Appropriate Assessment Screening and Natura Impact Statement

Bohernabreena Landfill

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1 INTRODUCTION

1.1 SCOPE OF REPORT

RPS was commissioned by South Dublin County Council (SDCC) to undertake an Environmental Risk Assessment of the unlicensed Bohernabreena landfill, located on the Bohernabreena Road, Tallaght, Dublin 24 adjacent to the River Dodder. The landfill site is approximately 2.7 hectares and was used to deposit domestic refuse by Dublin County Council. The landfill was closed in 1974 and is currently unlicensed.

SDCC intends to apply for a Certificate of Authorisation (CoA) from the Environmental Protection Agency (EPA) for the landfill under Part II of the Third Schedule of the Waste Management (Facility Permit and Registration) Regulations 2007, S.I. No. 821 of 2007 as amended by S.I. No. 86 of 2008.

As part of the CoA application process, the EPA requires all sites to be subject to screening for Appropriate Assessment (AA) in accordance with the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011). The screening will demonstrate whether the project is/is not likely, whether individually or in combination with other plans or projects, to have significant effects on any European Site or sites as defined in Regulation 2(1) of the Habitats Regulations (S.I. No. 477 of 2011) having regard to best scientific knowledge and its conservation objectives.

Where screening has determined that an AA is required, an AA in accordance with Article 6(3) of the Habitats Directive (92/43/EEC) should be completed and a copy of the Natura Impact Statement submitted as part of the CoA application. The EPA require that the assessment should consider the following impacts on any European Site(s):

1. The impact of the existing landfill on European sites;
2. The cumulative effects of the project combined with other plans or projects that might impact on the European site or sites;
3. An assessment of the implications of the project for the European site in view of the European site's conservation objectives;
4. The objectives of proposed remediation measures with regard to existing impacts identified in item 1;
5. The impact on the European site of any physical works carried out at the closed landfill as part of the remediation plan;
6. Details of any mitigation measures proposed at or in relation to the European site, including timeframes for the implementation and monitoring of the measures; and
7. Natura Impact Statement conclusion statement. The statement should conclude whether the project will or will not adversely affect the integrity of the European site(s) having regard to its conservation objectives.

This report comprises information in support of the AA in line with the requirements of Article 6(3) of the EU Habitats Directive (EC 92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora; the Planning and Development (Amendment) Act 2010; and the European Union (Birds and Natural Habitats) Regulations 2011 as amended.

1.2 LEGISLATIVE BACKGROUND FOR APPROPRIATE ASSESSMENT

1.2.1 European Sites

The Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, better known as 'The Habitats Directive', provides legal protection for habitats and species of European importance. Articles 3 to 9 provide the legislative means to protect habitats and species of Community interest through the establishment and conservation of a European Union (EU)-wide network of sites known as Natura 2000 (hereafter referred to as 'European sites'). In the Republic of Ireland, European sites comprise:

- Special Areas of Conservation (SACs) designated for habitats, plants, and non-bird species, under the Habitats Directive (92/43/EEC);
- Special Protection Areas (SPAs) designated for bird species and their habitats, under the Birds Directive (79/409/ECC as codified by Directive 2009/147/EC); and
- 'Candidate' sites including 'cSACs'. The process of designating cSACs as SACs is ongoing in Ireland. The term SAC is used throughout this report for both SACs and cSACs, given they are subject to equal protection.

1.2.2 Appropriate Assessment- European Context

Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to have a significant effect on or to adversely affect the integrity of European sites (Annex 1.1). Article 6(3) establishes the requirement for Appropriate Assessment (AA):

'*Any plan or project not directly connected with or necessary to the management of the [European] site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subjected to appropriate assessment of its implications for the site in view of the site's conservation objectives. In light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public*.'

Article 6(4) states:

If, in spite of a negative assessment of the implications for the [European] site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, Member States shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.'

1.2.3 Appropriate Assessment- National Context

AA is not a specific requirement of the CoA application under Regulation 7 of the Waste Management (Certification of Historic Unlicenced Waste Disposal and Recovery Activity) Regulations 2008 (S.I. No. 524/2008). However, SDCC is obliged to examine the likely significant effects

individually or in combination, of the application, on European sites in light of their specific qualifying interests (QIs; i.e. non-bird species and habitats), Special Conservation Interests (SCIs; i.e. bird species and associated wetland habitats) and Conservation Objectives (COs). If Screening for AA determines that there is likely to be significant effects on any European site, then full AA must be carried out for the proposed development, including the compilation of a Natura Impact Statement (NIS) to inform the application.

