


PLAN

Resource and Waste Management Plan for Planning Stage of Whitebox Student Campus at Groody Road, Newcastle, Castletory, Limerick

January 2025

GARLAND
Concepts Realised

CONTENTS

Description of change	Originator	Rev	Approval	Date
Initial Release	PC	1st	BL	16/10/24
Updated Project Details	PC	A	BL	23/01/25

1. INTRODUCTION

GARLAND were commissioned by Groody Developments Limited to prepare a Resource and Waste Management Plan (RWMP) for new Student Campus at Groody Road, Newcastle, Castletroy, Limerick.

This plan will provide information necessary to ensure that the management of construction waste at the site is undertaken in accordance with all current legal and industry standards including the Waste Management Act 1996 as amended and associated Regulations, Environmental Protection Agency Act 1992 as amended, Litter Pollution Act 1997 as amended and the Southern Region Waste Management Plan 2015-2021. In particular, this plan aims to ensure maximum recycling, reuse and recovery of waste with diversion from landfill, wherever possible. It also seeks to provide guidance on the appropriate collection and transport of waste from the site to prevent issues associated with litter or more serious environmental pollution (e.g. contamination of soil and/or water).

This RWMP includes information on the legal and policy framework for Construction & Demolition (C&D) waste management in Ireland, estimates of the type and quantity of waste to be generated by the proposed development and makes recommendations for management of different waste streams. The RWMP should be viewed as a live document and should be regularly revisited throughout a project's lifecycle so that opportunities to maximise waste reduction / efficiencies are exploited throughout, and that data is collected on an ongoing basis so that it is as accurate as possible.

2. C&D RESOURCE AND WASTE MANAGEMENT IN IRELAND

2.1. National Level

The Irish Government issued a policy statement in September 1998, Changing Our Ways, which identified objectives for the prevention, minimisation, reuse, recycling, recovery and disposal of waste in Ireland. The target for C&D waste in this report was to recycle at least 50% of C&D waste within a five year period (by 2003), with a progressive increase to at least 85% over fifteen years (i.e. 2013).

In response to the Changing Our Ways report, a task force (Task Force B4) representing the waste sector of the already established Forum for the Construction Industry, released a report entitled 'Recycling of Construction and Demolition Waste concerning the development and implementation of a voluntary construction industry programme to meet the Government's objectives for the recovery of C&D waste.

In September 2020, the Irish Government published a policy document outlining a new action plan for Ireland to cover the period of 2020-2025. This plan, 'A Waste Action Plan for a Circular Economy (WAPCE), replaces the previous national waste management plan, "A Resource Opportunity" (2012), and was prepared in response to the 'European Green Deal' which sets a roadmap for a transition to an altered economical model, where climate and environmental challenges are turned into opportunities.

The WAPCE sets the direction for waste planning and management in Ireland up to 2025. This reorientates policy from a focus on managing waste to a much greater focus on creating circular patterns of production and consumption. Other policy statements of a number of public bodies already acknowledge the circular economy as a national policy priority.

The policy document contains over 200 measures across various waste areas including circular economy, municipal waste, consumer protection and citizen engagement, plastics and packaging, construction and demolition, textiles, green public procurement and waste enforcement.

One of the first actions to be taken was the development of the Whole of Government Circular Economy Strategy 2022-2023 'Living More, Using Less' (2021) to set a course for Ireland to transition across all sectors and at all levels of Government toward circularity and was issued in December 2021. It is anticipated that the Strategy will be updated in full every 18 months to 2 years.

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

The Environmental Protection Agency (EPA) of Ireland issued 'Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects' in November 2021. These guidelines replace the previous guidelines issued by The National Construction and Demolition Waste Council (NCDWC) and the Department of the Environment, Heritage and Local Government (DoEHLG) in 2006. The guidelines provide a practical approach which is informed by best practice in the prevention and management of C&D wastes and resources from design to construction of a project, including consideration of the deconstruction of a project. These guidelines have been followed in the preparation of this document and include the following elements:

- Predicted C&D wastes and procedures to prevent, minimise, recycle and reuse wastes;
- Design teams roles and approach;
- Relevant EU, national and local waste policy, legislation and guidelines;
- Waste disposal/recycling of C&D wastes at the site;
- Provision of training for Resource Manager (RM) and site crew;
- Details of proposed record keeping system;
- Details of waste audit procedures and plan; and
- Details of consultation with relevant bodies i.e. waste recycling companies, Local Authority, etc.

Section 3 of the Guidelines identifies thresholds above which there is a requirement for the preparation of a RWMP for developments. The new guidance classifies developments on a two-tiered system. Developments which do not exceed any of the following thresholds may be classed as Tier 1 development:

- New residential development of less than 10 dwellings.

- Retrofit of 20 dwellings or less.
- New commercial, industrial, infrastructural, institutional, educational, health and other developments with an aggregate floor area less than 1,250m^2.
- Retrofit of commercial, industrial, infrastructural, institutional, educational, health and other developments with an aggregate floor area less than 2,000m^2; and
- Demolition projects generating in total less than 100m^3 in volume of C&D waste.

A development which exceeds one or more of these thresholds is classed as Tier-2 projects.

This development requires a RWMP as a Tier 2 development as it is above following criteria:

- New commercial, industrial, infrastructural, institutional, educational, health and other developments with an aggregate floor area less than 1,250m^2

Other guidelines followed in the preparation of this report include 'Construction and Demolition Waste Management – a handbook for Contractors and Site Managers, published by FÁS and the Construction Industry Federation in 2002 and the previous guidelines, 'Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects' (2006).

These guidance documents are considered to define best practice for C&D projects in Ireland and describe how C&D projects are to be undertaken such that environmental impacts and risks are minimised and maximum levels of waste recycling are achieved.

2.2. Regional Level

The proposed development is located in the Local Authority area of Limerick City and County Council (LCCC).

The Southern Region Waste Management Plan 2015 – 2021 is the regional waste management plan for the LCCC area published in 2014.
The Regional Plan sets out the strategic targets for waste management in the region and sets a specific target for C&D waste of "70% preparing for reuse, recycling and other recovery of construction and demolition waste" (excluding natural soils and stones and hazardous wastes) to be achieved by 2020.

Municipal landfill charges in Ireland are based on the weight of waste disposed. In the Munster Region, charges are approximately €200 per tonne of waste which includes a €85 per tonne landfill levy introduced under the Waste Management (Landfill Levy) (Amendment) Regulations 2015.

The Limerick Development Plan 2022-2028 sets out a number of objectives for the Limerick City and County area, in line with the objectives of the regional waste management plan and the Circular Economy Policy. Waste objectives with a particular relevance to the proposed development are:

Objective IN O17 Waste Management and the Circular Economy It is an objective of the Council to:

- Support innovative, smart solutions and processes, based on the principles of the circular economy to implement the Regional Waste Management Plan for the Southern Region 2015 – 2021 and any subsequent plan, including any targets contained therein.
- Collaborate with the Regional Waste Management Office and other agencies to implement the EU Action Plan for the Circular Economy – Closing the Loop, 2015, its successor the Circular Economy Action Plan: A New Circular Economy Action Plan for a Cleaner More Competitive Europe, 2020 and the Resource Opportunity Waste Management Policy, DECLG, 2012 and any subsequent plans.
- Promote sustainable patterns of consumption and production in the areas of product design, production processes and waste management.
- Implement the provisions of the Waste Action Plan for a Circular Economy – Ireland's National Waste Policy 2020 - 2025, DECC, 2020 in the assessment of planning applications.

2.3. Legislative Requirements

The primary legislative instruments that govern waste management in Ireland and applicable to the development are:

- Waste Management Act 1996 as amended.
- Environmental Protection Agency Act 1992 as amended.
- Litter Pollution Act 1997 as amended.
- Planning and Development Act 2000 as amended 14
- Circular Economy and Miscellaneous Provisions Act 2022.

One of the guiding principles of European waste legislation, which has in turn been incorporated into the Waste Management Act 1996 as amended and subsequent Irish legislation, is the principle of "Duty of Care". This implies that the waste producer is responsible for waste from the time it is generated through until its legal recycling, recovery or disposal (including its method of disposal). As it is not practical in most cases for the waste producer to physically transfer all waste from where it is produced to the final destination, waste contractors will be employed to physically transport waste to the final destination. Following on from this is the concept of "Polluter Pays" whereby the waste producer is liable to be prosecuted for pollution incidents, which may arise from the incorrect management of waste produced, including the actions of any contractors engaged (e.g. for transportation and disposal/recovery/recycling of waste).

It is therefore imperative that the applicant ensures that the waste contractors engaged by the construction contractors are legally compliant with respect to waste transportation, recycling, recovery and disposal. This includes the requirement that a contractor handle, transport and recycle/recover/dispose of waste in a manner that ensures that no adverse environmental impacts occur as a result of any of these activities.

A collection permit to transport waste must be held by each waste contractor which is issued by the National Waste Collection Permit Office (NWCPO). Waste receiving facilities must also be appropriately permitted or licensed. Operators of such facilities cannot receive any waste, unless in possession of a Certificate of Registration (COR) or waste permit granted by the relevant Local Authority under the Waste Management (Facility Permit & Registration) Regulations 2007 and Amendments or a Waste or Industrial Emissions License granted by the EPA. The COR /

permit / license held will specify the type and quantity of waste able to be received, stored, sorted, recycled, recovered and/or disposed of at the specified site.

3. DESIGN APPROACH

The client and the design team have integrated the 'Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects' into the design workshops, to help review processes, identify and evaluate resource reduction measures and investigate the impact on cost, time, quality, buildability, second life and management post construction. Further details on these design principals can be found within the aforementioned guidance document.

The design team have undertaken the design process in line with the international best practice principles to firstly prevent wastes, reuse where possible and thereafter sustainably reduce and recover materials. The below sections have been the focal point of the design process and material selections and will continued to be analysed and investigated throughout the design process and when selecting material.

The approaches presented are based on international principles of optimising resources and reducing waste on construction projects through:

- Prevention;
- Reuse;
- Recycling;
- Green Procurement Principles;
- Off-Site Construction;
- Materials Optimisation; and
- Flexibility and Deconstruction.

3.1. Designing For Prevention, Reuse and Recycling

Undertaken at the outset and during project feasibility and evaluation, the Client and Design Team considered the potential for any reusable site assets e.g. topsoils and subsoils.

There are no existing structures or buildings on site so there is no opportunity for refurbishment and refitting rather than new build.

3.2. Designing for Green Procurement

Waste prevention and minimisation pre-procurement have been discussed and will be further elaborated within in this section. The Design Team will discuss proposed design solutions, encourage innovation in tenders and incentivise competitions to recognise sustainable approaches. They will also discuss options for packaging reduction with the main construction contractor and subcontractors/suppliers using measures such as 'Just-in-Time' delivery and use ordering procedures that avoid excessive waste and unnecessary transport. The Green procurement extends from the planning stage into the detailed design and tender stage and will be an ongoing part of the long-term design and selection process for this development.

3.3. Designing for Off-Site Construction

Use of off-site manufacturing has been shown to reduce residual wastes by up to 90% (volumetric building versus traditional). The decision to use offsite construction is typically cost led but there are significant benefits for resource management. Some further considerations for procurement which are being investigated as part of the planning stage design process are listed as follows:

- Early collaboration with the market
- Standardization of components and modularization
- Designing to permit transport and assembly
- Use of structural steelwork
- Use of structural framing systems for infill wall panels
- Use of roof paneling system
- Use of pre-cast structural concrete cores which can reduce the residual volumes of concrete blocks, mortars, plasters, etc; and
- Use of prefabricated reinforcement

The use of off-site construction using Modern Methods of Construction based on off-site fabrication have already been considered in the design todate and will be further considered post grant of a planning permission.

3.4. Designing for Materials Optimisation during Construction

To ensure manufacturers and construction companies will adopt lean production models, including maximising the reuse of materials onsite. This helps to reduce the environmental impacts associated with transportation of materials and from waste management activities. This includes investigating the use of standardised sizes for certain materials to help reduce the amount of offcuts produced on site, focusing on promotion and development of off-site manufacture.

The structural design approach for the proposed development is such that all nonstructural internal walls will be made in lightweight but robust partition systems appropriately rated for required impact duty. As such, heavy masonry works are not envisaged for the internal layouts.

Prefabricated Mechanical, Electrical, and Plumbing (MEP) systems present an innovative solution to enhance construction efficiency and sustainability. By specifically specifying MEP components that can be assembled off-site, projects benefit from streamlined on-site installation processes. This method not only reduces construction timelines but also minimizes material waste, as the manufacturing of MEP systems can be closely controlled in a controlled environment. The off-site assembly ensures precision and accuracy in the construction of these critical building systems, promoting a higher level of quality and consistency. Prefabricated MEP systems not only contribute to the optimization of construction processes but also align with the broader goal of sustainable and resource-efficient building practices.

3.5. Designing for Flexibility and Deconstruction

Design flexibility has and will be investigated throughout the design process to ensure that where possible products (including buildings) only contain materials that can be recycled and are designed to be easily disassembled. Material efficiency is being considered for the duration and

end of life of a building project to produce; flexible, adaptable spaces that enable a resource-efficient, low-waste future change of use; durability of materials and how they can be recovered effectively when maintenance and refurbishment are undertaken and during disassembly/deconstruction.

Designing building facades with removable and reusable elements is a forward-thinking strategy that enhances both flexibility and sustainability in construction. By incorporating components that can be easily removed and replaced, the facade becomes adaptable to updates in aesthetics, energy efficiency improvements, or changing design trends without the need for significant demolition or waste generation. This approach allows for a dynamic and responsive building exterior, aligning with evolving architectural preferences and environmental standards. Moreover, the ability to update specific facade elements independently reduces the overall environmental impact, promoting a more resource-efficient and economically viable construction and renovation process. This commitment to removable and reusable facade elements reflects a commitment to long-term sustainability, where structures can evolve with minimal environmental impact over time.

Opting for bolted connections and fasteners in structural elements is a strategic design choice with long-term sustainability in mind. By favouring bolted connections over welded alternatives, structures become more amenable to disassembly during deconstruction phases. This design approach facilitates the efficient dismantling of the building, allowing for the reuse of structural components. Bolted connections offer a key advantage in their reversibility, as they can be easily undone without compromising the integrity of the materials. This not only simplifies the deconstruction process but also contributes to resource conservation by preserving structural elements for potential reuse in future construction projects. The use of bolted connections aligns with principles of circular economy, promoting a more environmentally conscious and adaptable approach to construction and demolition practices.

Designing buildings with plug-and-play building services involves integrating utility connections that are easily adaptable to future changes in technology or equipment. By implementing this approach, the installation and replacement of building systems become simplified, mitigating the need for major disruptions to the structure. The concept of plug-and-play building services allows for a seamless transition when upgrading or incorporating new technologies, ensuring that the building remains agile and responsive to evolving needs. This flexibility not only enhances the longevity of the building but also contributes to a more sustainable and resource-efficient construction and maintenance process. Whether it's accommodating advancements in energy systems, communication infrastructure, or other utilities, the plug-and-play approach promotes a future-ready and easily adaptable built environment.

4. DESCRIPTION OF THE PROJECT

4.1. Location, Size and Scale of the Development

The development of a Purpose-Built Student Accommodation (PBSA) scheme on land fronting the Groody Road and Dublin Road, Castletroy, in the townland of Newcastle, Limerick, for a period of seven years.

The development consisting of 196 no. Bed Clusters, is distributed across 5 no. separate blocks, ranging in height from 5 - 8 storeys, with a total of 1,400 no. student bedspaces to be delivered in two phases of development including: (i) Block A comprising 8 storeys providing for (a) 28 no. bed clusters and 224 no. bedspaces; (b) Student library; (c) Student union; (d) Plant room; (e) Bin store; (f) Bicycle store; (ii) Block B comprising 7 storeys providing for (a) 52 no. bed clusters and 400 no. bedspaces; (b) Reception & Office; (c) Post room; (d) Laundry room; (e) Student canteen; (f) Maintenance store; (g) Plant room; (h) ESB sub station & switch room; (i) Bin Storage; (j) and Bicycle store; (iii) Block C comprising 6 storeys providing for (a) 51 no. bed clusters and 355 no. bedspaces; (b) Student Gym; (c) Maintenance store; (d) Plant room; (e) ESB sub station & switch room; (f) Bin Storage; (g) and Bicycle store; (iv) Block D comprising 6 storeys providing for (a) 32 no. bed clusters and 211 no. bedspaces; (b) Reception & Office; (c) Post room; (d) Laundry room; (e) Student canteen; (f) Student supply retail unit (60m2); (g) Plant room; (h) Maintenance store; (i) Bin Storage; and (k) Bicycle Storage; (v) Block E comprising 5 storeys providing for (a) 33 no. bed clusters and 210 no. bedspaces; (b) Reception & Office; (c) Laundry room; (d) Maintenance store; (e) Bicycle store; and (f) Plant room; and (vi) ancillary site development works including car parking provision; boundary treatments; roof plant; public lighting; water supply; foul and surface water drainage infrastructure; signage; and a temporary construction access to facilitate Phase 2. The site will be accessed via the Groody Road. Extensive landscaping proposals, including (a) landscaped courtyards; (b) pedestrian and cycle connections from the Groody Road to the Groody Green Wedge; (c) natural landscaping and public walkways within the Groody Green Wedge; and (d) a Wetland & Biodiversity area adjacent to the Groody River are also proposed. Planning permission is also sought for use of the accommodation, outside of student term time, for short-term letting purposes.

Figure 1 - Site Layout

4.2. Details of the Non-Hazardous Wastes to be produced

There will be waste materials generated from the excavation of topsoil, clay, gravel and bedrock to facilitate site clearance, site levelling, construction of new building`s foundations and installation of services.

GARLAND have been furnished with the following documentation related to the site:

- An Environmental Subsurface Investigation Report by ELS dated 15th March 2010. This is available within Appendix A.

