, the proposed development site has been found to be a suitable location for a waste facility site with regard to a number of criteria including presence of existing infrastructure, environmental effects, distance from dwellings and landscape character. The location is particularly appropriate with regard to the foregoing and with regard to ease of access, and proximity to the likely sources of wastes.