1.3 STAGES OF APPROPRIATE ASSESSMENT

The AA process progresses through four stages. If at any stage in the process it is determined that there will be no adverse effect on the integrity of a European site in view of the sites conservation objectives, the process is effectively completed. The four stages are as follows:

- Stage 1 – Screening of the proposed plan or project for AA;
- Stage 2 – An AA of the proposed plan or project;
- Stage 3 – Assessment of alternative solutions; and
- Stage 4 – Imperative Reasons of Overriding Public Interest (IROPI) Derogation.

Stages 1 and 2 relate to Article 6(3) of the Habitats Directive; and Stages 3 and 4 relate to Article 6(4).

Stage 1: Screening for AA

The aim of screening is to assess firstly if the plan or project is directly connected with or necessary to the management of European site(s); or in view of best scientific knowledge, if the plan or project, individually or in combination with other plans or projects, is likely to have a significant effect on a European site. This is done by examining the proposed plan or project and the conservation objectives of any European sites that might potentially be affected. If screening determines that there is potential for significant effects or there is uncertainty regarding the significance of effects then it will be recommended that the plan or project is brought forward to the next stage of the AA process.

Stage 2: Appropriate Assessment

The aim of Stage 2 of the AA process is to identify any adverse impacts that the plan or project might have on the integrity of relevant European sites. As part of the assessment, a key consideration is 'in combination' effects with other plans or projects. Where adverse impacts are identified, mitigation measures can be proposed that would avoid, reduce or remedy any such negative impacts and the plan or project should then be amended accordingly, thereby avoiding the need to progress to Stage 3.

Stage 3: Assessment of Alternative Solutions

If it is not possible during Stage 2 of the AA process to conclude that there will be no adverse effects on site integrity, Stage 3 of the process must be undertaken which is to objectively assess whether alternative solutions exist by which the objectives of the plan or project can be achieved. Explicitly,

this means alternative solutions that do not have adverse impacts on the integrity of a European site. It should also be noted that EU guidance on this stage of the process states that, '*other assessment criteria, such as economic criteria, cannot be seen as overruling ecological criteria*' (EC, 2002). In other words, if alternative solutions exist that do not have adverse impacts on European sites; they should be adopted regardless of economic considerations. This stage of the AA process should result in the identification of the least damaging options for the plan or project.

Stage 4: Imperative Reasons of Overriding Public Interest (IROPI)/Derogation

This stage of the AA process is undertaken when it has been determined that a plan or project will have adverse effects on the integrity of a European site, but that no alternatives exist. At this stage of the AA process, it is the characteristics of the plan or project itself that will determine whether or not the competent authority can allow it to progress. This is the determination of 'over-riding public interest'.

It is important to note that in the case of European sites that include in their qualifying features 'priority' habitats or species, as defined in Annex I and II of the Directive, the demonstration of 'over-riding public interest' is not sufficient and it must be demonstrated that the plan or project is necessary for 'human health or safety considerations'. Where plans or projects meet these criteria, they can be allowed, provided adequate compensatory measures are proposed. Stage 4 of the process defines and describes these compensation measures.

2 METHODOLOGY

2.1 GUIDANCE DOCUMENTS ON APPROPRIATE ASSESSMENT

EU and national guidance exists in relation to Member States' fulfilling their requirements under the EU Habitats Directive, with particular reference to Article 6(3) and 6(4) of that Directive. The methodology followed in relation to this AA has had regard to the following guidance:

- Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities. Department of Environment, Heritage and Local Government (DoEHLG, 2010);
- Communication from the Commission on the Precautionary Principle (EC, 2000);
- Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (known as MN2000), Office for Official Publications of the European Communities, Luxembourg (EC, 2018);
- Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Articles 6(3) and (4) of the Habitats Directive 92/43/EEC. Office for Official Publications of the European Communities, Brussels (EC, 2001);
- Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the Commission (EC, 2007);
- Nature and biodiversity cases: Ruling of the European Court of Justice (EC, 2006);
- Interpretation Manual of European Union Habitats. Version EUR 28. European Commission (EC, 2013); and
- Article 6 of the Habitats Directive: Rulings of the European Court of Justice (EC, 2014).