The report from ELS confirms that the previous site owner was issued a Waste Permit from Limerick Co Council in 2001. It is understood that the waste permit allowed for the import of clean inert building rubble and subsoil. A condition of the permit stated “no organic matter (including organic soils, timber or other biodegradable matter) plastics metals, refuse hazardous wastes shall be imported to the site.” The Permit was granted for a period not exceeding three

years. It is unknown when waste operations ceased, but ELS confirm that as of October 2009 when investigations were carried out all waste operations had ceased.
The investigations carried out by ELS have revealed the depth of imported fill material was observed to range between 1.2-4.2m BGL. ELS made the following observations in relation to the waste and these are presented within the Figure below:

Waste Type & Description	EWC Code	%v/v (estimated)	Trench Locations	Other Observations
Made ground/CLAY	17 05 04	90 to100	All	-
Concrete and Bricks	17 01 01 17 01 02	<1 to 10	1,2, 5, 6, 7, 9, 11	Trench 9 at 1.0-2.3 m bgl contained up to 40% v/v concrete/ bricks.
Wood	17 02 01	<1 to 5	All	Trench 9 at 1.0-2.3 m bgl contained up to 15% v/v wood.
Metal (Note 2)	17 04 07	<1 to 3	All	Trench 9 at 1.0-2.3 m bgl and Trench 12 at 1.1-1.7 m bgl contained up to 20% v/v metal.
Plastic & Rubber	17 02 03	<1 to 1	1 to 11	Trench 9, two tyres were observed estimated at 2% v/v. At Trench 8 a narrow 0.1 metre thick band of plastic encountered.
Glass	17 02 02	<1	9	-
Fabric, Cloth & Carpet	20 01 11	<1 to 1	5, 7, 8, 9, 10, 11, and 12	-

Figure 2 – Summary of Waste Items Recorded (ELS)

The majority of the material encountered comprised Made ground/clay with various quantities of concrete and bricks, wood, metal, plastic and rubber, glass and fabrics.

Beneath the imported waste materials natural ground was described as comprising grey/blue SILT and at one location as a dark brown peaty horizon. We carried out further trial pits more recently, the results of which are contained within Appendix B, and we found the ground conditions to be broadly similar to the findings of ELS in 2010.

ELS carried out chemical analysis of the imported soils which revealed 9 of the 10 samples analysed would be considered suitable for inert disposal i.e in line with the waste permit conditions. 1 of the 10 samples revealed elevated levels of sulphate above the inert threshold and would therefore be unsuitable for disposal at an inert waste facility. No further analysis is available after 2010 and we note that any up to date analysis will be required to determine the exact suitability of materials of current landfill categorisation.

Based on the aforementioned investigation data, we have prepared 3D analysis of the site based on site topography and trial hole data.

Figure 3 - Estimate of Filled Ground

The envisaged strategy for the site is of segregation and reuse where possible on site but disposal where required to licensed facilities.

Based on this analysis, the area of the site to be remediated is in the order of 20,000m^2 and a volume of fill to be in the order of 70,000m^3. Based on the previous classification of trial holes being 90% of trial hole material being clay with stones and boulders, 63,000m^3 of the material will be reused on site and 10% of the material, being 7,000m^3 of the material having to go off site to a licensed waste recycling material and disposal facility to a waste or recycling stream suitable to the material being brought off site.

An outline methodology for the segregation and reuse is outlined herewith:

- Produce a Remediation Strategy
- Obtain appropriate licenses to undertake the remedial works.
- Surface water management measures to be put in place
- Excavation of made ground and transport to a designated treatment area within the site.

- Processing the made ground through a 100mm screener and picking station to remove oversize and unacceptable materials.
- Disposal of unacceptable picked waste material removed from the soils at suitability licensed waste disposal / recycling facility
- Placement of the picked soils back in the excavation and compaction with stabilization if deemed appropriate and necessary
- Onsite environmental monitoring during the works and provision of dust mitigation and odour suppression during the works.
- Provision of a Validation Report detailing the works undertaken.

During the construction phase there may be a surplus of building materials, such as timber off-cuts, broken concrete blocks, plastics, metals and tiles generated. There may also be excess concrete during construction which will need to be disposed of. Plastic and cardboard waste from packaging and oversupply of materials will also be generated.

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

4.3. Potential Hazardous Wastes to be produced

4.3.1. Contaminated Soil

As outlined above, it is expected that in the order of 7,000m^3 of material of the filled area of the site will not be suitable for reuse within the site and will be brought to licensed waste disposal / recycling facility into a waste or recycling stream suitable to the material being brought off site.

In the event that any potentially contaminated material is encountered during the segregation and reuse methodology being applied to the site, it will need to be segregated from clean/inert material, tested and classified as either non-hazardous or hazardous in accordance with the EPA publication entitled 'Waste Classification: List of Waste & Determining if Waste is Hazardous or Non-Hazardous using the HazWasteOnline application (or similar approved classification method). The material will then need to be classified as clean, inert, non-hazardous or hazardous in accordance with the EC Council Decision 2003/33/EC, which establishes the criteria for the acceptance of waste at landfills.

Note, all soils and stones removed offsite as a waste will require testing and classification as non-hazardous or hazardous in accordance with 'Waste Classification: List of Waste & Determining if Waste is Hazardous or Non-Hazardous' and in accordance with the EC Council Decision 2003/33/EC, which establishes the criteria for the acceptance of waste at landfills.

If any Asbestos or Asbestos Containing Material (ACMs) are identified in the soil, the removal of asbestos will be carried out by a suitably qualified contractor will only be removed from site by a suitably permitted waste contractor. in accordance with S.I. No. 386 of 2006 Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006-2010. All asbestos will be taken to a suitably licensed or permitted facility.

4.3.2. Fuel/Oils

As fuels and oils are classed as hazardous materials, any on-site storage of fuel/oil, all storage tanks and all draw-off points will be bunded (or stored in double-skinned tanks) and located in a dedicated, secure area of the site. Provided that these requirements are adhered to and site crew are trained in the appropriate refuelling techniques, it is not expected that there will be any fuel/oil wastage at the site.

4.3.3. Japanese Knotweed and Other Invasive Plant Species

There were no invasive species recorded at the proposed development site.

4.3.4. Other known Hazardous Substances

Paints, glues, adhesives and other known hazardous substances will be stored in designated areas. They will generally be present in small volumes only and associated waste volumes generated will be kept to a minimum. Wastes will be stored in appropriate receptacles pending collection by an authorised waste contractor.

In addition, WEEE (containing hazardous components), printer toner/cartridges, batteries (Lead, Ni-Cd or Mercury) and/or fluorescent tubes and other mercury containing waste may be generated from during C&D activities or temporary site offices. These wastes (if encountered) will be stored in appropriate receptacles in designated areas of the site pending collection by an authorised waste contractor.

5. ROLES AND RESPONSIBILITIES

The Best Practice Guidelines on the Preparation of Resource Waste Management Plans for Construction and Demolition Projects promotes that a RM should be appointed. The RM may be performed by number of different individuals over the life- cycle of the Project, however it is intended to be a reliable person chosen from within the Planning/Design/Contracting Team, who is technically competent and appropriately trained, who takes the responsibility to ensure that the objectives and measures within the Project RWMP are complied with. The RM is assigned the requisite authority to meet the objective and obligations of the RWMP. The role will include the important activities of conducting waste checks/audits and adopting construction methodology that is designed to facilitate maximum reuse and/or recycling of waste.

5.1. Role of the Client

The Client is the body establishing the aims and the performance targets for the project.

- The Client has commissioned the preparation and submission of a preliminary RWMP as part of the design and planning submission;
- The Client is to commission the preparation and submission of an updated RWMP as part of the construction tendering process;

- The Client will ensure that the RWMP is agreed on and submitted to the local authority prior to commencement of works on site;
- The Client is to request the end-of-project RWMP from the Contractor.

5.2. Role of the Client Advisory Team

The Client Advisory Team or Design Team is formed of architects, consultants, quantity surveyors and engineers and is responsible for:

- Drafting and maintaining the RWMP through the design, planning and procurement phases of the project;
- Appointing a RM to track and document the design process, inform the Design Team and prepare the RWMP.
- Including details and estimated quantities of all projected waste streams with the support of environmental consultants/scientists. This should also include data on waste types (e.g. waste characterisation data, site investigation information) and prevention mechanisms (such as by-products) to illustrate the positive circular economy principles applied by the Design Team;
- Handing over of the RWMP to the selected Contractor upon commencement of construction of the development, in a similar fashion to how the safety file is handed over to the Contractor;
- Working with the Contractor as required to meet the performance targets for the project.

5.3. Future Role of the Contractor

The future construction Contractors have not yet been decided upon for this RWMP. However, once selected they will have major roles to fulfil. They will be responsible for:

- Preparing, implementing and reviewing the RWMP throughout the construction phase (including the management of all suppliers and sub-contractors) as per the requirements of these guidelines;
- Identifying a designated and suitably qualified RM who will be responsible for implementing the RWMP;
- Identifying all hauliers to be engaged to transport each of the resources / wastes off-site;
- Implementing waste management policies whereby waste materials generated on site are to be segregated as far as practicable;
- Identifying all destinations for resources taken off-site. As above, any resource that is legally classified as a ‘waste’ must only be transported to an authorised waste facility;
- End-of-waste and by-product notifications addressed with the EPA where required;
- Clarification of any other statutory waste management obligations, which could include on-site processing;
- Full records of all resources (both wastes and other resources) should be maintained for the duration of the project; and
- Preparing a RWMP Implementation Review Report at project handover.

6. KEY MATERIALS & QUANTITIES

6.1. Project Resource Targets

Project specific resource and waste management targets for the site have not yet been set and this information should be updated for these targets once these targets have been confirmed by the client. However, it is expected for projects of this nature that a minimum of 70% of waste is fully re-used, recycled or recovered. Target setting will inform the setting of project-specific benchmarks to track target progress. Typical Key Performance Indicators (KPIs) that may be used to set targets include (as per guidelines):

- Weight (tonnes) or Volume (m3) of waste generated per construction value;
- Weight (tonnes) or Volume (m3) of waste generated per construction floor area (m2);
- Fraction of resource reused on site;
- Fraction of resource notified as by-product;
- Fraction of waste segregated at source before being sent off-site for recycling/recovery; and
- Fraction of waste recovered, fraction of waste recycled, or fraction of waste disposed.

6.2. Main C&D Waste Categories

The main non-hazardous and hazardous waste streams that could be generated by the construction activities at a typical site are shown in Table 1. The List of Waste (LoW) code (as effected from 1 June 2015) (also referred to as the European Waste Code or EWC) for each waste stream is also shown.

Waste Material	LoW/EWC
Concrete, bricks, tiles, ceramics	17 01 01-03 &
Wood, glass and plastic	17 02 01-03
Treated wood, glass, plastic, containing hazardous substances	17-02-04*
Bituminous mixtures, coal tar and tarred products	17 03 01*, 02 &
Metals (including their alloys) and cable	17 04 01-11
Soil and stones	17 05 03* & 04
Gypsum-based construction material	17 08 01* & 02
Paper and cardboard	20 01 01
Mixed C&D waste	17 09 04
Green waste	20 02 01
Electrical and electronic components	20 01 35 & 36
Batteries and accumulators	20 01 33 & 34
Liquid fuels	13 07 01-10
Chemicals (solvents, pesticides, paints, adhesives, detergents etc.)	20 01 13, 19,
Insulation materials	17 06 04
Organic (food) waste	20 01 08
Mixed Municipal Waste	20 03 01

Table 1 - Typical Waste Generated

6.3. Demolition Waste Generation

There is no demolition required for the project.

6.4. Construction Waste Generation

Table 2 shows the breakdown of C&D waste types produced on a typical site based on data from the EPA National Waste Reports, the joint EPA and GMIT study and other research reports.

Waste Types	%
Mixed C&D	33
Timber	28
Plasterboard	10
Metals	8
Concrete	6
Other	15
Total	**100**

Table 2 - Waste type percentages generated on a typical Irish construction site

Table 3 shows the predicted construction waste generation for the proposed development based on the information available to date along with the targets for management of the waste streams. The predicted waste amounts are based on an average large-scale development waste generation rate per m^2, using the waste breakdown rates shown in Table 2.

Waste Type	Tonnes	Reuse				Recycle/Recovery	
		%	Tonnes	%	Tonnes	%	Tonnes
Mixed C&D	297	10	30	80	237	10	30
Timber	252	40	101	55	139	5	13
Plasterboard	90	30	27	60	54	10	9
Metals	72	5	4	90	65	5	4
Concrete	54	30	16	65	35	5	3
Other	135	20	27	60	81	20	27
Total	**900**		**204**		**611**		**85**

Table 3 - Estimated Waste Generation

In addition to the information within Table 3, it is estimated that approx. 63,000m3 of clay with stones and boulders will be reused on site however, in the order of 7,000m3 of existing material within the ground will not be appropriate for reuse on site and instead will be brought off site to a licensed recycling and disposal facility

It should be noted that until final materials and detailed construction methodologies have been confirmed, it is difficult to predict with a high level of accuracy the construction waste that will be generated from the proposed works as the exact materials and quantities may be subject to some degree of change and variation during the construction process. It is anticipated that the estimates in Table 3 are conservative estimates and the actual quantum of wastes generated will be less due to sustainable design approach proposed for this development.

6.5. Proposed Resource Waste Management Options

Waste materials generated will be segregated on site, where it is practical. Where the on-site segregation of certain wastes types is not practical, off-site segregation will be carried out. There will be skips and receptacles provided to facilitate segregation at source where feasible. The appointed waste contractor will collect and transfer the wastes as receptacles are filled. There are numerous waste contractors in the LCCC Region that provide this service.

All waste arising's will be handled by an approved waste contractor holding a current waste collection permit. All waste arising's requiring disposal off-site will be reused, recycled, recovered or disposed of at a facility holding the appropriate registration, permit or licence, as required.

Some of the sub-contractors on site will generate waste in relatively low quantities. The transportation of non-hazardous waste by persons who are not directly involved with the waste business, at weights less than or equal to 2 tonnes, and in vehicles not designed for the carriage of waste, are exempt from the requirement to have a waste collection permit (Ref. Article 30 (1) (b) of the Waste Collection Permit Regulations 2007 as amended). Any sub-contractors engaged that do not generate more than 2 tonnes of waste at any one time can transport this waste offsite in their work vehicles (which are not design for the carriage of waste). However, they are required to ensure that the receiving facility has the appropriate COR / permit / licence.

Written records will be maintained by the contractor(s) detailing the waste arising throughout the C&D phases, the classification of each waste type, waste collection permits for all waste contactors who collect waste from the site and COR/permit or licence for the receiving waste facility for all waste removed off site for appropriate reuse, recycling, recovery and/or disposal.

Dedicated bunded storage containers will be provided for hazardous wastes which may arise such as batteries, paints, oils, chemicals etc, if required.

The management of the main waste streams is outlined as follows:

6.5.1. Soil, Stone, Gravel and Clay

The Waste Management Hierarchy states that the preferred option for waste management is prevention and minimisation of waste, followed by preparing for reuse and recycling/recovery, energy recovery (i.e. incineration) and, least favoured of all, disposal. The excavations are required to facilitate the construction works so the preferred option (prevention and minimisation) cannot be accommodated for all the material generated excavation phase. However, excavated material will be reused on site where possible to minimise the requirement to removal material from the site.

If material is removed off-site, it could be reused as a by-product (and not as a waste). If this is done, it will be done in accordance with Regulation 15 (By-products) (Previously Article 27 and referred to as Article 27 in this report) of European Union (Waste Directive) Regulations 2011-2020, which requires that certain conditions are met and that by-product notifications are made to the EPA via their online notification form. Excavated material should not be removed from site until approval from the EPA has been received.

The potential to reuse material as a by-product will be confirmed during the course of the excavation works, with the objective of eliminating any unnecessary disposal of material.

The next option (beneficial reuse) may be appropriate for the excavated material pending environmental testing to classify the material as hazardous or non-hazardous in accordance with the EPA Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous publication. Clean inert material may be used as fill material in other construction projects or engineering fill for waste licensed sites. Beneficial reuse of surplus excavation material as engineering fill may be subject to further testing to determine if materials meet the specific engineering standards for their proposed end-use.

Any nearby sites requiring clean fill/capping material will be contacted to investigate reuse opportunities for clean and inert material. If any of the material is to be reused on another site as a by-product (and not as a waste), this will be done in accordance with Article 27. Similarly, if any soils/stones are imported onto the site from another construction site as a by-product, this will also be done in accordance with Article 27. Article 27 will be investigated to see if the material can be imported onto this site for beneficial reuse instead of using virgin materials.

If the material is deemed to be a waste, then it will require testing and classification as non-hazardous or hazardous in accordance with 'Waste Classification: List of Waste & Determining if Waste is Hazardous or Non-Hazardous' and in accordance with the EC Council Decision 2003/33/EC, which establishes the criteria for the acceptance of waste at landfills. The removal and reuse/recovery/disposal of the material will be carried out in accordance with the Waste Management Acts 1996 – 2011 as amended, the Waste Management (Collection Permit) Regulations 2007 as amended and the Waste Management (Facility Permit & Registration) Regulations 2007 as amended.

Once all available beneficial reuse options have been exhausted, the options of recycling and recovery at waste permitted and licensed sites will be considered.

In the event that contaminated material is encountered and subsequently classified as hazardous, this material will be stored separately to any non-hazardous material. It will require off-site treatment at a suitable facility or disposal abroad via Transfrontier Shipment of Wastes (TFS).

6.5.2. Bedrock

It is not anticipated that bedrock will be encountered at the site. However, if any bedrock is encountered that needs to be excavated, it is proposed to crush the bedrock on site for reuse as fill, subject to an assessment of suitability. If deemed necessary, approval will be sought from LCCC for the onsite crushing of bedrock.

6.5.3. Silt & Sludge

During the construction phase, silt and petrochemical interception should be carried out on runoff and pumped water from site works, where required. Sludge and silt will then be collected by a suitably licensed contractor and removed offsite.

6.5.4. Concrete Blocks, Bricks, Tiles & Ceramics

The majority of concrete blocks, bricks, tiles and ceramics generated as part of the construction works are expected to be clean, inert material and should be recycled, where possible.

6.5.5. Hard Plastic

As hard plastic is a highly recyclable material, much of the plastic generated will be primarily from material off-cuts. All recyclable plastic will be segregated and recycled, where possible.

6.5.6. Timber

Timber that is uncontaminated, i.e. free from paints, preservatives, glues etc., will be disposed of in a separate skip and recycled off-site.

6.5.7. Metal

Metals will be segregated into mixed ferrous, aluminium cladding, high grade stainless steel, low grade stainless steel etc., where practical and stored in skips. Metal is highly recyclable and there are numerous companies that will accept these materials.