There have been significant changes to AA practice since both the EC (2001) and the DoEHLG guidance (2010), arising from practice and rulings in European, UK and Irish courts. The following issues have been addressed in the preparation of this report:

- When considering whether a European site can be screened out, the competent authority cannot take into account any measures intended to avoid or reduce the harmful effects of the proposed development (i.e. mitigation measures)[1]; however, a 2019 Irish High Court consideration[2] concluded that Sustainable Drainage Systems (SuDS) are '*as a matter of fact and law… not mitigation measures which a competent authority is precluded from considering at the stage 1 screening stage*';
- The screening must consider the cumulative impacts of any development: that already exists; for which a planning application has been made; which the applicant for permission intends to make an application in the future; and, which is a matter of public record and which is planned to be implemented in the future;
- Consideration of the cumulative effects of plans, including local area plans;

[1] *People Over Wind v Coillte Teoranta* (Court of Justice of the EU, case C-323/17)
[2] *Kelly v An Bord Pleanála & anor* [2019] IEHC 84 (High Court)

- Where an element of the proposed development is missing design detail or subsequent agreements, the assessment should assume the worst-case scenario (i.e. the design with the greatest environmental impact); and
- Making of findings explicit[3].

2.2 INFORMATION CONSULTED

A desk study was completed to assess the potential for all QIs and SCIs of European sites to occur, given their ecological requirements identified by Balmer *et al*. (2013) for SCIs, and the National Parks and Wildlife Service (NPWS) for QIs (NPWS, 2013a,b,c).

SCI Birds and mobile QI species can travel many kilometres from core areas, and desktop surveys assessed the potential presence of such species beyond the European sites for which these species are QIs/SCIs. Desktop studies had particular regard for the following sources:

- Department of Environment, Community and Local Government – online land use mapping www.myplan.ie/en/index.html;
- National Parks and Wildlife Service – Online European Site information www.npws.ie;
- National Parks and Wildlife Service – Information on the status of EU protected habitats and species in Ireland (NPWS 2013a & 2013b);
- National Biodiversity Data Centre – www.biodiversityireland.ie;
- Ordnance Survey of Ireland – Mapping and aerial photography www.osi.ie;
- GeoHive – Online mapping http://map.geohive.ie/mapviewer.html;
- Environmental Protection Agency – Envision online mapping www.epa.ie;
- Geological Survey of Ireland – Geology, soils and hydrogeology www.gsi.ie;
- Information on the conservation status of birds in Ireland (Colhoun & Cummins 2013);
- Information on the Eastern Region River Basin ; and
- South Dublin County Development Plan 2016-2022. www.southdublindevplan.ie/adopted-plan

2.3 LIMITATIONS

Sources of desk study information are neither exhaustive nor necessarily easily available, and a reasoned effort was made to obtain ecological data in the public domain to inform the description of the receiving environment and its assessment. Additional information, not in the public domain, is likely to exist. This limitation is acknowledged and incorporated into the assessment.

2.4 SCREENING APPROACH

A four-step process is applied in the screening to establish potential for Likely Significant Effect (LSE) as follows:

[3] *Connelly v An Bord Pleanála* [2018] IESC 31 (Supreme Court)

- Identification of European sites within the ZoI;
- Identification of impact pathways;
- Conformation of connectivity; and
- Assessment of LSE.

The identification of relevant European sites to be included in this report was based on the identification of the ZoI of the proposed development, a source-pathway-receptor model of effects and the likely significance of any identified effects.

2.4.1 Zone of Influence

The proximity of the proposed development to European sites, and more importantly QIs/SCIs of the European sites, is of importance when identifying potentially likely significant effects. During the initial scoping of this report, a 15 km ZoI was applied for impact assessment. A conservative approach has been used, which minimises the risk of overlooking distant or obscure effect pathways, while also avoiding reliance on buffer zones (e.g. 15 km), within which all European sites should be considered. This approach assesses the complete list of all QIs/SCIs of European sites in Ireland (i.e. potential receptors), instead of listing European sites within buffer zones. This follows Irish departmental guidance on AA:

'*For projects, the distance could be much less than 15 km, and in some cases less than 100m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects*' (DoEHLG, 2010; p.32, para 1).

Following the guidance set out by the NRA (2009), the landfill site (both current status and proposed remediation) has been evaluated based on an identified ZoI with regard to the potential impact pathways to ecological feature (e.g. mobile and static). The ZoI of a proposed development on mobile species (e.g. birds, mammals, and fish), and static species and habitats (e.g. saltmarshes, woodlands, and flora) is considered differently. Mobile species have 'range' outside of the European site in which they are QI/SCI. The range of mobile QI/SCI species varies considerably, from several metres (e.g. in the case of whorl snails *Vertigo* spp.), to hundreds of kilometres (in the case of migratory wetland birds). Whilst static species and habitats are generally considered to have ZoIs within close proximity of a proposed development, they can be significantly affected at considerable distances from an effect source; for example, where an aquatic QI habitat or plant is located many kilometres downstream from a pollution source.

Hydrological linkages between the proposed development and European site (and their QIs/SCIs) can occur over significant distances; however, any effect will be site specific depending on the receiving water environment and nature of the potential impact. As a precautionary measure, a reasonable worst-case ZoI for water pollution from the proposed development site is considered to be the surface water catchment. In this report, the surface water catchment is defined at the scale of Catchment Management Unit (CMU), as adopted in the River Basin Management Plan (RBMP) for Ireland 2018-2021 (DoHPLG, 2018).

2.4.2 Source-Pathway-Receptor Model

The likely effects of the proposed development on any European site from has been assessed using a source-pathway-receptor model, where:

- A 'source' is defined as the individual element of the proposed works that has the potential to impact on a European site, its qualifying features and its conservation objectives.
- A 'pathway' is defined as the means or route by which a source can affect the ecological receptor.
- A 'receptor' is defined as the Special Conservation Interests (SCI) of SPAs or Qualifying Interests (QI) of SACs for which conservation objectives have been set for the European sites being screened.

A source-pathway-receptor model is a standard tool used in environmental assessment. In order for an effect to be likely, all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism results in no likelihood for the effect to occur. The source-pathway-receptor model was used to identify a list of European sites, and their QIs/SCIs, with potentially links to European site. These are termed as 'relevant' European sites/QIs/SCIs throughout this report.

2.4.3 Likely Significant Effect

The threshold for a Likely Significant Effect (LSE) is treated in the screening exercise as being above a *de minimis* level[4]. The opinion of the Advocate General in CJEU case C-258/11 outlines:

'the requirement that the effect in question be 'significant' exists in order to lay down a de minimis threshold. Plans or projects that have no appreciable effect on a European site are thereby excluded. If all plans or projects capable of having any effect whatsoever on the site were to be caught by Article 6(3), activities on or near the site would risk being impossible by reason of legislative overkill.'

In this report, therefore, 'relevant' European sites are those within the potential ZoI of activities associated with both the existing landfill and the proposed capping works, where LSE pathways to European sites were identified through the source-pathway-receptor model.

2.4.4 Consideration of Mitigation Measures

In determining the likelihood of significant impacts, and hence the need for an appropriate assessment, mitigation measures (i.e. measures that are intended to avoid or reduce harmful effects) cannot be taken into account. Accordingly, mitigation measures have not been taken into account in the screening stage appraisal.

[4]*Sweetman v. An Bord Pleanála* (Court of Justice of the EU, case C-285/11). A de minimis effect is a level of risk that is too small to be concerned with when considering ecological requirements of an Annex I habitat or a population of Annex II species present on a European site necessary to ensure their favourable conservation condition. If low level effects on habitats or individuals of species are judged to be in this order of magnitude and that judgment has been made in the absence of reasonable scientific doubt, then those effects are not considered to be likely significant effects

2.4.5 In-combination Effects

Article 6(3) of the Habitats Directive requires that in-combination effects with other plans or projects are also considered. As set out in the Commissions 2018 Notice (EC, 2019), significance will vary depending on factors such as magnitude of impact, type, extent, duration, intensity, timing, probability, cumulative effects and the vulnerability of the habitats and species concerned. In that context, plans or projects which are completed, approved but uncompleted, or proposed have been considered. The EC guidance (2019) specifically advises that as regards other proposed plans or projects, on grounds of legal certainty it would seem appropriate to restrict the in-combination provision to those which have been actually proposed, i.e. for which an application for approval or consent has been introduced.