6.5.8. Plasterboard

There are currently a number of recycling services for plasterboard in Ireland. Plasterboard from the construction phase will be stored in a separate skip, pending collection for recycling. The site manager will ensure that oversupply of new plasterboard is carefully monitored to minimise waste.

6.5.9. Glass

Glass materials will be segregated for recycling, where possible.

6.5.10. Waste Electrical and Electronic Equipment (WEEE)

Any WEEE will be stored in dedicated covered cages/receptacles/pallets pending collection for recycling.

6.5.11. Other Recyclables

Where any other recyclable wastes such as cardboard and soft plastic are generated, these will be segregated at source into dedicated skips and removed off-site.

6.5.12. Non-Recyclable Waste

C&D waste which is not suitable for reuse or recovery, such as polystyrene, some plastics and some cardboards, will be placed in separate skips or other receptacles. Prior to removal from site, the non-recyclable waste skip/receptacle will be examined by a member of the waste team to determine if recyclable materials have been placed in there by mistake. If this is the case, efforts will be made to determine the cause of the waste not

being segregated correctly and recyclable waste will be removed and placed into the appropriate receptacle.

6.5.13. Other Hazardous Wastes

On-site storage of any hazardous wastes produced (i.e. contaminated soil if encountered and/or waste fuels) will be kept to a minimum, with removal off-site organised on a regular basis. Storage of all hazardous wastes on-site will be undertaken so as to minimise exposure to on-site personnel and the public and to also minimise potential for environmental impacts. Hazardous wastes will be recovered, wherever possible, and failing this, disposed of appropriately.

It should be noted that until a construction contractor is appointed it is not possible to provide information on the specific destinations of each construction waste stream. Prior to commencement of construction and removal of any construction waste offsite, details of the proposed destination of each waste stream will be provided to LCCC by the project team.

6.6. Tracking and Documentation Procedures for Off-Site Waste

All waste will be documented prior to leaving the site. Waste will be weighed by the contractor, either by weighing mechanism on the truck or at the receiving facility. These waste records will be maintained on site by the nominated project RM (see Section 10.0).

All movement of waste and the use of waste contract85ors will be undertaken in accordance with the Waste Management Act 1996 as amended, Waste Management (Collection Permit) Regulations 2007 as amended and Waste Management (Facility Permit & Registration) Regulations 2007 and amended. This includes the requirement for all waste contractors to have a waste collection permit issued by the NWCPO. The nominated project RM (see Section 10.0) will maintain a copy of all waste collection permits on-site.

If the waste is being transported to another site, a copy of the Local Authority waste COR/permit or EPA Waste/IE Licence for that site will be provided to the nominated project RM. If the waste is being shipped abroad, a copy of the Transfrontier Shipping (TFS) notification document will be obtained from DCC (as the relevant authority on behalf of all local authorities in Ireland) and kept on-site along with details of the final destination (COR, permits, licences etc.). A receipt from the final destination of the material will be kept as part of the on-site waste management records.

All information will be entered in a waste management recording system to be maintained on site.

7. ESTIMATED COST OF WASTE MANAGEMENT

The total cost of C&D waste management will be measured and will take into account handling costs, storage costs, transportation costs, revenue from rebates and disposal costs.

7.1. Reuse

By reusing materials on site, there will be a reduction in the transport and recycle/recovery/disposal costs associated with the requirement for a waste contractor to take the material off-site.

Clean and inert soils, gravel, stones etc. which cannot be reused on site may be used as access roads or capping material for landfill sites etc. This material is often taken free of charge or a reduced fee for such purposes, reducing final waste disposal costs.

7.2. Recycling

Salvageable metals will earn a rebate which can be offset against the costs of collection and transportation of the skips.

Clean uncontaminated cardboard and certain hard plastics can also be recycled. Waste contractors will charge considerably less to take segregated wastes, such as recyclable waste, from a site than mixed waste.

Timber can be recycled as chipboard. Again, waste contractors will charge considerably less to take segregated wastes such as timber from a site than mixed waste.

7.3. Disposal

Landfill charges in the Limerick region are currently at around €200 per tonne which includes a €85 per tonne landfill levy specified in the Waste Management (Landfill Levy) Regulations 2015. In addition to disposal costs, waste contractors will also charge a collection fee for skips.

Collection of segregated C&D waste usually costs less than municipal waste. Specific C&D waste contractors take the waste off-site to a licensed or permitted facility and, where possible, remove salvageable items from the waste stream before disposing of the remainder to landfill. Clean soil, rubble, etc. is also used as fill/capping material, wherever possible.

8. TRAINING PROVISIONS

A member of the construction team will be appointed as the project RM to ensure commitment, operational efficiency and accountability during the C&D phases of the project.

8.1. Resource Manager Training and Responsibilities

The nominated RM will be given responsibility and authority to select a waste team if required, i.e. members of the site crew that will aid them in the organisation, operation and recording of the waste management system implemented on site. The RM will have overall responsibility to oversee, record and provide feedback to the client on everyday waste management at the site. Authority will be given to the RM to delegate responsibility to sub-contractors, where necessary, and to coordinate with suppliers, service providers and sub-contractors to prioritise waste prevention and material salvage.

The RM will be trained in how to set up and maintain a record keeping system, how to perform an audit and how to establish targets for waste management on site. The RM will also be trained in the best methods for segregation and storage of recyclable materials, have information on the materials that can be reused on site and be knowledgeable in how to implement this RWMP.

8.2. Site Crew Training

Training of site crew is the responsibility of the RM and, as such, a waste training program should be organised. A basic awareness course will be held for all site crew to outline the RWMP and to detail the segregation of waste materials at source. This may be incorporated with other site training needs such as general site induction, health and safety awareness and manual handling.

This basic course will describe the materials to be segregated, the storage methods and the location of the Waste Storage Areas (WSAs). A sub-section on hazardous wastes will be incorporated into the training program and the particular dangers of each hazardous waste will be explained.

9. TRACKING AND TRACING / RECORD KEEPING

Records should be kept for all waste material which leaves the site, either for reuse on another site, recycling or disposal. A recording system will be put in place to record the waste arising's on site.

A waste tracking log should be used to track each waste movement from the site. On exit from the site the waste collection vehicle driver should stop at the site office and sign out as a visitor and provide the security personnel or RM with a waste docket (or WTF for hazardous waste) for the waste load collected. At this time, the security personnel should complete and sign the Waste Tracking Register with the following information:

- Date
- Time
- Waste Contractor
- Company waste contractor appointed by e.g. Contractor or subcontractor
- Collection Permit No.
- Vehicle Reg.
- Driver Name
- Docket No.
- Waste Type
- EWC/LoW

The waste vehicle will be checked by security personal or the RM to ensure it has the waste collection permit no. displayed and a copy of the waste collection permit in the vehicle before they are allowed to remove the waste from the site.

The waste transfer dockets will be transferred to the RM on a weekly basis and can be placed in the Waste Tracking Log file. This information will be forwarded onto the DCC Waste Regulation Unit when requested.

Each subcontractor that has engaged their own waste contractor will be required to maintain a similar waste tracking log with the waste dockets / WTF maintained on file and available for inspection on site by the main contractor as required. These subcontractor logs will be merged with the main waste log.

Waste receipts from the receiving waste facility will also be obtained by the site contractor(s) and retained. A copy of the Waste Collection Permits, CORs, Waste Facility Permits and Waste Licences will be maintained on site at all times and will be periodically reviewed by the RM. Subcontractors who have engaged their own waste contractors, should provide the main contractor with a copy of the waste collection permits and COR / permit / licence for the receiving waste facilities and maintain a copy on file, available for inspection on site as required.

A copy of the Waste Collection Permits, CORs, Waste Facility Permits and Waste Licences will be sent to the LCCC Waste Regulation Unit prior to any material being removed from site.

10. OUTLINE WASTE AUDIT PROCEDURE

10.1. Responsibility for Waste Audit

The appointed RM will be responsible for conducting a waste audit at the site during the C&D phase of the development. Contact details for the nominated RM will be provided to the LCCC Environmental Section after the main contractor is appointed and prior to any material being removed from site.

10.2. Review of Records and Identification of Corrective Actions

A review of all the records for the waste generated and transported off-site should be undertaken mid-way through the project. If waste movements are not accounted for, the reasons for this should be established in order to see if and why the record keeping system has not been maintained. The waste records will be compared with the established recovery/reuse/recycling targets for the site.

Each material type will be examined, in order to see where the largest percentage waste generation is occurring. The waste management methods for each material type will be reviewed in order to highlight how the targets can be achieved.

Waste management costs will also be reviewed.

Upon completion of the construction phase, a final report will be prepared, summarising the outcomes of waste management processes adopted and the total recycling/reuse/recovery figures for the development.

11. CONSULTATION WITH RELEVANT BODIES

11.1. Local Authority

Once construction contractors have been appointed, have appointed waste contractors and prior to removal of any C&D waste materials offsite, details of the proposed destination of each waste stream will be provided to the LCCC Environmental Section.

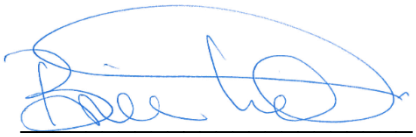
LCCC will also be consulted, as required, throughout the excavation and construction phases in order to ensure that all available waste reduction, reuse and recycling opportunities are identified and utilised and that compliant waste management practices are carried out.

11.2. Recycling/Salvage Companies

Companies that specialise in C&D waste management will be contacted to determine their suitability for engagement. Where a waste contractor is engaged, each company will be audited in order to ensure that relevant and up-to-date waste collection permits and facility COR/permits/licences are held. These permit details will be sent to the LCCC Environmental Section. In addition, information regarding individual construction materials will be obtained, including the feasibility of recycling each material, the costs of recycling/reclamation and the means by which the wastes will be collected and transported off-site, and the recycling/reclamation process each material will undergo off site.

12. REFERENCES

- Waste Management Act 1996 (No. 10 of 1996) as amended.
- Environmental Protection Agency Act 1992 as amended.
- Litter Pollution Act 1997 (S.I. No. 12 of 1997) as amended.
- Southern Region Waste Management Plan 2015 – 2021 (2015).
- Department of Environment and Local Government (DoELG) Waste Management – Changing Our Ways, A Policy Statement (1998).
- Forum for the Construction Industry – Recycling of Construction and Demolition Waste.
- Department of Communications, Climate Action and Environment (DCCAE), Waste Action Plan for the Circular Economy - Ireland's National Waste Policy 2020-2025 (Sept 2020).
- DCCAE, Whole of Government Circular Economy Strategy 2022-2023 'Living More, Using Less' (2021).
- Circular Economy and Miscellaneous Provisions Act 2022.
- Environmental Protection Agency (EPA) 'Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects' (2021).
- Department of Environment, Heritage and Local Government, Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (2006).
- FÁS and the Construction Industry Federation (CIF), Construction and Demolition Waste Management – a handbook for Contractors and site Managers (2002).
- Planning and Development Act 2000 (S.I. No. 30 of 2000) as amended.
- EPA, Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous (2015).
- Council Decision 2003/33/EC, establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC.
- Environmental Protection Agency (EPA), National Waste Database Reports 1998 – 2012.
- EPA and Galway-Mayo Institute of Technology (GMIT), EPA Research Report 146 – A Review of Design and Construction Waste Management Practices in Selected Case Studies – Lessons Learned (2015).
- Limerick City and County Council (LCCC) Limerick Development Plan 2022-2028 (2022).

Signed: 

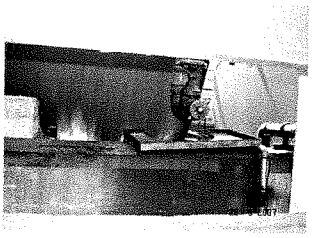
BRIAN LAHIFF
CHARTERED ENGINEER

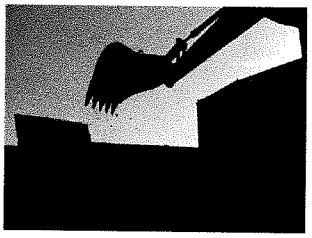
Date: 23 January 2025

Appendix A
Site Investigation Data from 2010

ELS

ENVIRONMENTAL SUBSURFACE INVESTIGATION REPORT





SITE:

WASTE PERMITTED SITE
NO. WP LK 06
GROODY VALLEY
RHENOGUE MEADOWS
CO. LIMERICK

Completed at the request of:

PADDY HOARE BUILDING &
CIVIL ENGINEERING CONTRACTORS
UNIT 20
GROODY NEIGHBOURHOOD CENTRE
CASTLETROY
CO. LIMERICK

ELS Ref. 4591.02

15 March 2010

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TABLES

APPENDICES

1 INTRODUCTION

This report was prepared by Environmental Liability Services Ltd. (ELS) at the request of Mr. Paddy Hoare, Paddy Hoare Building and Civil Engineering Contractors (PHBCE) in connection with a subsurface investigation carried out at the former waste permitted site Ref. WP LK 06 located at Groody Valley, Rhenogue Meadows, Co. Limerick ('the site'). The investigation was carried out by Limerick County Council. Upon the request of PHBCE, an Environmental Engineer from ELS was present to undertake an observational role during the investigation works.

1.1 Site Location and Description

The site covers an approximate area of 54,440 m^2 (8-acres) and is located in an urban residential and commercial area of Castletroy, Co. Limerick, adjacent to the River Groody. The site topographical gradient was generally observed to be gently sloping towards the River Groody, which flows along the west/southwest site boundary. The surface of the site was undulating, particularly at the lower (south) end of the site.

There was no observed drainage features on the site; however based upon the topographic gradient, it may be considered that surface drainage is towards the Groody River.

Underground services include 10KV and 38 KV cables which traverse the site.

1.2 Background

On 13 November 2001, Limerick County Council, Environment Section issued a waste permit Reference WP/LK/06 to Mr. Paddy Hoare, Crescent House, Hartstonge Street, Limerick. In granting the permit, the Council exercised its powers under the Waste Management Act, 1996 (WMA) and Waste Permit Regulations 1998. The activities permitted at the site in accordance with the Fourth Schedule of the Waste Management Act, 1996 were:

Class 4: Recycling or reclamation of other (i.e. non-metal) inorganic materials; and

Class 13: Storage of waste intended for submission to any activity referred to in the preceding paragraph of Schedule 4 of the WMA, other than temporary storage pending collection on the premises where such waste is produced.

It is understood that following issue of the Permit, waste recovery operations commenced at the site.

It is our understanding that most of the site area is owned by Mr. Paddy Hoare. It is furthermore understood that Limerick County Council own an approximate 20 metre strip of the site along the west/southwest boundary.

According to information provided to ELS at the time of this report, the Waste Permit was granted for a period not exceeding three years. The Conditions of the Permit included restrictions on the land area to be used for fill activities, the elevation of the fill material and the nature of the fill. Permit Conditions with respect to the nature of the material imported onto the site included:

Condition 1.7: Only clean, inert building rubble (i.e. concrete, brick and stone) and subsoil material shall be used as fill on the site. No organic matter (including organic soils, timber or any other biodegradable matter) plastics, metals, refuse, hazardous wastes shall be imported to the site;

Condition 1.8: No substance shall be discharged from the site in such quantities as would exceed the concentration limits imposed for the specific substance in National or International legislation.

At the time of the site investigation, all waste operations had ceased and there were no operations observed on the site by ELS.

2 SUMMARY OF INVESTIGATION OBSERVATIONS

The intrusive investigation was designed and carried out by Mr. Michael D'Arcy, Limerick County Council over a period of three days including 9, 10 and 12 October 2009. Summary details of the sampling strategy provided to ELS by Mr. D'arcy, indicated that the investigation was based upon an approximate $50m^2$ grid across the site. Excavations were located within the North and Northwest portions of the site, close to the Groody River.

A total of 12 No. trenches were excavated to approximate depths of between 1.2 metres below ground level (bgl) at Trench No. 7 to a maximum depth of approximately 4.3 m bgl at Trench No. 8. The length of the trenches ranged from 3 metres (Trench No.'s 1, 2, 3 and 4) to 29 metres (Trench 3), with a total combined length of approximately 124.5 metres. Please refer to Appendix A, Photographic Plates.

2.1 Ground Conditions

The depth of the fill/imported material was observed to range from between approximately 1.2 to 4.2 m bgl.

Made ground comprising *'brown CLAY, slightly moist, loose with sub-angular stone and small boulders throughout'* and *'orange/brown silty CLAY, slightly moist, compact with small stones'* was recorded at all twelve exploratory excavations. Based upon visual observations, eight of the twelve exploratory locations showed CLAY comprised between approximately 90% v/v (by volume) and 100% v/v of the material excavated. Please refer to Table 1 below.

At the remaining four locations identified as Trench No.'s 7, 9, 11 and 12, a proportion of the excavated depth was found to contain an estimated waste debris content of above 10%, as follows

- Clay was recorded to comprise 100% v/v at Trench No. 7 at depths of between 0-0.5m bgl, and 88% v/v CLAY intermixed with up to 12% v/v waste debris at depths of between 0.5-1.2 m bgl.
- At Trench No. 9, 100% v/v CLAY was recorded within the upper 1 m bgl, with 100% v/v waste debris found beneath this depth at between 1.0 to 2.3 m bgl.
- At Trench No. 11, CLAY was recorded to comprise 100% v/v in the upper 1.5 metres bgl underlain by CLAY 88% v/v intermixed with up to 16% v/v waste debris to a recorded depth of 2.7 m bgl;
- At Trench No. 12, CLAY was recorded to comprise 98% v/v within the upper metre depth and from 1.1 to 1.7m bgl CLAY comprised 80% v/v intermixed with waste debris.

Table 1: Summary of Exploratory Trenches & Estimated Material Volumes

Trench No.	Approx. Length (m)	Approx. Depth of Excavation (m bgl)	Approx. Depth to natural ground (m bgl)	Estimated Total Imported CLAY % v/v	Estimated Total Waste Debris % v/v
1	3.0	2.8	N/A	92.0	8
2	3.0	2.7	N/A	92.0	8
3	29.0	4.1	4.1	93.0	7
4	10.0	3.5	3.5	92-95	5-8
5	15.0	3.0	N/A	90-92	8-10
6	10.0	2.0	2.0	96-100	0-4
7	12.0	1.2	N/A	88-100	0-12
8	10.0	4.3	4.3	98-100	0-2
9*	8.0	2.3	N/A	0-100	0-100
10	9.0	2.7	2.6	95-100	0-5
11	6.5	2.7	N/A	84-100	0-16
12	9.0	1.8	1.8	80-98	2-20

Notes to Table:
N/A = not ascertained
* : up to 100% v/v waste debris at Trench No. 9 was observed in the lower 1.0-2.3 m bgl.