3 APPLICATION DETAILS

3.1 PROJECT BACKGROUND

Historic maps indicate that there were several gravel pits within the vicinity of the Bohernabreena site. Local knowledge indicated that there was a gravel quarry onsite which was active in the 1970s and once gravel extraction had ceased the site was used as a landfill for domestic refuse by Dublin County Council and was closed in 1974. There is no information on the volume of waste or type of waste.

From a review of the register compiled in accordance with the Waste Management Act 1996 as amended (the Act) and presented in the Eastern Midlands Region Waste Management Plan 2015-2021, the site was previously classified as a Class C (Low Risk) site as noted in **Table 3.1.**

Table 3.1: Previous Risk Rating of the Site

Site ID	Local Authority	Site Name	Risk Rating
S22-02632	South Dublin County Council	Bohernabreena Ref B 215	Class C (Low Risk)

Source: Eastern Midlands Region Waste Management Plan 2015-2021

Section 22 of the EPA Register of historic landfill sites classifies the site as 'pre 1977'. The EPA CoP does not specially address these sites as these were in existence before the relevant legislation and historically considered low risk due to the age of waste and likely high levels of decomposition. Classifying a site as 'pre 1977' affects the landfill score during the risk prioritisation.

3.2 SITE DESCRIPTION

3.2.1 Site Setting

The site is located on the Bohernabreena Road, Tallaght, South County Dublin within the townland of Friarstown Upper in a predominantly agricultural area. The site is approximately 2.7 hectares and is used for pastural grazing. The site location is shown in **Figure 3.1**.

The site is bounded to the east by the Ballinascorney Road, with the Friarstown Landfill further east. The River Dodder forms the western boundary of the site and flows in a northerly directly. To the south of the site is the Font Bridge which carried the R114 regional road over the Dodder, The site is bounded to the north by agricultural fields.

3.2.2 Regional Topography

The site is located within a river valley with the Dodder terraces either side of the river valley. The site rises from 111mAOD at the north of the site to 118mAOD at the southern boundary. To the eastern boundary there is a steep slope to the River Dodder level (approximately 100mAOD).

3.2.3 Geology

According to the GSI the soils beneath the site area are classified as Alluvium undifferentiated. The area immediately surrounding the river alluvium consists predominantly of coarse loamy drift with siliceous stones.

The subsoils beneath the site area are classified as Alluvium (Carboniferous Limestone sands and gravels) and tills derived from Lower Palaeozoic sandstones and shales (TLPSsS) in the immediate surrounding area.

3.2.4 Bedrock Geology

According to the GSI, the entire site is underlain by the Aghfarrell Formation which consists of thinly-bedded greywacke siltstone, slate and quartzite deposited by turbidity currents in the Palaeozoic. The Lower Paleozoic rocks represent a complex geological history, the rocks are highly folded and faulted representing polyphase deformation. Bedrock permeability is influenced by this deformation.

3.2.5 Geological Heritage

The site is surrounded to the east and west by the Irish Geological Heritage Site ID: SD004 also known as the Dodder Terraces. The Dodder Terraces comprise a series of flat-topped, elevated terraces above the river and record the deglacial retreat of the ice sheet through South Dublin. The site importance is noted as a location with good potential as a reaching site on glacial meltwater deposition, as the feature is accessible and easily viewed from the R114 at Bohernabreena and the N81 at Templeogue-Tallaght.

3.2.6 Hydrogeology

According to the GSI the aquifer beneath the site and the surrounding vicinity is designated as a Poor Aquifer (Pl) which is described as bedrock which is generally unproductive except for local zones.

The aquifer is assigned to the Kilcullen Groundwater Body (GWB) (IE_EA_G_003) which is characterised predominantly by a poorly productive flow regime. Most groundwater flow occurs mostly in a shallow upper weathered zone, deeper groundwater flow is possible along fractures, joints and major faults. Recharge occurs diffusely through the subsoils and via outcrops. Typical groundwater flow paths are likely to be in the order of a couple of hundred metres and discharging to the closest surface water features which in this case is the River Dodder which runs along the western boundary of the site.

The majority of groundwater flow will occur in the top three to five metres. In some instances, a greater degree of structural deformation may provide a fracture network, which will allow groundwater movement at greater depths. Only flow in isolated fractures is expected below 30 metres.

According to the GSI there are no gravel aquifers within the vicinity of the site. However, according to historical maps there are several gravel pits within the vicinity of the site and along the River Dodder.