Beneath the waste deposits, natural ground was described at six exploratory locations at depths of between 1.8 m bgl (Trench 6) to 4.3 m bgl (Trench 8). At five of the exploratory locations the natural ground was described as comprising grey/blue compact SILT and at one location (Trench 8) as a dark brown peaty horizon.

Perched groundwater was observed at eight exploratory locations (Trench No.'s 3, 4, 5, 7, 8, 9, 11 and 12). At one location, Trench 11, the water was observed to have an unidentified floating matter (recorded as 'scum') on the surface. There were no observations of floating matter at any of other locations.

The log descriptions of material encountered within each trench are presented in Appendix B of this report. Table 2 below summarises some of the key information provided in the logs.

Table 2: Summary of Waste Items Recorded and European Waste Catalogue (EWC) Codes (Note 1)

Waste Type & Description	EWC Code	%v/v (estimated)	Trench Locations	Other Observations
Made ground/CLAY	17 05 04	90 to100	All	-
Concrete and Bricks	17 01 01 17 01 02	<1 to 10	1,2, 5, 6, 7, 9, 11	Trench 9 at 1.0-2.3 m bgl contained up to 40% v/v concrete/ bricks.
Wood	17 02 01	<1 to 5	All	Trench 9 at 1.0-2.3 m bgl contained up to 15% v/v wood.
Metal (Note 2)	17 04 07	<1 to 3	All	Trench 9 at 1.0-2.3 m bgl and Trench 12 at 1.1-1.7 m bgl contained up to 20% v/v metal.
Plastic & Rubber	17 02 03	<1 to 1	1 to 11	Trench 9, two tyres were observed estimated at 2% v/v. At Trench 8 a narrow 0.1 metre thick band of plastic encountered.
Glass	17 02 02	<1	9	-
Fabric, Cloth & Carpet	20 01 11	<1 to 1	5, 7, 8, 9, 10, 11, and 12	-

Notes to Table 2

Note 1: the European Waste Catalogue and Hazardous Waste List – valid from 1 January 2002 (EWC) presents a harmonised list of waste for EU member states in accordance with Directive 75/442/EEC. Each waste type is assigned a six-digit code.

Note 2: The EWC 17 04 07 refers to 'mixed metals' associated with C&D wastes. Suspected lead containing material was observed at two locations, if confirmed this may be assigned EWC 17 04 03.

With regard to the waste items:

Concrete, concrete blocks, and bricks was observed at seven of the exploratory locations and comprised approximately between <1% to 10% v/v of the arisings. The exception was Trench 9 at 1.0-2.3 m bgl which contained up to 40% v/v concrete/ bricks.

Wood material was observed at all locations and was found to comprise mainly wooden planks, and also smaller quantities of roots, woody stems, and hedging. A tree trunk and a wooden frame were also observed. Generally, the quantity of wood was estimated to be between <1 to 5% v/v. The exception was Trench 9 at 1.0-2.3 m bgl where 15% v/v of the material comprised wood.

Metal was observed at all locations and was observed to consist of between approximately <1% to 3% v/v. The exception was Trench 9 at 1.0-2.3 m bgl where 20% of the material was metal. The metal included mainly reinforced steel bars, and also items such as PVC coated wire, barbed wire, a metal bracket, vehicle components, computer parts, a radiator, a grill, and suspected lead containing roof material and pipework.

Plastic & Rubber materials were observed at Trench No.'s 1 through to 11 with estimated volumes of less than and up to 1% v/v. At Trench No. 8 a narrow horizon of black plastic bags was recorded at between 1.7 and 1.8 m bgl, and Trench 9 at 1.0 to 2.3 m bgl 20% v/v of the material was described as plastic. The items observed comprised mainly plastic bags and rigid plastic piping, but also items included polystyrene bonded insulation, polythene wrapping, a gully bracket, plastic components on computer equipment, and a plastic bottle.

Cloth, fabric and carpeting were observed at seven exploratory locations and comprised less than and up to 1% v/v.

Broken pieces of glass were observed in the arisings from Trench 9. Glass was not observed in any of the other locations.

Olfactory evidence of contamination/malodours such as may be associated with petroleum hydrocarbons or polynucleur aromatic hydrocarbons was not observed in any of excavation arisings. A slight odour of hydrogen sulphide (H_2S) was observed at Trench No.'s 5, 7, 9, and 11. Quantities of plants/woody stems associated with landscape gardening material were observed at locations Trench 5 and 7.

3 SUMMARY OF SOIL ANALYSIS RESULTS

3.1 Soil Sampling

As outlined above, the excavations were located within the North and Northwest portions of the site, close to the Groody River.

A total of ten No. soil samples were retrieved by Limerick County Council from Trench No.'s 3, 4, 5, 7, 9, and 11 and submitted to a laboratory for bulk soil and leachate analysis. The samples were observed to have been single grab samples, taken randomly at various depth intervals from the excavations. Samples were placed in an open plastic bag and remained unsealed for up to 6 hours on site until preparation for collection and dispatch to BHP laboratories each afternoon.

The chain of custody documentation was maintained by Limerick County Council.

3.2 Soil Classification Parameters

The suite of analysis undertaken on the collected soil samples was in accordance with Council Decision (2003/33/EC) establishing criteria and procedures for the acceptance of waste pursuant to Article 16 and Annex II to Directive 1999/31/EC. To this end, the analytical suite included:

Bulk Soil Analysis

- Petroleum hydrocarbons (mineral oil, benzene, toluene, ethylbenzene and xylene - BTEX)
- Polycyclic aromatic hydrocarbons (PAHs)
- Polychlorinated biphenyls (PCBs) 7 congeners
- Total organic carbon (TOC)

Leachate Analysis (at Liquid Solid Ratio's (L/S) of 2 l/kg, 10 l/kg and C_0)[1]

- Metals
- Chloride, fluoride, sulphate
- Phenol Index
- Dissolved organic carbon (DOC)
- Total dissolved solids (TDS)

The sample analytical results (BHP Ref. No. 89856) are presented in Appendix C of this report.

[1] C0 is the first eluate of the percolation test at liquid to solid ration L/S = 0.1 l/kg.

3.2 Bulk Soil Analysis Results

A summary table of the bulk soil analysis results are presented in Table 3 of this report.

3.2.1 Petroleum Hydrocarbons

The petroleum hydrocarbon range of analysis included mineral oil and benzene, toluene, ethylbenzene and xylene (BTEX). The results showed concentrations of mineral oil and BTEX compounds were below the respective laboratory detection limits of 0.1 mg/kg and 0.01 mg/kg, respectively, in all ten samples analysed. These values were below the respective criteria values for waste acceptable at landfills for inert waste.

3.2.2 Polynucleur aromatic hydrocarbons (PAHs)

Council Decision 2003/33/EC allowed member states to set specific acceptance criteria with respect to PAH levels. Subsequent to this Decision during *c.* 2007, the Irish Environmental Protection Agency (EPA), Office of Environmental Enforcement (OEE) issued guidance to Inert Landfills in respect of Section 2.1.2.2 of Council Decision 2003/33/EC, whereby the pollutant content limit value for Total PAHs (17 No.) was set at up to a maximum of 100mg/kg.

However, prior to the issue of this ad-hoc guidance, the EPA had set differing levels for PAHs on the merits of each individual waste landfill licence application. The above revised guidance limit must be applied for and agreed with the Agency in writing prior to implementation. Therefore the specific landfill criteria may be more stringent than that cited above.

For the purposes of this report, the results were compared with the EPA-OEE guidance limit of 100 mg/kg. The results showed concentrations of 16 No. PAHs were below the laboratory detection limit for individual parameters of 0.01 mg/kg in all ten of the samples analysed. These values were below the criteria value for waste acceptable at landfills for inert waste.

3.2.3 Polychlorinated Biphenyls (PCBs)

Concentrations of PCBs were below the laboratory detection limit of 0.001 mg/kg in all ten samples analysed. These values were below the acceptance criteria for inert waste landfill of 1 mg/kg.

3.2.4 *Total Organic Carbon (TOC)*

The results showed that the TOC values in the ten samples ranged from 2,120 mg/kg to 5,120 mg/kg, values below the acceptance criteria for inert waste landfill of 30,000 mg/kg.

3.3 Soil Leachate Results

The following discussion is based upon the results for leachate generation at a liquid/solid (L/S) ratio of 10 l/kg, the standard leachate test for waste acceptable at landfills for inert waste in Ireland. Where relevant, analysis results from the leachate generated at liquid to solid ratio of 2 l/kg and 0.1 l/kg shall be referenced. A summary of the soil leachate analysis results (liquid to solid ratio 10 litres/kg) are presented in Table 4 of this report.

3.3.1 *Metals in Leachate*

The metal suite included arsenic, barium, cadmium, chromium, copper, mercury, molybdenum, nickel, lead, antimony, selenium and zinc.

The results showed that the concentrations of all of the above metals detected in leachate were below the respective acceptance criteria for inert waste landfill.

3.3.2 *Chloride, Fluoride and Sulphate in Leachate*

Chloride concentrations in leachate ranged from 9.7 mg/kg to 170 mg/kg, below the criteria value for waste acceptable at landfills for inert waste of 800 mg/kg.

Fluoride concentrations in the ten samples ranged from below the method detection limit (0.1 mg/kg) to 5.9 mg/kg. These values were below the criteria value for waste acceptable at landfills for inert waste of 10 mg/kg.

Sulphate concentrations ranged from 366 mg/kg to 3,709 mg/kg. Eight of the ten samples exceeded the sulphate criterion value of 1,500 mg/kg for waste acceptable at landfills for inert waste. These samples were identified as sample No.'s SP3 through to SP10.

The results for these eight samples were additionally screened in accordance with Table 2.1.2.1 entitled 'Leaching Limit Values' of CD/2003/33/EC, where it states:

'if the waste does not meet the values for sulphate, it may still be considered as complying with the acceptance criteria if the leaching does not exceed either of the following values: 1,500 mg/l as C0 at L/S = 0.1 l/kg and 6,000 mg/kg at L/S = 10 l/kg..'

Of the eight samples, none of the samples exceeded the criterion of 6,000 mg/kg *at* L/S = 10 l/kg and only one (SP3) exceeded the criterion of 1,500 mg/l sulphate as C0 at L/S = 0.1 l/kg.

Therefore, when applying the above derogation for sulphate concentrations in leachate, it may be considered that one of the ten samples exceeded the waste acceptance value for waste acceptable at inert waste landfill with respect to sulphate.

3.3.3 Dissolved Organic Carbon in Leachate

The DOC concentrations in the ten samples analysed ranged from 24 mg/kg to 150 mg/kg, values below the criteria value of 500 mg/kg for waste acceptable at landfills for inert waste.

3.3.4 Total Dissolved Solids (TDS) in Leachate

TDS were below the criteria value for waste acceptable at landfills for inert waste of 4,000 mg/kg in all of the ten samples.

3.3.5 Phenols in Leachate

The Phenol concentrations in all ten samples were below the laboratory detection limit of 0.1 mg/kg, values below the criteria value of 1 mg/kg for waste acceptable at landfills for inert waste.

4 CONCLUSIONS

With the exception of the individual items observed which are associated with end-of-life vehicles including tyres (EWC 16 01 03) and vehicle components (16 01 22), computer components (20 01 36) and textiles (20 01 11), all of the waste types observed during the excavations were consistent with Construction and Demolition (C&D) Waste types as described in the European Waste Catalogue and Hazardous Waste List – valid from 1 January 2002 (EWC).

Based upon visual observations none of the materials observed by ELS were classified as hazardous under the European Waste Catalogue. This includes the suspected lead flashing and pipework (EWC 17 04 03).

The bulk soil and leachate analysis results showed that nine of the ten sample analysed may be considered within the criteria values for waste acceptable at landfills for inert waste in accordance with Council Decision 2003/33/EC.

One sample identified as SP3 which was retrieved from Trench No. 3 at an approximate depth of 2.5 m bgl was shown to exceed the criterion for waste acceptable at landfills for inert waste in respect of sulphate only. All of the remaining bulk soil and leachate parameters analysed in this sample were below the respective criteria values for waste acceptable at landfills for inert waste.

5 LIMITATIONS

The current correspondence was prepared on behalf of Paddy Hoare Building & Civil Engineering Contractors.

The evaluations and conclusions presented herein are also based upon information provided by companies and individuals outside of Environmental Liability Services Ltd. We have accepted as true the information provided by those sources.

The soil data gathered for the purposes of this report is indicative of conditions at a given location and time. This report refers, within the limitations stated to the condition of the site at the time of the sampling and at the locations sampled. No warranty is given as to the possibility of future changes in the condition of the site or variations in condition at other parts of the site.

This report has been prepared by Environmental Liability Services Ltd. with reasonable care skill and diligence according to the objectives as agreed with the Client. We disclaim any responsibility to the Client and others in respect of any matters outside this scope of works.

This report is confidential to the Client, and we accept no responsibility to third parties to whom this report, or any part thereof, is made known. Any such party relies on the contents of the report at their own risk. Save for the Client, no duty is undertaken, warranty or representation made to any party in respect of the opinions, advice, recommendations or conclusions herein set out.

ELS	Environmental Liability Services Ltd.
TABLES	
Table 3: Bulk Soil WC and Analysis Results Table 4: Leachate WAC and Analysis Results (L:S 10 l/kg)	

Table 3: Waste Acceptance Criteria and Bulk Soil Results

Job No:	4595.02
Date:	10-Mar-10
Sheet:	1 of 1

Job Title: Waste Permitted Site WP LK 06

Laboratory Results - Metals

Lab: BHP Laboratories
Test: Various

Date Sampled: 9 to 12 October 2009
Analysis Completed: 25 January 2010

Sample Reference	Trench/Trial Pit Reference	Compound / Sample Depth (mbgl)	Mineral Oil mg/kg	BTEX mg/kg	PCBs mg/kg	TOC mg/kg	PAHs mg/kg				
SP1	Trench # 3	0.5	<0.1	<0.01	<0.001	2120	<0.005				
SP2	Trench # 3	2.0	<0.1	<0.01	<0.001	3500	<0.005				
SP3	Trench # 3	2.5	<0.1	<0.01	<0.001	3300	<0.005				
SP4	Trench # 4	Bulk	<0.1	<0.01	<0.001	2840	<0.005				
SP5	Trench # 5	3.0	<0.1	<0.01	<0.001	5120	<0.005				
SP6	Trench # 5	Bulk	<0.1	<0.01	<0.001	4850	<0.005				
SP7	Trench # 7	Bulk	<0.1	<0.01	<0.001	2890	<0.005				
SP8	Trench # 7	Bulk	<0.1	<0.01	<0.001	3400	<0.005				
SP9	Trench # 9	Bulk	<0.1	<0.01	<0.001	2900	<0.005				
SP10	Trench # 11	Bulk	<0.1	<0.01	<0.001	3800	<0.005				

Guidelines

Limit Values for Waste Acceptable at Inert waste landfills		Mineral Oil	BTEX	PCBs	TOC	PAHs				
Total Contents	mg/kg dry mass	500	6	1	30000	2				
Limit Values for Waste Acceptable at Non-Hazardous waste landfills		**Mineral Oil**	**BTEX**	**PCBs**	**TOC**	**PAHs**				
Target Intervention	mg/kg dry mass	-	-	-	-	-				

Notes to Table
Polychlorinated biphenyls, 7 congeners by GC-MS
BTEX: Benzene, Toluene, Ethylbenzene, and Xylene by GC-FID
Mineral Oil carbon range C10-C40 by GC-FID
PAHs: polynucleur aromatic hydrocarbons by GC-MS

Table 4: Leachate Waste Acceptance Criteria and Analysis Results (L:S 10l/kg)

Job No:	4595.02
Date:	10-Mar-10
Sheet:	1 of 1

Job Title: Waste Permitted Site WP LK 06

Laboratory Results - Leachate Waste Acceptance Criteria (WAC)

Lab: BHP Laboratories
Test: Leachate 10 litres/kg*

Date Sampled: 9 to 12 October 2009
Analysis Completed: 25 January 2010

Sample Reference	Trench/Trial Pit Reference	Compound	Arsenic	Barium	Cadmium	Chromium	Copper	Mercury	Molybdenum	Nickel	Lead	Antimony	Selenium	Zinc	Chloride	Fluoride	Sulphate**	DOC	TDS	Phenol
		Sample Depth (mbgl)	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SP1	Trench # 3	0.5	0.003	0.01	0.013	0.01	0.12	<0.0002	0.005	0.01	0.06	<0.001	0.005	0.05	17.5	5.5	366.1	49	254	0.001
SP2	Trench # 3	2.0	0.004	0.15	0.013	0.01	0.036	<0.0002	0.005	0.03	0.12	<0.001	0.006	0.05	11.1	1.2	662.6	36	738	0.003
SP3	Trench # 3	2.5	0.005	0.2	0.014	0.01	0.09	<0.0002	0.006	0.01	0.04	<0.001	0.004	0.05	9.7	5.9	1657	24	2200	0.08
SP4	Trench # 4	Bulk	0.003	1.1	0.02	0.01	0.04	<0.0002	0.06	0.02	0.07	0.002	0.004	0.06	16.5	1.1	1545	31	1880	0.12
SP5	Trench # 5	3.0	0.005	0.9	0.01	0.14	0.1	<0.0002	0.11	0.01	0.07	0.002	0.004	0.06	131	3.7	1662	150	1680	0.14
SP6	Trench # 5	Bulk	0.01	1.1	0.014	0.01	0.06	<0.0002	0.09	0.01	0.05	0.002	0.002	0.07	87.7	3.5	2080	45	2220	0.09
SP7	Trench # 7	Bulk	0.01	2.4	0.002	0.01	0.04	<0.0002	0.008	0.01	0.06	0.001	0.002	0.05	170.1	1.4	2470	63	1780	0.08
SP8	Trench # 7	Bulk	0.008	1.8	0.002	0.01	0.02	<0.0002	0.008	0.06	0.04	0.001	0.003	0.05	76	2.4	1406	76	2240	0.16
SP9	Trench # 9	Bulk	0.006	0.7	0.01	0.01	0.05	<0.0002	0.006	0.19	0.1	0.006	0.004	0.05	49.7	1.4	3082	24	1860	0.08
SP10	Trench # 11	Bulk	0.006	0.2	0.02	0.01	0.04	<0.0002	0.004	0.03	0.07	0.002	0.001	0.05	94.3	<0.1	3709	46	2500	0.18

Guidelines

Limit Values for Waste Acceptable at Inert waste landfills		Arsenic	Barium	Cadmium	Chromium	Copper	Mercury	Molybdenum	Nickel	Lead	Antimony	Selenium	Zinc	Chloride	Fluoride	Sulphate	DOC	TDS	Phenol
Total Contents	mg/kg dry mass	0.5	20	0.04	0.5	2	0.01	0.5	0.4	0.5	0.06	0.1	4	800	10	1000	500	4000	1
Limit Values for Waste Acceptable at Non-Hazardous waste landfills		**Arsenic**	**Barium**	**Cadmium**	**Chromium**	**Copper**	**Mercury**	**Molybdenum**	**Nickel**	**Lead**	**Antimony**	**Selenium**	**Zinc**	**Chloride**	**Fluoride**	**Sulphate**	**DOC**	**TDS**	**Phenol**
Target Intervention	mg/kg dry mass	2	100	1	10	50	0.2	10	10	10	0.7	0.5	50	15000	150	20000	800	60000	-

Notes to Table

*Leaching limit values for waste acceptable at inert waste landfills calculated at a liquid to solid ratio of 10 litres/kg.

** If the waste does not meet the values for sulphate, it may be considered as complying with the acceptance criteria if the leaching does not exceed either of the following values: 1,500 mg/l as C0 at L/S = 0.1 l/kg and 6,000 mg/kg at L/S = 10 l/kg.

ELS	Environmental Liability Services Ltd.
APPENDIX A	
PHOTOGRAHIC PLATES	

Plate 1
Date 8 October 2009
Location Waste Permit Site WP-LK-06 Castletroy, Co. Limerick
Details Trench No. 1

Plate 2
Date 8 October 2009
Location Waste Permit Site WP-LK-06 Castletroy, Co. Limerick
Details Trench No. 3

Plate 3
Date 8 October 2009
Location Waste Permit Site WP-LK-06 Castletroy, Co. Limerick
Details Trench No. 3

Plate 4
Date 9 October 2009
Location Waste Permit Site WP-LK-06 Castletroy, Co. Limerick
Details Trench No. 5

Plate 5
Date 9 October 2009
Location Waste Permit Site WP-LK-06 Castletroy, Co. Limerick
Details Trench No. 5

Plate 6
Date 12 October 2009
Location Waste Permit Site WP-LK-06 Castletroy, Co. Limerick
Details Trench No. 7

Plate 7
Date 9 October 2009
Location Waste Permit Site WP-LK-06 Castletroy, Co. Limerick
Details Trench No. 8

Plate 8
Date 9 October 2009
Location Waste Permit Site WP-LK-06 Castletroy, Co. Limerick
Details Trench No. 9

Plate 9
Date 12 October 2009
Location Waste Permit Site WP-LK-06 Castletroy, Co. Limerick
Details Trench No. 9

Plate 10
Date 12 October 2009
Location Waste Permit Site WP-LK-06 Castletroy, Co. Limerick
Details Trench No. 11

Plate 11
Date 12 October 2009
Location Waste Permit Site WP-LK-06 Castletroy, Co. Limerick
Details Trench No. 12

Plate 12
Date 12 October 2009
Location Waste Permit Site WP-LK-06 Castletroy, Co. Limerick
Details Trench No. 12 – Natural Ground

Environmental Liability Services Ltd.

APPENDIX B

TRENCH LOGS

ELS	TRENCH LOG 1	Job No.:	4591.01
		Date Logged:	08/10/2009

Prepared By: CW **Sample Method:** Track Digger

Site: Castletroy, Limerick **Contractor:** Paddy Hoare Building & Civil Engineering Contractors

Site Chainage: **Sample Chainage:**

Overburden Geology m (bgl):		**Estimated % v/v**
0 - 2.8m	Made ground - brown CLAY, slightly moist, loose. Sub-angular stones and small to large boulders throughout.	92%
	Waste debris comprising:	
	Concrete / bricks	5%
	Building blocks	
	Bricks	
	Wood	1%
	Planks (2 - 3m)	
	Metal	1%
	Reinforcing steel bars	
	PVC coated wire	
	Plastic	1%
	Black polythene wrapping	
	Rigid plastic pipin	
	Plastic bags	

Estimated %v/v debris:	8%
Depth to Rock:	Not encountered
Depth to natural ground:	Not encountered
Water Entry:	No groundwater encountered
Total Depth:	2.8m
Elevation:	Not recorded (LCC GPS recorded elevation at approx. 9m a.s.l.
Length of Trench:	3m
Comments:	No soil or water samples taken. Did not excavate to natural ground. No malodour observed prior to or during excavation.

ELS	TRENCH LOG 2	Job No.:	4591.01
		Date Logged:	08/10/2009

Prepared By: CW **Sample Method:** Track Digger

Site: Castletroy, Limerick **Contractor:** Paddy Hoare Building & Civil Engineering Contractors

Site Chainage: **Sample Chainage:**

Overburden Geology m (bgl):		**Estimated % v/v**
0 - 2.7m	Made ground - brown CLAY, slightly moist, loose. Sub-angular stones and small to large boulders throughout.	92%
	Waste debris comprising:	
	Concrete / bricks	5%
	Building blocks	
	Bricks	
	Wood	1%
	Planks (2 - 3m)	
	Metal	1%
	Reinforcing steel bars	
	Barbed wire	
	Plastic	<1%
	Black polythene wrapping	
	Rigid plastic piping	
	Plastic bags	

Estimated %v/v debris:	8%
Depth to Rock:	Not Encountered
Depth to natural ground:	Not Encountered
Water Entry:	No groundwater encountered
Total Depth:	2.7m
Elevation:	Not Recorded (LCC GPS recorded elevation at approx. 9m a.s.l.)
Length of Trench:	3m
Comments:	No soil or water samples taken. Did not excavate to original soil. No malodour observed prior to or during excavation.

ELS	TRENCH LOG 3	Job No.:	4591.01
		Date Logged:	08/10/2009

Prepared By: CW **Sample Method:** Track Digger

Site: Castletroy, Limerick **Contractor:** Paddy Hoare Building & Civil Engineering Contractors

Site Chainage: **Sample Chainage:**

Overburden Geology m (bgl):		**Estimated % v/v**
0 - 4.1m	Made ground - brown CLAY, slightly moist, loose. Sub-angular stones and small to large boulders throughout. Black mottled patches.	93%
	Waste debris comprising:	
	Wood	4%
	Planks (1 - 3m)	
	Metal	2%
	Reinforcing steel bars	
	Plastic	<1%
	Black polythene wrapping	
4.1m	SILT grey/blue, compact, moist, possible alluvium	100%

Estimated %v/v debris:	7%
Depth to Rock:	Not Encountered
Depth to natural ground:	4.1m
Water Entry:	Perched groundwater at 3.5m at 22m along trench
Total Depth:	4.1m
Elevation:	Not Recorded (LCC GPS recorded elevation at approx. 9m a.s.l.)
Length of Trench:	29 m
Comments:	Soil samples taken SP1/TH3 at approx. 0.5m depth, SP2/TH3 at approx. 2m depth, SP3/TH3 at at approx. 2.5m depth. First samples taken at 11am by LCC for pick-up by BHP at 4.15pm. Samples remained unsealed on site. Each bag was marked with a reference. No malodour prior to or during prior to or during excavation.

ELS	TRENCH LOG 4	Job No.:	4591.01
		Date Logged:	09/10/2009

Prepared By: CW **Sample Method:** Track Digger

Site: Castletroy, Limerick **Contractor:** Paddy Hoare Building & Civil Engineering Contractors

Site Chainage: **Sample Chainage:**

Overburden Geology m (bgl):		**Estimated % v/v**
0 - 3m	Made ground - brown CLAY, slightly moist, loose. Sub-angular stones and small boulders throughout.	95%
	Waste debris comprising: Wood Planks (1 - 3m)	4%
	Plastic Black polythene wrapping	<1%
3 - 3.4 m	Made ground - Orange-brown siltly CLAY, slightly moist, compact Small stones	92%
	Waste debris comprising: Wood Planks (1 - 3m) Tree stump	5%
	Plastic Black polythene wrapping	1%
	Metal Wire Metal bracket	2%
3.5m	SILT grey/blue, compact, moist. Possible alluvium.	100%

Estimated %v/v debris:	5 - 8%
Depth to Rock:	Not Encountered
Depth to natural groud:	3.5m
Water Entry:	Perched groundwater at 4 m
Total Depth:	3.5m
Elevation:	Not Recorded (LCC GPS recorded elevation at 9m a.s.l.)
Length of Trench:	10 m
Comments:	Soil samples taken from arisings SP1/TH4, second sample SP2/TH4 (check this second sample against LCC records). Samples taken by LCC for pick-up by BHP. Samples remained unsealed on site. Each bag was marked with a reference. No malodour observed prior to or during excavation.

ELS	TRENCH LOG 5	Job No.:	4591.01
		Date Logged:	09/10/2009

Prepared By: CW **Sample Method:** Track Digger

Site: Castletroy, Limerick **Contractor:** Paddy Hoare Building & Civil Engineering Contractors

Site Chainage: **Sample Chainage:**

Overburden Geology m (bgl):		**Estimated % v/v**
Trench Length		
0 - 5 m Length		
0 - 3m bgl	Made ground - brown CLAY, slightly moist, loose. Sub-angular stones and small boulders throughout.	92%
	Waste debris comprising:	
	Wood	5%
	Planks (1 - 3m)	
	Roots	
	Concrete/bricks	2%
	Plastic	<1%
	Black polythene wrapping	
5 - 10m Length	Made ground - brown CLAY, slightly moist, loose. Sub-angular stones	90%
0 - 2.5m bgl	and small boulders throughout.	
	Waste debris comprising:	
	Wood	5%
	Planks (1 - 3m)	
	Roots	
	Concrete/bricks	2%
	Concrete blocks	
	Old red/yellow bricks	
	Metal	1%
	Vehicle component parts with metal casings and wiring	
	Computer components with metal parts	
	Reinforcing steel bars	
	Plastic	1%
	Black polythene wrapping	
	Plastic components parts on computer equipment	
	Plastic bottle	
	Cloth & domestic waste	1%
	Comb, material, shoe	
10 - 15 m Length	Made ground - brown CLAY, slightly moist, loose. Sub-angular stones	90%
0 - 2.5m bgl	and small boulders throughout.	
	Waste debris comprising:	
	Wood/garden waste	8%
	Approx. 1.5m depth layer of landscape gardening material incl. Rhododendrum and Llandi (?)	
	Plastic	1%
	Rigid pipe	
	Metal	1%
	Suspect car grill	

ELS	TRENCH LOG 5	Job No.:	4591.01
		Date Logged:	09/10/2009

Prepared By:	CW	**Sample Method:**	Track Digger
Site:	Castletroy, Limerick	**Contractor:**	Paddy Hoare Building & Civil Engineering Contractors
Site Chainage:		**Sample Chainage:**	

Estimated %v/v debris:	8 - 10%
Depth to Rock:	Not Encountered
Depth to natural ground:	Not Encountered
Water Entry:	Perched groundwater at 2.5 m with surface scum and floating bonded polystyrene foam
Total Depth:	3m
Elevation:	Not Recorded (LCC GPS recorded elevation at approx.9m a.s.l.)
Length of Trench:	15 m
Comments:	Soil samples taken from arisings SP5/TH5 (approx. depth 3m), SP6/TH5 bulk sample. Samples taken by LCC for pick-up by BHP. Samples remained unsealed on site. Each bag was marked with a reference. Odour encountered during excavation at approx. 2m, H_2S.

ELS	TRENCH LOG 6	Job No.:	4591.01
		Date Logged:	09/10/2009

Prepared By: CW **Sample Method:** Track Digger

Site: Castletroy, Limerick **Contractor:** Paddy Hoare Building & Civil Engineering Contractors

Site Chainage: **Sample Chainage:**

Overburden Geology m (bgl):		**Estimated % v/v**
0 - 5 m Length **0 - 1.9m bgl**	Made ground - brown CLAY, slightly moist, loose. Sub-angular stones and small boulders throughout.	97%
	Waste debris comprising: Concrete/bricks Red/yellow brick	1%
	Plastic Black polythene wrapping	<1%
	Metal Wires	<1%
2- 3m bgl	SILT grey/blue, compact, moist. Possible alluvium.	100%
5 - 10m Length **0 - 1.9m bgl**	Made ground - brown CLAY, slightly moist, loose. Sub-angular stones and small boulders throughout.	96%
	Waste debris comprising: Wood/garden waste Approx. 1.5m depth layer of landscape gardening material incl. Rhododendron and coniferous hedging	2%
	Concrete/bricks Concrete blocks Old red/yellow bricks	<1%
	Plastic Black polythene wrapping	<1%
2m bgl	SILT grey/blue, compact, moist. Possible alluvium.	100%

Estimated %v/v debris:	3 - 4%
Depth to Rock:	Not Encountered
Depth to natural ground:	2m
Water Entry:	Some seepage at 2m. No groundwater encountered
Total Depth:	3m
Elevation:	Not Recorded (LCC GPS recorded elevation at approx. 9m a.s.l.)
Length of Trench:	10 m
Comments:	No Soil samples taken. No Malodour encountered during excavation.

ELS	TRENCH LOG 7	Job No.:	4591.01
		Date Logged:	09/10/2009

Prepared By: CW **Sample Method:** Track Digger

Site: Castletroy, Limerick **Contractor:** Paddy Hoare Building & Civil Engineering Contractors

Site Chainage: **Sample Chainage:**

Overburden Geology m (bgl):		**Estimated % v/v**
0 - 0.5m	Made ground - Light brown sandy CLAY, stones and small boulders	100%
0.5 - 1.2m	Made ground - Black/brown layer comprising of boulders, stones and waste debris	88%
	Waste debris comprising: Wood/garden waste Approx. 1.5m depth layer of landscape gardening material incl. Rhododendron and coniferous hedging Planks (1-2m)	3%
	Concrete/bricks Concrete blocks Old red/yellow bricks	3%
	Metal Full radiator Grill Suspected roofing lead in roll (approx. 0.5m) Metal in domestic power plug	3%
	Plastic Black polythene wrapping	<1%
	Foam Expanded foam insulation Polystyrene bonded insulation Fibrous roof insulation	<1%
	Cloth	<1%

Estimated %v/v debris:	0 - 12%
Depth to Rock:	Not Encountered
Depth to natural ground:	Not Encountered
Water Entry:	Perched groundwater at 1.2m
Total Depth:	1.2m
Elevation:	Not Recorded (LCC GPS recorded elevation at approx. 9m a.s.l.)
Length of Trench:	12 m
Comments:	Soil samples taken from arisings SP7/TH7 bulk sample. Samples taken by LCC for pick-up by BHP. Samples remained unsealed on site. Each bag was marked with a reference. Slight odour encountered during excavation, H_2S.

ELS	TRENCH LOG 8	Job No.:	4591.01
		Date Logged:	12/10/2009

Prepared By:	CW	**Sample Method:**	Track Digger
Site:	Castletroy, Limerick	**Contractor:**	Paddy Hoare Building & Civil Engineering Contractors
Site Chainage:		**Sample Chainage:**	

Overburden Geology m (bgl):		**Estimated % v/v**
0 - 1.5m	Made ground - Brown loose clay, small stones	100%
1.5 - 1.7m	Made ground - Orange brown sandy siltly clay	100%
1.7 - 1.8m	Waste debris layer comprising:	100%
	Plastic Black plastic bags	98%
	Cloth	1%
	Metal Wire	1%
1.8m - 4.2m	Made ground - Brown clay, stones and boulders	98%
	Waste debris layer comprising: Wood Large tree stump (grey)	2%
4.3m	Dark brown peaty layer. Possible natural ground.	100%

Estimated %v/v debris:	0 - 2%
Depth to Rock:	Not Encountered
Depth to Natural Ground:	4.3m
Water Entry:	Perched groundwater at 4.4m
Total Depth:	4.3m
Elevation:	Not Recorded (LCC GPS recorded elevation at apprx. 9m a.s.l.)
Length of Trench:	10m
Comments:	No soil samples. No malodour detected during excavation.

ELS	TRENCH LOG 9	Job No.:	4591.01
		Date Logged:	12/10/2009

Prepared By: CW **Sample Method:** Track Digger

Site: Castletroy, Limerick **Contractor:** Paddy Hoare Building & Civil Engineering Contractors

Site Chainage: **Sample Chainage:**

Overburden Geology m (bgl):		**Estimated % v/v**
0 - 0.3m	Made ground - Dark brown clay, loose	100%
0.3 - 1m	Made ground - Orange brown sandy clay, sub-angular stones	100%
1 - 2.3m	Waste debris comprising: Concrete/bricks	40%
	Plastic: Black plastic bags, Rigid plastic pipes	20%
	Metal: PVC coated wire, Reinforcing steel bars, Suspected lead pipe	20%
	Wood: Frames, Planks (1-2m)	15%
	Rubber: 2 whole tyres	2%
	Foam: Polystyrene bonded insulation	<1%
	Glass: Broken pieces of glass	<1%
	Cloth: Carpet	<1%

Estimated %v/v debris: 0 - 100%

Depth to Rock: Not Encountered

Depth to natural ground: Not Encountered

Water Entry: Perched groundwater at 2.3m

Total Depth: 2.3m

Elevation: Not Recorded (LCC GPS recorded elevation at approx. 9m a.s.l.)

Length of Trench: 8m

Comments: Soil samples taken from arisings SP9/TH9 bulk sample. Samples taken by LCC for pick-up by BHP. Samples remained unsealed on site and unsupervised over lunch time. Each bag was marked with a reference. Slight odour encountered during excavation, H_2S.