According to the GSI the aquifer vulnerability at the majority of the site is classified as High, with a small portion of the site at the south classified as Extreme. Assuming a moderate permeability of the subsoil due to the presence of sand and gravels, the depth to bedrock, based on the GSI classification is expected to be between three to five metres.

According to the EPA the status of the groundwater within the Kilcullen GWB located beneath the site and the surrounding area is classified as 'Good Status' (EPA, catchments.ie, 2018). The Water Framework Directive (WFD) groundwater risk of the groundwater is projected as 'Not at Risk'.

The hydro-chemical signature of the GWB is slightly hard water (100-150 mg/l ($CaCO_3$)) and electrical conductivity values of 300-500 µS/cm. the groundwater has very low alkalinity (generally less than 50 mg/l).

There are no Public Supply Source Protection Areas within the site or proximity of the site, the nearest is located at Kilteel approximately 8.5km southwest of the site.

3.2.7 Hydrology

The site is within the Eastern River Basin District, the River Dodder which originates in the Wicklow Mountains runs along the western perimeter of the site, flowing north-easterly towards the Liffey Estuary Lower, approximately 12.5km north east of the site.

The River Dodder is considered a heavily modified water body (Eastern River Basin District, 2009) and the river has been impounded upstream to form two reservoirs which supply water to south Dublin. There is a bridge apron at Eont Bridge at the southern boundary of the site and SDCC has constructed rock armour as flood defences at locations along the boundary of the site. Under the River Basin Management Plan for Ireland 2018 – 2021 the River Dodder is listed as a Prioritised Area for Action.

According to the EPA the surface water quality at the nearest monitoring point immediately south of the site upstream (Dodder- Fort Bridge [ID:RS09D010200]) in 2017 reports a linear value of Q4-Q5 which indicates a High Status. No chemical information is available for this station.

Approximately 1.4km downstream north east of the site at the Old Bawn Bridge (RS09D010300) in 2017 indicated linear value of Q3-Q4 which indicates a Moderate Status. Surface water levels of ammonium for 2010 – 2015 exceed the statutory threshold in the river**.**

The Water Framework Directive (WFD) status 2010-2015 of the River Dodder is assigned as 'Good', and the WFD risk is still under review.

3.2.8 Adjacent Landfill

Friarstown landfill is located adjacent to the eastern boundary of the Bohernbreena landfill site. The Friarstown landfill is classified as a Class A (High Risk) (Site ID S22-02166) according to the Eastern Midlands Region Waste Management Plan 2015-2021. The Friarstown landfill is a former waste disposal site operated by SDCC for 22 years which was closed in 1997 and capped in 2003. Currently there is onsite emission monitoring and a weather station and has been used for energy recovery and electricity generation since its closure. An Environmental Risk Assessment has not been completed at the site, however environmental monitoring has been completed at this site on surface water, groundwater and gas. No groundwater wells are located directly downgradient of the landfill. Leachate tanks for the Friarstown landfill are located opposite and the Bohernabreena Landfill site and are monitored regularly by SDCC. The Friarstown landfill leachate overflow pipes run across the Bohernbreena landfill site and discharge into the River Dodder along the boundary of the Bohernbreena landfill site.

The offsite leachate source from the adjacent Friarstown landfill leachate holding tank is having a potential significant adverse impact on the Dodder. Leachate overflow from this landfill is discharging directly to the river and has been observed to show exceedances for Ammonium and BOD.

3.3 DESCRIPTION OF THE LANDFILL

3.3.1 Composition and Quantity of Waste

Intrusive site investigations (trial pitting and borehole installations at a series of locations as shown in **Figure 3.2**) identified the waste as black clay with varying amounts of decayed organic matter, ash, plastics, fabrics, wire, brick. The majority of the biodegradable organic portion of the waste had degraded, however some fragments of paper had not degraded. The waste was relatively dry as the organic fraction of the waste has decomposed and the lack of a basal liner allowed rain infiltration to pass directly through the waste before discharging to the River Dodder.

The waste (estimated at 151,200 tonnes deposited at the site) was found across the majority of the site, with the exception of the southern portion. The waste was encountered at shallow depths (0.2m – 0.5m) with an overlying layer of slightly sandy silty clay which did not meet with the requirements of an engineered landfill cap. The depth to waste varied across the site and could not be ascertained in one location (TP06 where depth to waste greater than 3.8m). Trial pit excavations indicated the waste had been deposited directly onto gravels or natural clays with no basal liner allowing for free drainage of any leachate.