ELS	TRENCH LOG 10	Job No.:	4591.01
		Date Logged:	12/10/2009

Prepared By: CW **Sample Method:** Track Digger

Site: Castletroy, Limerick **Contractor:** Paddy Hoare Building & Civil Engineering Contractors

Site Chainage: **Sample Chainage:**

Overburden Geology m (bgl):		**Estimated % v/v**
0 - 0.4m	Made ground - Dark brown clay, moist,loose	100%
0.5 - 2.6m	Made ground - Dark brown clay, stones and boulders	95%
	Waste debris comprising:	
	Plastic	<1%
	Black plastic bags	
	Rigid plastic pipes	
	Metal	<1%
	PVC coated wire	
	Wood	<1%
	Planks (1-2m)	
	Cloth	<1%
	Carpet	
2.6m	SILT grey/blue compact, moist, possible alluvium	100%

Estimated %v/v debris: 0 - 5%

Depth to Rock: Not Encountered

Depth to natural ground: 2.6m

Water Entry: No groundwater encountered

Total Depth: 2.7m

Elevation: Not Recorded (LCC GPS recorded elevation at approx. 9m a.s.l.)

Length of Trench: 9m

Comments: No samples taken. No malodour encountered during excavation.

ELS	TRENCH LOG 11	Job No.:	4591.01
		Date Logged:	12/10/2009

Prepared By: CW **Sample Method:** Track Digger

Site: Castletroy, Limerick **Contractor:** Paddy Hoare Building & Civil Engineering Contractors

Site Chainage: **Sample Chainage:**

Overburden Geology m (bgl):		**Estimated % v/v**
0 - 1.5m	Made ground - Brown clay, loose, stones and boulders	100%
1.5 - 2.7m	Made ground - Dark brown clay, stones and boulders	84%
	Waste debris comprising: Concrete/bricks/patio slab	10%
	Plastic	<1%
	Black plastic bags Rigid plastic pipes Gully bracket	
	Paper	<1%
	Cartons	
	Metal	<1%
	Reinforcing steel bars PVC coated wire	
	Wood	<1%
	Planks (1-2m)	
	Cloth	<1%
	carpet	
	Foam	<1%
	Polystyrene bonded insulation	

Estimated %v/v debris: 0 - 16%

Depth to Rock: Not Encountered

Depth to natural ground: Not encountered

Water Entry: Perched groundwater at 2.4m . Scum on water surface.

Total Depth: 2.7m

Elevation: Not Recorded (LCC GPS recorded elevation at approx. 6m a.s.l.)

Length of Trench: 6.5m

Comments: Soil samples taken from arisings SP10/T11 bulk sample. Samples taken by LCC for pick-up by BHP. Samples remained unsealed on site. Each bag was marked with a reference. Slight odour encountered during excavation, H_2S.

ELS	TRENCH LOG 12	Job No.:	4591.01
		Date Logged:	12/10/2009

Prepared By: CW **Sample Method:** Track Digger

Site: Castletroy, Limerick **Contractor:** Paddy Hoare Building & Civil Engineering Contractors

Site Chainage: **Sample Chainage:**

Overburden Geology m (bgl):		**Estimated % v/v**
0 - 1m	Made ground - Dark brown clay, stones and boulders	98%
	Waste debris comprising:	
	Wood	<1%
	Planks (1-2m)	
	Cloth	<1%
1.1 - 1.7m	Made ground - Orange brown sandy CLAY, stones	80%
	Waste debris comprising:	
	Wood	<1%
	Planks (1-2m)	
	Metal	
	PVC coated wire	20%
1.8m	Silt grey/blue compact moist, possible alluvium.	100%

Estimated %v/v debris: 2 - 20%

Depth to Rock: Not Encountered

Depth to natural ground: 1.8m

Water Entry: Perched groundwater at 1.7m

Total Depth: 1.8m

Elevation: Not Recorded (LCC GPS recorded elevation at approx. 6m a.s.l.)

Length of Trench: 9 m

Comments: No soil samples taken. No malodours during excavation

Environmental Liability Services Ltd.

APPENDIX C

Laboratory Analysis Results

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 1 of 4) **Description:** L/S = 2 l/kg **Sample: SP1 (TH3-8/10/2009)** **Leachate analysis**

Parameter	Results (mg/kg dry substance)							Limit values L/S = 2 l/kg mg/kg dry substance	Analysis method / technique
BHP Reference	89856.1						Method		
							Detection		
Product Description	Soil sample						Limits		
Arsenic **As**	0.008						0.002	0.1	ICP-MS
Barium **Ba**	0.4						0.01	7	ICP-MS
Cadmium **Cd**	0.054						0.001	0.03	ICP-MS
Chromium total **Cr**	0.008						0.001	0.2	ICP-MS
Copper **Cu**	0.12						0.001	0.9	ICP-MS
Mercury **Hg**	<0.0002						0.001	0.003	ICP-MS
Molybdenum **Mo**	0.012						0.002	0.3	ICP-MS
Nickel **Ni**	0.006						0.001	0.2	ICP-MS
Lead **Pb**	0.06						0.001	0.2	ICP-MS
Antimony **Sb**	0.001						0.001	0.02	ICP-MS
Selenium **Se**	0.004						0.002	0.06	ICP-MS
Zinc **Zn**	0.014						0.002	2	ICP-MS
Chloride	6.68						0.1	550	I.C
Fluoride	0.32						0.2	4	I.C
Sulphate	3.1						0.1	560	I.C
Dissolved Organic Carbon	120						1	240	Photometric
Total Dissolved Solids	621						1	2500	Gravimetric
Phenol Index	0.002						0.001	0.5	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 2 of 4) **Description:** L/S = 10 l/kg **Sample: SP1 (TH3-8/10/2009)** **Leachate analysis**

Parameter	**Results (mg/kg dry substance)**							**Limit values L/S = 10 l/kg mg/kg dry substance**	**Analysis method / technique**
BHP Reference	89856.1						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Arsenic **As**	0.003						0.002	0.5	ICP-MS
Barium **Ba**	0.01						0.01	20	ICP-MS
Cadmium **Cd**	0.013						0.001	0.04	ICP-MS
Chromium total **Cr**	0.01						0.001	0.5	ICP-MS
Copper **Cu**	0.12						0.001	2	ICP-MS
Mercury **Hg**	<0.0002						0.001	0.01	ICP-MS
Molybdenum **Mo**	0.005						0.002	0.5	ICP-MS
Nickel **Ni**	0.01						0.001	0.4	ICP-MS
Lead **Pb**	0.06						0.001	0.5	ICP-MS
Antimony **Sb**	<0.001						0.001	0.06	ICP-MS
Selenium **Se**	0.005						0.002	0.1	ICP-MS
Zinc **Zn**	0.05						0.002	4	ICP-MS
Chloride	17.5						0.1	800	I.C
Fluoride	5.5						0.2	10	I.C
Sulphate	366.1						0.1	1000	I.C
Dissolved Organic Carbon	49						1	500	Photometric
Total Dissolved Solids	254						1	4000	Gravimetric
Phenol Index	0.001						0.001	1	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 3 of 4) **Description:** L/S = 0.1 l/kg C0 (Percolation) **Sample: SP1 (TH3-8/10/2009)** **Leachate analysis**

Parameter	**Results (mg/l)**							**Limit values L/S = 0.1 l/kg mg/l**	**Analysis method / technique**
BHP Reference	89856.1						**Method**		
Product Description	**Soil sample**						**Detection Limits**		
Arsenic **As**	0.004						0.002	0.06	ICP-MS
Barium **Ba**	0.003						0.01	4	ICP-MS
Cadmium **Cd**	0.005						0.001	0.02	ICP-MS
Chromium total **Cr**	0.005						0.001	0.1	ICP-MS
Copper **Cu**	0.065						0.001	0.6	ICP-MS
Mercury **Hg**	<0.002						0.001	0.002	ICP-MS
Molybdenum **Mo**	0.005						0.002	0.2	ICP-MS
Nickel **Ni**	0.005						0.001	0.12	ICP-MS
Lead **Pb**	0.04						0.001	0.15	ICP-MS
Antimony **Sb**	<0.001						0.001	0.1	ICP-MS
Selenium **Se**	0.012						0.002	0.04	ICP-MS
Zinc **Zn**	0.008						0.002	1.2	ICP-MS
Chloride	7.97						0.1	460	I.C
Fluoride	0.78						0.2	2.5	I.C
Sulphate	2134						0.1	1500	I.C
Dissolved Organic Carbon	22.1						1	160	Photometric
Total Dissolved Solids								-	Gravimetric
Phenol Index	0.005						0.001	0.3	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 4 of 4) **Description:_____Organic Parameters _____** **Sample: SP1 (TH3-8/10/2009)** **Solid analysis**

Parameter	**Results (mg/kg)**							**Limit values mg/kg**	**Analysis method / technique**
BHP Reference	89856.1						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Total Organic Carbon	2120						0.1	30000	Photometric
BTEX	<0.01						0.01	6	GC-FID
PCBs (7 cogeners)	<0.001						0.001	1	GC-MS
Mineral Oil (C10 to C40)	<0.1						0.1	500	GC-FID
PAHs (16)	<0.005						0.005	-	GC-MS

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 1 of 4) **Description:** L/S = 2 l/kg **Sample: SP2 (TH3-8/10/2009)** **Leachate analysis**

Parameter	**Results (mg/kg dry substance)**							**Limit values L/S = 2 l/kg mg/kg dry substance**	**Analysis method / technique**
BHP Reference	89856.2						**Method Detection Limits**		
Product Description	**Soil sample**								
Arsenic **As**	0.004						0.002	0.1	ICP-MS
Barium **Ba**	1.2						0.01	7	ICP-MS
Cadmium **Cd**	0.012						0.001	0.03	ICP-MS
Chromium total **Cr**	0.05						0.001	0.2	ICP-MS
Copper **Cu**	0.67						0.001	0.9	ICP-MS
Mercury **Hg**	<0.0002						0.001	0.003	ICP-MS
Molybdenum **Mo**	0.011						0.002	0.3	ICP-MS
Nickel **Ni**	0.01						0.001	0.2	ICP-MS
Lead **Pb**	0.072						0.001	0.2	ICP-MS
Antimony **Sb**	0.002						0.001	0.02	ICP-MS
Selenium **Se**	0.004						0.002	0.06	ICP-MS
Zinc **Zn**	0.018						0.002	2	ICP-MS
Chloride	8.02						0.1	550	I.C
Fluoride	0.72						0.2	4	I.C
Sulphate	2052						0.1	560	I.C
Dissolved Organic Carbon	11.1						1	240	Photometric
Total Dissolved Solids	1758						1	2500	Gravimetric
Phenol Index	0.01						0.001	0.5	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 2 of 4) **Description:** L/S = 10 l/kg **Sample: SP2 (TH3-8/10/2009)**

Leachate analysis

Parameter	**Results (mg/kg dry substance)**							**Limit values L/S = 10 l/kg mg/kg dry substance**	**Analysis method / technique**
BHP Reference	89856.2						**Method Detection Limits**		
Product Description	**Soil sample**								
Arsenic **As**	0.004						0.002	0.5	ICP-MS
Barium **Ba**	0.15						0.01	20	ICP-MS
Cadmium **Cd**	0.013						0.001	0.04	ICP-MS
Chromium total **Cr**	0.01						0.001	0.5	ICP-MS
Copper **Cu**	0.036						0.001	2	ICP-MS
Mercury **Hg**	<0.0002						0.001	0.01	ICP-MS
Molybdenum **Mo**	0.005						0.002	0.5	ICP-MS
Nickel **Ni**	0.03						0.001	0.4	ICP-MS
Lead **Pb**	0.12						0.001	0.5	ICP-MS
Antimony **Sb**	<0.001						0.001	0.06	ICP-MS
Selenium **Se**	0.006						0.002	0.1	ICP-MS
Zinc **Zn**	0.05						0.002	4	ICP-MS
Chloride	11.1						0.1	800	I.C
Fluoride	1.2						0.2	10	I.C
Sulphate	662.6						0.1	1000	I.C
Dissolved Organic Carbon	36						1	500	Photometric
Total Dissolved Solids	738						1	4000	Gravimetric
Phenol Index	0.003						0.001	1	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 3 of 4) **Description:**_____**L/S = 0.1 l/kg C0 (Percolation)** _____ **Sample: SP2 (TH3-8/10/2009)** **Leachate analysis**

Parameter	**Results (mg/l)**							**Limit values L/S = 0.1 l/kg mg/l**	**Analysis method / technique**
BHP Reference	89856.2						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Arsenic **As**	0.002						0.002	0.06	ICP-MS
Barium **Ba**	0.003						0.01	4	ICP-MS
Cadmium **Cd**	0.006						0.001	0.02	ICP-MS
Chromium total **Cr**	0.006						0.001	0.1	ICP-MS
Copper **Cu**	0.083						0.001	0.6	ICP-MS
Mercury **Hg**	<0.002						0.001	0.002	ICP-MS
Molybdenum **Mo**	0.002						0.002	0.2	ICP-MS
Nickel **Ni**	0.007						0.001	0.12	ICP-MS
Lead **Pb**	0.042						0.001	0.15	ICP-MS
Antimony **Sb**	<0.001						0.001	0.1	ICP-MS
Selenium **Se**	0.005						0.002	0.04	ICP-MS
Zinc **Zn**	0.011						0.002	1.2	ICP-MS
Chloride	6.94						0.1	460	I.C
Fluoride	0.52						0.2	2.5	I.C
Sulphate	2319						0.1	1500	I.C
Dissolved Organic Carbon	14.7						1	160	Photometric
Total Dissolved Solids								-	Gravimetric
Phenol Index	0.01						0.001	0.3	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 4 of 4) **Description:_____Organic Parameters _____** **Sample: SP2 (TH3-8/10/2009)**

Solid analysis

Parameter	**Results (mg/kg)**							**Limit values**	**Analysis method / technique**
BHP Reference	89856.2						**Method**	**mg/kg**	
							Detection		
Product Description	**Soil sample**						**Limits**		
Total Organic Carbon	3500						0.1	30000	Photometric
BTEX	<0.01						0.01	6	GC-FID
PCBs (7 cogeners)	<0.001						0.001	1	GC-MS
Mineral Oil (C10 to C40)	<0.1						0.1	500	GC-FID
PAHs (16)	<0.005						0.005	-	GC-MS

Signed for and on behalf of BHP Laboratories Ltd.

BHP Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 1 of 4) **Description:** L/S = 2 l/kg **Sample: SP3 (TH3-8/10/2009)**

Leachate analysis

Parameter	**Results (mg/kg dry substance)**							**Limit values L/S = 2 l/kg mg/kg dry substance**	**Analysis method / technique**
BHP Reference	89856.3						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Arsenic **As**	0.006						0.002	0.1	ICP-MS
Barium **Ba**	0.8						0.01	7	ICP-MS
Cadmium **Cd**	0.026						0.001	0.03	ICP-MS
Chromium total **Cr**	0.04						0.001	0.2	ICP-MS
Copper **Cu**	0.6						0.001	0.9	ICP-MS
Mercury **Hg**	<0.0002						0.001	0.003	ICP-MS
Molybdenum **Mo**	0.009						0.002	0.3	ICP-MS
Nickel **Ni**	0.01						0.001	0.2	ICP-MS
Lead **Pb**	0.035						0.001	0.2	ICP-MS
Antimony **Sb**	0.004						0.001	0.02	ICP-MS
Selenium **Se**	0.005						0.002	0.06	ICP-MS
Zinc **Zn**	0.014						0.002	2	ICP-MS
Chloride	4.52						0.1	550	I.C
Fluoride	3.09						0.2	4	I.C
Sulphate	1832						0.1	560	I.C
Dissolved Organic Carbon	69						1	240	Photometric
Total Dissolved Solids	842						1	2500	Gravimetric
Phenol Index	0.02						0.001	0.5	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 2 of 4) **Description:** L/S = 10 l/kg **Sample: SP3 (TH3-8/10/2009)**

Leachate analysis

Parameter	**Results (mg/kg dry substance)**							**Limit values L/S = 10 l/kg mg/kg dry substance**	**Analysis method / technique**
BHP Reference	89856.3						**Method Detection Limits**		
Product Description	**Soil sample**								
Arsenic **As**	0.005						0.002	0.5	ICP-MS
Barium **Ba**	0.2						0.01	20	ICP-MS
Cadmium **Cd**	0.014						0.001	0.04	ICP-MS
Chromium total **Cr**	0.01						0.001	0.5	ICP-MS
Copper **Cu**	0.09						0.001	2	ICP-MS
Mercury **Hg**	<0.0002						0.001	0.01	ICP-MS
Molybdenum **Mo**	0.006						0.002	0.5	ICP-MS
Nickel **Ni**	0.01						0.001	0.4	ICP-MS
Lead **Pb**	0.04						0.001	0.5	ICP-MS
Antimony **Sb**	<0.001						0.001	0.06	ICP-MS
Selenium **Se**	0.004						0.002	0.1	ICP-MS
Zinc **Zn**	0.05						0.002	4	ICP-MS
Chloride	9.7						0.1	800	I.C
Fluoride	5.9						0.2	10	I.C
Sulphate	1657						0.1	1000	I.C
Dissolved Organic Carbon	24						1	500	Photometric
Total Dissolved Solids	2200						1	4000	Gravimetric
Phenol Index	0.08						0.001	1	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 3 of 4) **Description:**_____**L/S = 0.1 l/kg C0 (Percolation)** _____ **Sample: SP3 (TH3-8/10/2009)** **Leachate analysis**

Parameter	**Results (mg/l)**							**Limit values L/S = 0.1 l/kg mg/l**	**Analysis method / technique**
BHP Reference	89856.3						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Arsenic **As**	0.002						0.002	0.06	ICP-MS
Barium **Ba**	0.005						0.01	4	ICP-MS
Cadmium **Cd**	0.005						0.001	0.02	ICP-MS
Chromium total **Cr**	0.009						0.001	0.1	ICP-MS
Copper **Cu**	0.066						0.001	0.6	ICP-MS
Mercury **Hg**	<0.002						0.001	0.002	ICP-MS
Molybdenum **Mo**	0.003						0.002	0.2	ICP-MS
Nickel **Ni**	0.008						0.001	0.12	ICP-MS
Lead **Pb**	0.036						0.001	0.15	ICP-MS
Antimony **Sb**	0.001						0.001	0.1	ICP-MS
Selenium **Se**	0.004						0.002	0.04	ICP-MS
Zinc **Zn**	0.009						0.002	1.2	ICP-MS
Chloride	4.44						0.1	460	I.C
Fluoride	2.15						0.2	2.5	I.C
Sulphate	1861						0.1	1500	I.C
Dissolved Organic Carbon	10						1	160	Photometric
Total Dissolved Solids								-	Gravimetric
Phenol Index	0.011						0.001	0.3	Photometric