3.3.2 Extent and Area of the Waste

The intrusive site investigation, in conjunction with the geophysical survey, identified that the waste extended across the entire site to edges of the site boundary with the exception of the southern boundary which was free from waste. The waste was encountered at shallow depths (0.2m – 0.5m) with an overlying layer of slightly sandy silty clay which did not meet with the requirements of an engineering cap. The depth to waste varied across the site and could not be ascertained in one location (TP06 where depth to waste greater than 3.8m). Trial pit excavations indicated the waste

had been deposited directly onto gravels or natural clays with no basal liner allowing for free drainage of any leachate.

3.3.3 Presence of Leachate

No significant volumes of leachate and seepages were encountered within the subsurface during the intrusive site investigations. All the leachate wells were dry with the exception of LW4. Lab analysis from LW4 indicated exceedances of iron, manganese, ammonia and microbial indicators. Organic contaminants were below the level of detection with the exception of a slight exceedance of benzene, however the leachate was of low strength in comparison with typical leachate concentrations. Sweet smells were noted while drilling LW4 which most likely originates from the anaerobic decomposition which releases volatile organic acids, esters, and thioesters. The lack of a basal liner allows for free drainage of any leachate generated, to the underlying gravels or directly to the River Dodder, which accounted for the dry composition of the waste along with a very dry summer (2018 when the investigations were undertaken).

3.3.4 Presence of Landfill Gas

Landfill gas monitoring indicated that there was little or no measurable flow rate recorded indicating low surface emission rates. There is no evidence of vegetation die back. Elevated concentrations of landfill gas (methane and carbon dioxide) were detected within the gas/leachate wells, the higher concentrations were detected within the middle of the site where the waste was thickest. Wells at the periphery of the site indicated lower concentrations of methane and carbon dioxide.

Based on the low flow and the ratio of methane to carbon dioxide concentrations monitored within the wells it would suggest that gas production is in the later stages of degradation. The lack of an engineered cap has resulted in gas being able to migrate to the atmosphere. Little or no flow indicates that the waste body is not actively producing landfill gas. This is due to the biodegradable component of the waste having been degraded. Therefore, there is not an active source of landfill gas.

3.3.5 Depth to Water Table

The presence of waste across the majority of the site restricted groundwater well installation. Monitoring well MW2 was installed offsite immediately north of the site and represents an upgradient monitoring location. Depth to water was recorded at 105.8mAOD. Monitoring well MW1 was installed at the southern boundary of the site, depth to groundwater was 109.7mAOD, the groundwater flow direction flows the regional topology in a northern direction. Seepages noted along the banks of the River Dodder represent groundwater baseflow. The leachate well, LW4, was installed within the waste and had a leachate level of 110.6mAOD, indicating potential connectivity of the groundwater with the waste body.

3.3.6 Presence of Aquifer

According to the EPA, the aquifer beneath the site is designated as a Poor Aquifer (Pl). While the GSI indicates there are no designated gravel aquifers beneath the site, site investigations identified an intermittent gravel layer which was in contact with groundwater.

3.3.7 Geology of the Area

The site is located within a River Valley and there is variable local geology across the site. The waste body was overlain by a clay cap of approximately 0.5m. Site investigations indicate glaciofluvial gravels and sands underlying silty, sandy clay overlying gravel, which considerably varied in thickness across the site. The gravel layer was found to be intermittent across the site which can be partially attributed to the past quarrying activity on site. Greywacke Sandstone bedrock outcrops located along river bank were noted, however bedrock was not encountered during groundwater installation.

3.3.8 Current Impact of the Landfill

As part of the Environmental Risk Assessment a series of surface water samples were taken at several locations as shown in **Figure 3.3**. Samples (SW1) taken from the River Dodder, directly upstream from the site indicate a slight exceedance of nickel, with no other exceedances observed. SW3 sampled from the River Dodder at the midpoint along the site boundary indicated an exceedance of ammonium. Further downstream and at the site boundary, samples (SW2) exceeded ammonium and fluoranthene.