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Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 4 of 4) **Description:_____Organic Parameters _____** **Sample: SP3 (TH3-8/10/2009)** **Solid analysis**

Parameter	**Results (mg/kg)**							**Limit values mg/kg**	**Analysis method / technique**
BHP Reference	89856.3						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Total Organic Carbon	3300						0.1	30000	Photometric
BTEX	<0.01						0.01	6	GC-FID
PCBs (7 cogeners)	<0.001						0.001	1	GC-MS
Mineral Oil (C10 to C40)	<0.1						0.1	500	GC-FID
PAHs (16)	<0.005						0.005	-	GC-MS

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Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 1 of 4) **Description:** L/S = 2 l/kg **Sample: SP4 (TH4-8/10/2009)** **Leachate analysis**

Parameter	Results (mg/kg dry substance)							Limit values L/S = 2 l/kg mg/kg dry substance	Analysis method / technique
BHP Reference	89856.4						Method Detection Limits		
Product Description	Soil sample								
Arsenic **As**	0.004						0.002	0.1	ICP-MS
Barium **Ba**	1.4						0.01	7	ICP-MS
Cadmium **Cd**	0.026						0.001	0.03	ICP-MS
Chromium total **Cr**	0.006						0.001	0.2	ICP-MS
Copper **Cu**	0.028						0.001	0.9	ICP-MS
Mercury **Hg**	<0.0002						0.001	0.003	ICP-MS
Molybdenum **Mo**	0.01						0.002	0.3	ICP-MS
Nickel **Ni**	0.012						0.001	0.2	ICP-MS
Lead **Pb**	0.024						0.001	0.2	ICP-MS
Antimony **Sb**	0.006						0.001	0.02	ICP-MS
Selenium **Se**	0.002						0.002	0.06	ICP-MS
Zinc **Zn**	0.018						0.002	2	ICP-MS
Chloride	10.24						0.1	550	I.C
Fluoride	<0.8						0.2	4	I.C
Sulphate	826						0.1	560	I.C
Dissolved Organic Carbon	93						1	240	Photometric
Total Dissolved Solids	506						1	2500	Gravimetric
Phenol Index	0.017						0.001	0.5	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 2 of 4) **Description:** L/S = 10 l/kg **Sample: SP4 (TH4-8/10/2009)**

Leachate analysis

Parameter	**Results (mg/kg dry substance)**							**Limit values L/S = 10 l/kg mg/kg dry substance**	**Analysis method / technique**
BHP Reference	89856.4						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Arsenic **As**	0.003						0.002	0.5	ICP-MS
Barium **Ba**	1.1						0.01	20	ICP-MS
Cadmium **Cd**	0.02						0.001	0.04	ICP-MS
Chromium total **Cr**	0.01						0.001	0.5	ICP-MS
Copper **Cu**	0.04						0.001	2	ICP-MS
Mercury **Hg**	<0.0002						0.001	0.01	ICP-MS
Molybdenum **Mo**	0.06						0.002	0.5	ICP-MS
Nickel **Ni**	0.02						0.001	0.4	ICP-MS
Lead **Pb**	0.07						0.001	0.5	ICP-MS
Antimony **Sb**	0.002						0.001	0.06	ICP-MS
Selenium **Se**	0.004						0.002	0.1	ICP-MS
Zinc **Zn**	0.06						0.002	4	ICP-MS
Chloride	16.5						0.1	800	I.C
Fluoride	1.1						0.2	10	I.C
Sulphate	1545						0.1	1000	I.C
Dissolved Organic Carbon	31						1	500	Photometric
Total Dissolved Solids	1880						1	4000	Gravimetric
Phenol Index	0.12						0.001	1	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 3 of 4) **Description:** L/S = 0.1 l/kg C0 (Percolation) **Sample: SP4 (TH4-8/10/2009)** **Leachate analysis**

Parameter	**Results (mg/l)**							**Limit values L/S = 0.1 l/kg mg/l**	**Analysis method / technique**
BHP Reference	89856.4						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Arsenic **As**	0.002						0.002	0.06	ICP-MS
Barium **Ba**	0.003						0.01	4	ICP-MS
Cadmium **Cd**	0.003						0.001	0.02	ICP-MS
Chromium total **Cr**	0.007						0.001	0.1	ICP-MS
Copper **Cu**	0.018						0.001	0.6	ICP-MS
Mercury **Hg**	<0.002						0.001	0.002	ICP-MS
Molybdenum **Mo**	0.001						0.002	0.2	ICP-MS
Nickel **Ni**	0.02						0.001	0.12	ICP-MS
Lead **Pb**	0.022						0.001	0.15	ICP-MS
Antimony **Sb**	0.001						0.001	0.1	ICP-MS
Selenium **Se**	0.002						0.002	0.04	ICP-MS
Zinc **Zn**	0.007						0.002	1.2	ICP-MS
Chloride	8.1						0.1	460	I.C
Fluoride	<0.08						0.2	2.5	I.C
Sulphate	698						0.1	1500	I.C
Dissolved Organic Carbon	12.9						1	160	Photometric
Total Dissolved Solids								-	Gravimetric
Phenol Index	0.008						0.001	0.3	Photometric

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Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 4 of 4) **Description:_____Organic Parameters _____** **Sample: SP4 (TH4-8/10/2009)**

Solid analysis

Parameter	**Results (mg/kg)**							**Limit values** mg/kg	**Analysis method / technique**
BHP Reference	89856.4						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Total Organic Carbon	2840						0.1	30000	Photometric
BTEX	<0.01						0.01	6	GC-FID
PCBs (7 cogeners)	<0.001						0.001	1	GC-MS
Mineral Oil (C10 to C40)	<0.1						0.1	500	GC-FID
PAHs (16)	<0.005						0.005	-	GC-MS

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Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 1 of 4) **Description:** L/S = 2 l/kg **Sample: SP5 (TH4-8/10/2009)**

Leachate analysis

Parameter	**Results (mg/kg dry substance)**							**Limit values L/S = 2 l/kg mg/kg dry substance**	**Analysis method / technique**
BHP Reference	89856.5						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Arsenic **As**	0.004						0.002	0.1	ICP-MS
Barium **Ba**	0.3						0.01	7	ICP-MS
Cadmium **Cd**	0.016						0.001	0.03	ICP-MS
Chromium total **Cr**	0.03						0.001	0.2	ICP-MS
Copper **Cu**	0.12						0.001	0.9	ICP-MS
Mercury **Hg**	<0.0002						0.001	0.003	ICP-MS
Molybdenum **Mo**	0.009						0.002	0.3	ICP-MS
Nickel **Ni**	0.02						0.001	0.2	ICP-MS
Lead **Pb**	0.018						0.001	0.2	ICP-MS
Antimony **Sb**	0.004						0.001	0.02	ICP-MS
Selenium **Se**	0.002						0.002	0.06	ICP-MS
Zinc **Zn**	0.14						0.002	2	ICP-MS
Chloride	16.9						0.1	550	I.C
Fluoride	0.88						0.2	4	I.C
Sulphate	412						0.1	560	I.C
Dissolved Organic Carbon	31.6						1	240	Photometric
Total Dissolved Solids	808						1	2500	Gravimetric
Phenol Index	0.012						0.001	0.5	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 2 of 4) **Description:** L/S = 10 l/kg **Sample: SP5 (TH4-8/10/2009)**

Leachate analysis

Parameter	**Results (mg/kg dry substance)**							**Limit values L/S = 10 l/kg mg/kg dry substance**	**Analysis method / technique**
BHP Reference	89856.5						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Arsenic **As**	0.005						0.002	0.5	ICP-MS
Barium **Ba**	0.9						0.01	20	ICP-MS
Cadmium **Cd**	0.01						0.001	0.04	ICP-MS
Chromium total **Cr**	0.14						0.001	0.5	ICP-MS
Copper **Cu**	0.1						0.001	2	ICP-MS
Mercury **Hg**	<0.0002						0.001	0.01	ICP-MS
Molybdenum **Mo**	0.11						0.002	0.5	ICP-MS
Nickel **Ni**	0.01						0.001	0.4	ICP-MS
Lead **Pb**	0.07						0.001	0.5	ICP-MS
Antimony **Sb**	0.002						0.001	0.06	ICP-MS
Selenium **Se**	0.004						0.002	0.1	ICP-MS
Zinc **Zn**	0.06						0.002	4	ICP-MS
Chloride	131						0.1	800	I.C
Fluoride	3.7						0.2	10	I.C
Sulphate	1662						0.1	1000	I.C
Dissolved Organic Carbon	150						1	500	Photometric
Total Dissolved Solids	1680						1	4000	Gravimetric
Phenol Index	0.14						0.001	1	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 3 of 4) **Description:** L/S = 0.1 l/kg C0 (Percolation) **Sample: SP5 (TH4-8/10/2009)** **Leachate analysis**

Parameter	**Results (mg/l)**							**Limit values L/S = 0.1 l/kg mg/l**	**Analysis method / technique**
BHP Reference	89856.5						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Arsenic **As**	0.001						0.002	0.06	ICP-MS
Barium **Ba**	0.004						0.01	4	ICP-MS
Cadmium **Cd**	0.002						0.001	0.02	ICP-MS
Chromium total **Cr**	0.0011						0.001	0.1	ICP-MS
Copper **Cu**	0.015						0.001	0.6	ICP-MS
Mercury **Hg**	<0.002						0.001	0.002	ICP-MS
Molybdenum **Mo**	0.001						0.002	0.2	ICP-MS
Nickel **Ni**	0.014						0.001	0.12	ICP-MS
Lead **Pb**	0.013						0.001	0.15	ICP-MS
Antimony **Sb**	0.001						0.001	0.1	ICP-MS
Selenium **Se**	0.001						0.002	0.04	ICP-MS
Zinc **Zn**	0.008						0.002	1.2	ICP-MS
Chloride	12.96						0.1	460	I.C
Fluoride	0.53						0.2	2.5	I.C
Sulphate	418						0.1	1500	I.C
Dissolved Organic Carbon	21.7						1	160	Photometric
Total Dissolved Solids								-	Gravimetric
Phenol Index	0.012						0.001	0.3	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 4 of 4) **Description:_____Organic Parameters _____** **Sample: SP5 (TH4-8/10/2009)** **Solid analysis**

Parameter	**Results (mg/kg)**							**Limit values mg/kg**	**Analysis method / technique**
BHP Reference	89856.5						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Total Organic Carbon	5120						0.1	30000	Photometric
BTEX	<0.01						0.01	6	GC-FID
PCBs (7 cogeners)	<0.001						0.001	1	GC-MS
Mineral Oil (C10 to C40)	<0.1						0.1	500	GC-FID
PAHs (16)	<0.005						0.005	-	GC-MS

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 1 of 4) **Description:**_____**L/S = 2 l/kg** _____ **Sample: SP6 (TH5-9/10/2009)** **Leachate analysis**

Parameter	**Results (mg/kg dry substance)**							**Limit values L/S = 2 l/kg mg/kg dry substance**	**Analysis method / technique**
BHP Reference	89856.6						**Method Detection**		
Product Description	**Soil sample**						**Limits**		
Arsenic **As**	0.004						0.002	0.1	ICP-MS
Barium **Ba**	0.3						0.01	7	ICP-MS
Cadmium **Cd**	0.019						0.001	0.03	ICP-MS
Chromium total **Cr**	0.01						0.001	0.2	ICP-MS
Copper **Cu**	0.042						0.001	0.9	ICP-MS
Mercury **Hg**	<0.0002						0.001	0.003	ICP-MS
Molybdenum **Mo**	0.007						0.002	0.3	ICP-MS
Nickel **Ni**	0.006						0.001	0.2	ICP-MS
Lead **Pb**	0.02						0.001	0.2	ICP-MS
Antimony **Sb**	0.002						0.001	0.02	ICP-MS
Selenium **Se**	0.01						0.002	0.06	ICP-MS
Zinc **Zn**	0.014						0.002	2	ICP-MS
Chloride	42.8						0.1	550	I.C
Fluoride	0.8						0.2	4	I.C
Sulphate	714						0.1	560	I.C
Dissolved Organic Carbon	17						1	240	Photometric
Total Dissolved Solids	1014						1	2500	Gravimetric
Phenol Index	0.024						0.001	0.5	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 2 of 4) **Description:** L/S = 10 l/kg **Sample: SP6 (TH5-9/10/2009)**

Leachate analysis

Parameter	**Results (mg/kg dry substance)**							**Limit values L/S = 10 l/kg mg/kg dry substance**	**Analysis method / technique**
BHP Reference	89856.6						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Arsenic **As**	0.01						0.002	0.5	ICP-MS
Barium **Ba**	1.1						0.01	20	ICP-MS
Cadmium **Cd**	0.014						0.001	0.04	ICP-MS
Chromium total **Cr**	0.01						0.001	0.5	ICP-MS
Copper **Cu**	0.06						0.001	2	ICP-MS
Mercury **Hg**	<0.0002						0.001	0.01	ICP-MS
Molybdenum **Mo**	0.09						0.002	0.5	ICP-MS
Nickel **Ni**	0.01						0.001	0.4	ICP-MS
Lead **Pb**	0.05						0.001	0.5	ICP-MS
Antimony **Sb**	0.002						0.001	0.06	ICP-MS
Selenium **Se**	0.002						0.002	0.1	ICP-MS
Zinc **Zn**	0.07						0.002	4	ICP-MS
Chloride	87.7						0.1	800	I.C
Fluoride	3.5						0.2	10	I.C
Sulphate	2080						0.1	1000	I.C
Dissolved Organic Carbon	45						1	500	Photometric
Total Dissolved Solids	2220						1	4000	Gravimetric
Phenol Index	0.09						0.001	1	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 3 of 4) **Description:**_____**L/S = 0.1 l/kg C0 (Percolation)** _____ **Sample: SP6 (TH5-9/10/2009)** **Leachate analysis**

Parameter	**Results (mg/l)**							**Limit values L/S = 0.1 l/kg mg/l**	**Analysis method / technique**
BHP Reference	89856.6						**Method Detection**		
Product Description	**Soil sample**						**Limits**		
Arsenic **As**	0.002						0.002	0.06	ICP-MS
Barium **Ba**	0.6						0.01	4	ICP-MS
Cadmium **Cd**	0.017						0.001	0.02	ICP-MS
Chromium total **Cr**	0.009						0.001	0.1	ICP-MS
Copper **Cu**	0.04						0.001	0.6	ICP-MS
Mercury **Hg**	<0.002						0.001	0.002	ICP-MS
Molybdenum **Mo**	0.001						0.002	0.2	ICP-MS
Nickel **Ni**	0.009						0.001	0.12	ICP-MS
Lead **Pb**	0.018						0.001	0.15	ICP-MS
Antimony **Sb**	0.001						0.001	0.1	ICP-MS
Selenium **Se**	0.001						0.002	0.04	ICP-MS
Zinc **Zn**	0.007						0.002	1.2	ICP-MS
Chloride	63.55						0.1	460	I.C
Fluoride	0.62						0.2	2.5	I.C
Sulphate	828.2						0.1	1500	I.C
Dissolved Organic Carbon	12.1						1	160	Photometric
Total Dissolved Solids								-	Gravimetric
Phenol Index	0.018						0.001	0.3	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 4 of 4) **Description:** Organic Parameters **Sample: SP6 (TH5-9/10/2009)**

Solid analysis

Parameter	**Results (mg/kg)**							**Limit values** mg/kg	**Analysis method / technique**
BHP Reference	89856.6						**Method Detection Limits**		
Product Description	**Soil sample**								
Total Organic Carbon	4850						0.1	30000	Photometric
BTEX	<0.01						0.01	6	GC-FID
PCBs (7 cogeners)	<0.001						0.001	1	GC-MS
Mineral Oil (C10 to C40)	<0.1						0.1	500	GC-FID
PAHs (16)	<0.005						0.005	-	GC-MS

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 1 of 4) **Description:** L/S = 2 l/kg **Sample: SP7** **Leachate analysis**

Parameter	**Results (mg/kg dry substance)**							**Limit values L/S = 2 l/kg mg/kg dry substance**	**Analysis method / technique**
BHP Reference	89856.7						Method		
							Detection		
Product Description	Soil sample						Limits		
Arsenic **As**	0.003						0.002	0.1	ICP-MS
Barium **Ba**	1.1						0.01	7	ICP-MS
Cadmium **Cd**	0.002						0.001	0.03	ICP-MS
Chromium total **Cr**	0.004						0.001	0.2	ICP-MS
Copper **Cu**	0.012						0.001	0.9	ICP-MS
Mercury **Hg**	<0.0002						0.001	0.003	ICP-MS
Molybdenum **Mo**	0.004						0.002	0.3	ICP-MS
Nickel **Ni**	0.004						0.001	0.2	ICP-MS
Lead **Pb**	0.014						0.001	0.2	ICP-MS
Antimony **Sb**	0.001						0.001	0.02	ICP-MS
Selenium **Se**	0.004						0.002	0.06	ICP-MS
Zinc **Zn**	0.014						0.002	2	ICP-MS
Chloride	2.24						0.1	550	I.C
Fluoride	0.58						0.2	4	I.C
Sulphate	812.1						0.1	560	I.C
Dissolved Organic Carbon	19						1	240	Photometric
Total Dissolved Solids	736						1	2500	Gravimetric
Phenol Index	0.011						0.001	0.5	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 2 of 4) **Description:** L/S = 10 l/kg **Sample: SP7** **Leachate analysis**

Parameter	Results (mg/kg dry substance)							Limit values L/S = 10 l/kg mg/kg dry substance	Analysis method / technique
BHP Reference	89856.7						Method		
							Detection		
Product Description	Soil sample						Limits		
Arsenic **As**	0.01						0.002	0.5	ICP-MS
Barium **Ba**	2.4						0.01	20	ICP-MS
Cadmium **Cd**	0.002						0.001	0.04	ICP-MS
Chromium total **Cr**	0.01						0.001	0.5	ICP-MS
Copper **Cu**	0.04						0.001	2	ICP-MS
Mercury **Hg**	<0.0002						0.001	0.01	ICP-MS
Molybdenum **Mo**	0.008						0.002	0.5	ICP-MS
Nickel **Ni**	0.01						0.001	0.4	ICP-MS
Lead **Pb**	0.06						0.001	0.5	ICP-MS
Antimony **Sb**	0.001						0.001	0.06	ICP-MS
Selenium **Se**	0.002						0.002	0.1	ICP-MS
Zinc **Zn**	0.05						0.002	4	ICP-MS
Chloride	170.1						0.1	800	I.C
Fluoride	1.4						0.2	10	I.C
Sulphate	2470						0.1	1000	I.C
Dissolved Organic Carbon	63						1	500	Photometric
Total Dissolved Solids	1780						1	4000	Gravimetric
Phenol Index	0.08						0.001	1	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 3 of 4) **Description:** L/S = 0.1 l/kg C0 (Percolation) **Sample: SP7**

Leachate analysis

Parameter	**Results (mg/l)**							**Limit values L/S = 0.1 l/kg mg/l**	**Analysis method / technique**
BHP Reference	89856.7						Method Detection Limits		
Product Description	Soil sample								
Arsenic **As**	0.001						0.002	0.06	ICP-MS
Barium **Ba**	0.2						0.01	4	ICP-MS
Cadmium **Cd**	0.002						0.001	0.02	ICP-MS
Chromium total **Cr**	0.005						0.001	0.1	ICP-MS
Copper **Cu**	0.008						0.001	0.6	ICP-MS
Mercury **Hg**	<0.002						0.001	0.002	ICP-MS
Molybdenum **Mo**	0.001						0.002	0.2	ICP-MS
Nickel **Ni**	0.011						0.001	0.12	ICP-MS
Lead **Pb**	0.008						0.001	0.15	ICP-MS
Antimony **Sb**	0.001						0.001	0.1	ICP-MS
Selenium **Se**	0.001						0.002	0.04	ICP-MS
Zinc **Zn**	0.012						0.002	1.2	ICP-MS
Chloride	26.81						0.1	460	I.C
Fluoride	0.48						0.2	2.5	I.C
Sulphate	1253.1						0.1	1500	I.C
Dissolved Organic Carbon	13.6						1	160	Photometric
Total Dissolved Solids								-	Gravimetric
Phenol Index	0.007						0.001	0.3	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 4 of 4) **Description:** Organic Parameters **Sample: SP7** **Solid analysis**

Parameter	Results (mg/kg)							Limit values mg/kg	Analysis method / technique
BHP Reference	89856.7						Method Detection Limits		
Product Description	Soil sample								
Total Organic Carbon	2890						0.1	30000	Photometric
BTEX	<0.01						0.01	6	GC-FID
PCBs (7 cogeners)	<0.001						0.001	1	GC-MS
Mineral Oil (C10 to C40)	<0.1						0.1	500	GC-FID
PAHs (16)	<0.005						0.005	-	GC-MS

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 1 of 4) **Description:** L/S = 2 l/kg **Sample: SP8**

Leachate analysis

Parameter	**Results (mg/kg dry substance)**							**Limit values L/S = 2 l/kg mg/kg dry substance**	**Analysis method / technique**
BHP Reference	89856.8						**Method Detection Limits**		
Product Description	**Soil sample**						0.002	0.1	ICP-MS
Arsenic **As**	0.002						0.01	7	ICP-MS
Barium **Ba**	0.8						0.001	0.03	ICP-MS
Cadmium **Cd**	0.004						0.001	0.2	ICP-MS
Chromium total **Cr**	0.038						0.001	0.9	ICP-MS
Copper **Cu**	0.048						0.001	0.003	ICP-MS
Mercury **Hg**	<0.0002						0.002	0.3	ICP-MS
Molybdenum **Mo**	0.005						0.001	0.2	ICP-MS
Nickel **Ni**	0.022						0.001	0.2	ICP-MS
Lead **Pb**	0.018						0.001	0.02	ICP-MS
Antimony **Sb**	0.002						0.002	0.06	ICP-MS
Selenium **Se**	0.004						0.002	2	ICP-MS
Zinc **Zn**	0.018						0.1	550	I.C
Chloride	60.3						0.2	4	I.C
Fluoride	1.29						0.1	560	I.C
Sulphate	614.8						1	240	Photometric
Dissolved Organic Carbon	38.8						1	2500	Gravimetric
Total Dissolved Solids	1604						0.001	0.5	Photometric
Phenol Index	0.022								

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 2 of 4) **Description:** L/S = 10 l/kg **Sample: SP8** **Leachate analysis**

Parameter	**Results (mg/kg dry substance)**							**Limit values L/S = 10 l/kg mg/kg dry substance**	**Analysis method / technique**
BHP Reference	89856.8						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Arsenic **As**	0.008						0.002	0.5	ICP-MS
Barium **Ba**	1.8						0.01	20	ICP-MS
Cadmium **Cd**	0.002						0.001	0.04	ICP-MS
Chromium total **Cr**	0.01						0.001	0.5	ICP-MS
Copper **Cu**	0.02						0.001	2	ICP-MS
Mercury **Hg**	<0.0002						0.001	0.01	ICP-MS
Molybdenum **Mo**	0.008						0.002	0.5	ICP-MS
Nickel **Ni**	0.06						0.001	0.4	ICP-MS
Lead **Pb**	0.04						0.001	0.5	ICP-MS
Antimony **Sb**	0.001						0.001	0.06	ICP-MS
Selenium **Se**	0.003						0.002	0.1	ICP-MS
Zinc **Zn**	0.05						0.002	4	ICP-MS
Chloride	76						0.1	800	I.C
Fluoride	2.4						0.2	10	I.C
Sulphate	1406						0.1	1000	I.C
Dissolved Organic Carbon	76						1	500	Photometric
Total Dissolved Solids	2240						1	4000	Gravimetric
Phenol Index	0.16						0.001	1	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 3 of 4) **Description:** L/S = 0.1 l/kg C0 (Percolation) **Sample: SP8**

Leachate analysis

Parameter	**Results (mg/l)**							**Limit values L/S = 0.1 l/kg mg/l**	**Analysis method / technique**
BHP Reference	89856.8						**Method Detection Limits**		
Product Description	**Soil sample**						0.002	0.06	ICP-MS
Arsenic **As**	0.001						0.01	4	ICP-MS
Barium **Ba**	0.3						0.001	0.02	ICP-MS
Cadmium **Cd**	0.004						0.001	0.1	ICP-MS
Chromium total **Cr**	0.037						0.001	0.6	ICP-MS
Copper **Cu**	0.047						0.001	0.002	ICP-MS
Mercury **Hg**	<0.002						0.002	0.2	ICP-MS
Molybdenum **Mo**	0.002						0.001	0.12	ICP-MS
Nickel **Ni**	0.021						0.001	0.15	ICP-MS
Lead **Pb**	0.016						0.001	0.1	ICP-MS
Antimony **Sb**	0.001						0.002	0.04	ICP-MS
Selenium **Se**	0.002						0.002	1.2	ICP-MS
Zinc **Zn**	0.01						0.1	460	I.C
Chloride	77.88						0.2	2.5	I.C
Fluoride	2.19						0.1	1500	I.C
Sulphate	836.2						1	160	Photometric
Dissolved Organic Carbon	34.2							-	Gravimetric
Total Dissolved Solids							0.001	0.3	Photometric
Phenol Index	0.012								

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Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 4 of 4) **Description:_____Organic Parameters _____** **Sample: SP8**

Solid analysis

Parameter	**Results (mg/kg)**							**Limit values mg/kg**	**Analysis method / technique**
BHP Reference	89856.8						**Method Detection Limits**		
Product Description	**Soil sample**								
Total Organic Carbon	3400						0.1	30000	Photometric
BTEX	<0.01						0.01	6	GC-FID
PCBs (7 cogeners)	<0.001						0.001	1	GC-MS
Mineral Oil (C10 to C40)	<0.1						0.1	500	GC-FID
PAHs (16)	<0.005						0.005	-	GC-MS

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 1 of 4) **Description:** L/S = 2 l/kg **Sample: SP9 (TH9-12/10/09)**

Leachate analysis

Parameter	Results (mg/kg dry substance)						Limit values L/S = 2 l/kg mg/kg dry substance	Analysis method / technique
BHP Reference	89856.9					Method Detection Limits		
Product Description	Soil sample							
Arsenic **As**	0.002					0.002	0.1	ICP-MS
Barium **Ba**	0.9					0.01	7	ICP-MS
Cadmium **Cd**	0.01					0.001	0.03	ICP-MS
Chromium total **Cr**	0.01					0.001	0.2	ICP-MS
Copper **Cu**	0.028					0.001	0.9	ICP-MS
Mercury **Hg**	<0.0002					0.001	0.003	ICP-MS
Molybdenum **Mo**	0.006					0.002	0.3	ICP-MS
Nickel **Ni**	0.044					0.001	0.2	ICP-MS
Lead **Pb**	0.024					0.001	0.2	ICP-MS
Antimony **Sb**	0.004					0.001	0.02	ICP-MS
Selenium **Se**	0.002					0.002	0.06	ICP-MS
Zinc **Zn**	0.012					0.002	2	ICP-MS
Chloride	28.9					0.1	550	I.C
Fluoride	0.52					0.2	4	I.C
Sulphate	725					0.1	560	I.C
Dissolved Organic Carbon	14.2					1	240	Photometric
Total Dissolved Solids	1108					1	2500	Gravimetric
Phenol Index	0.034					0.001	0.5	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 2 of 4) **Description:** L/S = 10 l/kg **Sample: SP9 (TH9-12/10/09)**

Leachate analysis

Parameter	**Results (mg/kg dry substance)**							**Limit values L/S = 10 l/kg mg/kg dry substance**	**Analysis method / technique**
BHP Reference	89856.9						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Arsenic **As**	0.006						0.002	0.5	ICP-MS
Barium **Ba**	0.7						0.01	20	ICP-MS
Cadmium **Cd**	0.01						0.001	0.04	ICP-MS
Chromium total **Cr**	0.01						0.001	0.5	ICP-MS
Copper **Cu**	0.05						0.001	2	ICP-MS
Mercury **Hg**	<0.0002						0.001	0.01	ICP-MS
Molybdenum **Mo**	0.006						0.002	0.5	ICP-MS
Nickel **Ni**	0.19						0.001	0.4	ICP-MS
Lead **Pb**	0.1						0.001	0.5	ICP-MS
Antimony **Sb**	0.006						0.001	0.06	ICP-MS
Selenium **Se**	0.004						0.002	0.1	ICP-MS
Zinc **Zn**	0.05						0.002	4	ICP-MS
Chloride	49.7						0.1	800	I.C
Fluoride	1.4						0.2	10	I.C
Sulphate	3082						0.1	1000	I.C
Dissolved Organic Carbon	24						1	500	Photometric
Total Dissolved Solids	1860						1	4000	Gravimetric
Phenol Index	0.08						0.001	1	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 3 of 4) **Description:**_____**L/S = 0.1 l/kg C0 (Percolation)** _____ **Sample: SP9 (TH9-12/10/09)** **Leachate analysis**

Parameter	**Results (mg/l)**							**Limit values L/S = 0.1 l/kg mg/l**	**Analysis method / technique**
BHP Reference	89856.9						**Method Detection**		
Product Description	**Soil sample**						**Limits**		
Arsenic **As**	0.002						0.002	0.06	ICP-MS
Barium **Ba**	0.2						0.01	4	ICP-MS
Cadmium **Cd**	0.012						0.001	0.02	ICP-MS
Chromium total **Cr**	0.024						0.001	0.1	ICP-MS
Copper **Cu**	0.027						0.001	0.6	ICP-MS
Mercury **Hg**	<0.002						0.001	0.002	ICP-MS
Molybdenum **Mo**	0.002						0.002	0.2	ICP-MS
Nickel **Ni**	0.025						0.001	0.12	ICP-MS
Lead **Pb**	0.014						0.001	0.15	ICP-MS
Antimony **Sb**	0.002						0.001	0.1	ICP-MS
Selenium **Se**	0.002						0.002	0.04	ICP-MS
Zinc **Zn**	0.008						0.002	1.2	ICP-MS
Chloride	24.32						0.1	460	I.C
Fluoride	0.3						0.2	2.5	I.C
Sulphate	687						0.1	1500	I.C
Dissolved Organic Carbon	12.7						1	160	Photometric
Total Dissolved Solids								-	Gravimetric
Phenol Index	0.018						0.001	0.3	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 4 of 4) **Description:** Organic Parameters **Sample: SP9 (TH9-12/10/09)**

Solid analysis

Parameter	**Results (mg/kg)**							**Limit values mg/kg**	**Analysis method / technique**
BHP Reference	89856.9						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Total Organic Carbon	2900						0.1	30000	Photometric
BTEX	<0.01						0.01	6	GC-FID
PCBs (7 cogeners)	<0.001						0.001	1	GC-MS
Mineral Oil (C10 to C40)	<0.1						0.1	500	GC-FID
PAHs (16)	<0.005						0.005	-	GC-MS

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 2 of 4) **Description:** L/S = 10 l/kg **Sample: SP10 (TH11-12/10/09)** **Leachate analysis**

Parameter	**Results (mg/kg dry substance)**							**Limit values L/S = 10 l/kg mg/kg dry substance**	**Analysis method / technique**
BHP Reference	89856.10						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Arsenic **As**	0.006						0.002	0.5	ICP-MS
Barium **Ba**	0.2						0.01	20	ICP-MS
Cadmium **Cd**	0.02						0.001	0.04	ICP-MS
Chromium total **Cr**	0.01						0.001	0.5	ICP-MS
Copper **Cu**	0.04						0.001	2	ICP-MS
Mercury **Hg**	<0.0002						0.001	0.01	ICP-MS
Molybdenum **Mo**	0.004						0.002	0.5	ICP-MS
Nickel **Ni**	0.03						0.001	0.4	ICP-MS
Lead **Pb**	0.07						0.001	0.5	ICP-MS
Antimony **Sb**	0.002						0.001	0.06	ICP-MS
Selenium **Se**	0.001						0.002	0.1	ICP-MS
Zinc **Zn**	0.05						0.002	4	ICP-MS
Chloride	94.3						0.1	800	I.C
Fluoride	<0.1						0.2	10	I.C
Sulphate	3709						0.1	1000	I.C
Dissolved Organic Carbon	46						1	500	Photometric
Total Dissolved Solids	2500						1	4000	Gravimetric
Phenol Index	0.18						0.001	1	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 3 of 4) **Description:** L/S = 0.1 l/kg C0 (Percolation) **Sample: SP10 (TH11-12/10/09)** **Leachate analysis**

Parameter	**Results (mg/l)**							**Limit values L/S = 0.1 l/kg mg/l**	**Analysis method / technique**
BHP Reference	89856.10						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Arsenic **As**	0.001						0.002	0.06	ICP-MS
Barium **Ba**	0.3						0.01	4	ICP-MS
Cadmium **Cd**	0.005						0.001	0.02	ICP-MS
Chromium total **Cr**	0.059						0.001	0.1	ICP-MS
Copper **Cu**	0.049						0.001	0.6	ICP-MS
Mercury **Hg**	<0.002						0.001	0.002	ICP-MS
Molybdenum **Mo**	0.002						0.002	0.2	ICP-MS
Nickel **Ni**	0.008						0.001	0.12	ICP-MS
Lead **Pb**	0.027						0.001	0.15	ICP-MS
Antimony **Sb**	0.001						0.001	0.1	ICP-MS
Selenium **Se**	0.002						0.002	0.04	ICP-MS
Zinc **Zn**	0.011						0.002	1.2	ICP-MS
Chloride	15.6						0.1	460	I.C
Fluoride	0.34						0.2	2.5	I.C
Sulphate	1162.7						0.1	1500	I.C
Dissolved Organic Carbon	10.9						1	160	Photometric
Total Dissolved Solids								-	Gravimetric
Phenol Index	0.016						0.001	0.3	Photometric

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Paddy Hoare

Client:

Address: Crescent House, Hartstonge Street, Limerick

(Sheet 4 of 4) **Description:**_____**Organic Parameters** _____ **Sample: SP10 (TH11-12/10/09)** **Solid analysis**

Parameter	**Results (mg/kg)**							**Limit values mg/kg**	**Analysis method / technique**
BHP Reference	89856.10						**Method**		
							Detection		
Product Description	**Soil sample**						**Limits**		
Total Organic Carbon	3800						0.1	30000	Photometric
BTEX	<0.01						0.01	6	GC-FID
PCBs (7 cogeners)	<0.001						0.001	1	GC-MS
Mineral Oil (C10 to C40)	<0.1						0.1	500	GC-FID
PAHs (16)	<0.005						0.005	-	GC-MS

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GARLAND
Concepts Realised

Appendix B
Site Investigation Data from 2024

Car Park

TH-1

TH-2

TH-3

TH-4

TH-5

1 >2.8m of fill

2 >2.7m of fill

3 4.1m to Natural Ground

4 3.5m to Natural Ground

5 >3.0m of fill

6 2m to Natural Ground

7 >1.2m of fill

8 4.3m to Natural Ground

9 >2.3m of fill

10 2.6m to Natural Ground

11 >2.7m of fill

12 1.8m to Natural Ground

GROOBY RD

GROOBY ROAD

CURRAGH BIRÍN

Groobly River
An Dúraíde

Currach na Réabóige Reboge Meadows

2023 Trial Hole Findings:

Trial Hole No	1	2	3	4	5
Depth	1.8m	1.4m	3m	2.5m	2.1m
Original Ground Found	Yes	No	No	No	No
Typical Contents Inspected Visually	C+D Waste incl: • Clay • Stones incl up to boulder size • Galvanised sheeting • Wood • Bricks • Plastic • Piping/cables	C+D Waste incl: • Clay • Stones incl up to boulder size • Concrete kerbs • Blocks • Timber post • Insulation (small amount) • plastic	C+D Waste incl: • Clay • Stones incl up to boulder size • Concrete kerbs • Concrete with rebar • Bicks • Drain pipe • Cooper pipe • plastic	C+D Waste incl: • Clay • Stones incl up to boulder size • Plastic drain • Plastic bottle • Timber • Pipes cables • bricks	C+D Waste incl: • Clay • Stones incl up to boulder size • Plastic • Wood
Notes	Possibly most non clay, stone material. Water at base, possibly perched on natural ground	Terminated by obstruction. Water ingress noted		Water ingress noted	Black coloured layer present within top 1m and black appearing at base of trial pit

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