Springs sampled which represent groundwater indicated exceedances of arsenic. This represents the baseflow in contact with the waste. An arsenic exceedance was not observed at the downstream sampling point (SW2).

It is considered that there is direct connectivity of leachate to the underlying gravel aquifer and the mixing of leachate with laterally flow groundwater in the saturated aquifer dilutes the leachate concentrations. Notwithstanding this dilution, there are slight exceedances of the groundwater threshold value for arsenic at GW2. The arsenic mobilisation would be accelerated by the reducing condition generated from the decomposition of organics or from the groundwater from the bedrock from the oxidation of naturally occurring sulphides.

Small seepages/springs were noted that had emerged along the bank at the western perimeter as discreet seepages. These seepages then discharge directly to the River Dodder. The seepages are the point of emergence from the groundwater baseflow. Ochre staining was noted around the seepages.

The results indicates that the Bohernabreena landfill is currently having a minor impact on the River Dodder while the Friarstown landfill is having a much more significant impact on the river.

3.4 PROPOSED REMEDIATION SOLUTION

3.4.1 Installation of a Landfill Cap

The findings of the Environmental Risk Assessment recommends the installation of an engineered cap on the waste body with a low permeability barrier. The cap will be designed and constructed in line with the EPA Landfills Manuals – Landfill Site Design. The capping system should consist of at a minimum the following:

- Top soil (150 – 300mm) and subsoil of at least 1m total thickness;
- Drainage layer of 0.5m thickness having a minimum hydraulic conductivity of $1x10^{-4}$m/s
- Compacted mineral layer of a minimum 0.6m thickness having a hydraulic conductivity of less than or equal to $1x10^{-9}$m/s or a geosynthetic material (e.g. GCL) or similar that provides equivalent protection; and
- A gas collection layer of natural material (minimum 0.3m) or a geosynthetic layer. This layer may be unnecessary given the gas generating potential of the waste body.

An engineered low permeability capping solution allied with controlled water and ecological monitoring would represent the preferred strategy for managing the risks associated with the site, assuming a net betterment approach be acceptable to the regulator.

The cap will create a barrier between the source (the waste body and associated leachate) and pathway (rainfall ingress to the waste body) to reduce the potential for the generation and transport of leachate from the site to the adjoining River Dodder.

3.4.2 Aftercare Monitoring

To support the capping, the following environmental monitoring is proposed at the site:

- Surface water monitoring at the locations shown in **Figure 3.3** should be undertaken monthly during the capping works and quarterly thereafter for a period of five years.
- Groundwater monitoring at the locations shown in **Figure 3.2** should be undertaken annually for a period of five years.
- While landfill gas is considered a low risk on the site, this was based on monitoring within a limited time frame. It is recommended to take a conservative approach and carry out additional gas monitoring in accordance with industry best practice (CIRIA C665) over a longer period to fully assess seasonal trends.
- An invasive alien plant species (IAPS) survey should be undertaken prior to and following the proposed capping works.

3.4.3 Friarstown Outlet Pipe

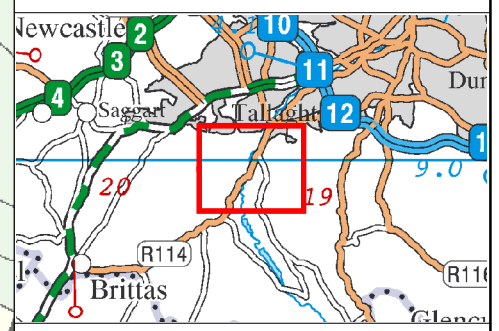
The Friarstown Landfill leachate tank overflow pipe which is discharging to the Dodder River urgently requires redirecting to the foul drainage network to control the impact of this discharge. Samples for the overflow pipe indicated that this discharge is adversely impacting the River Dodder. Based on historic maps, there appears to be pipes upgradient from the site which flow into the SAC. Theses pipes were not identified during this risk assessment.

Legend

Site Boundary

N

0 100 200 400 Meters



Client

Comhairle Contae Átha Cliath Theas
South Dublin County Council

Project

Bohernabreena Landfill Environmental Risk Assessment

Title

Site Location

Figure: 3.1

RPS

West Pier Business Campus,
Dun Laoghaire,
Co. Dublin,
Ireland.

T: +353 (0) 1 4882900
E: ireland@rpsgroup.com
W: rpsgroup.com/ireland

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