

APPENDIX 10.1

**CONSTRUCTION &
DEMOLITION WASTE
MANAGEMENT PLAN
FOR THE
NEW CHILDREN'S
HOSPITAL, FAMILY
ACOMMODATION UNIT
AND CHILDREN'S
RESEARCH AND
INNOVATION CENTRE AT
ST. JAMES'S HOSPITAL
CAMPUS, DUBLIN 8**

Report Prepared For

**National Paediatric Hospital
Development Board**

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Our Reference

RH/14/8182WMR01

Date of Issue

31 July 2015

Cork Office

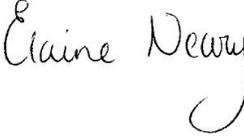
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Document History

Document Reference		Original Issue Date	
RH/14/8182W/MR01		31 July 2015	
Revision Level	Revision Date	Description	Sections Affected

Record of Approval

Details	Written by	Approved by
Signature		
Name	Robert Hunt	Elaine Neary
Title	Environmental Consultant	Principal Consultant
Date	31 July 2015	31 July 2015

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1.0 INTRODUCTION

As part of the National Paediatric Hospital Project, planning permission is being sought for the construction of a new children's hospital, a Family Accommodation Unit and a Children's Research and Innovation Centre (CRIC) at the St. James's Hospital campus, Dublin 8.

The new buildings will require the demolition of a number of existing structures on the campus and these will be included in a demolition plan produced by the contractor prior to commencement of the demolition works. In addition to having a number of active construction sites within St James's Hospital campus, an off-site construction compound is to be located on a brownfield site at Davitt Road.

AWN Consulting Ltd. (AWN) has prepared this Construction and Demolition (C&D) Waste Management Plan (WMP) for the proposed development. The purpose of the C&D WMP is to provide information necessary to ensure that the management of C&D waste at the site is undertaken in accordance with current legal and industry standards including the *Waste Management Act 1996 and 2008*¹, associated Regulations, *Litter Act 1997*² and the new '*Eastern-Midlands Region (EMR) Waste Management Plan 2015 – 2021*'³. In particular, the C&D WMP aims to ensure maximum recycling, re-use 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 or water resources).

This C&D WMP includes information on the legal and policy framework for 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.

2.0 CONSTRUCTION & DEMOLITION WASTE MANAGEMENT IN IRELAND

2.1 National Level

The Irish Government issued a policy statement in September 1998 known as '*Changing Our Ways*'⁴, 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*'⁵ concerning the development and implementation of a voluntary construction industry programme to meet the Government's objectives for the recovery of construction and demolition waste.

The most recent national policy document was published in July 2012, entitled '*A Resource Opportunity - Waste Management Policy in Ireland*'⁶. This document stresses the environmental and economic benefits of better waste management, particularly in relation to waste prevention. The document sets out a number of actions in relation to C&D waste and commits to undertake a review of specific producer responsibility requirements for C&D projects over a certain threshold.

The National Construction and Demolition Waste Council (NCDWC) was launched in June 2002, as one of the recommendations of the Forum for the Construction Industry,

in the Task Force B4 final report. The NCDWC subsequently produced *Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects*⁷ in July 2006 in conjunction with the then Department of the Environment, Heritage and Local Government (DoEHLG). The guidelines outline the issues that need to be addressed at the pre-planning stage of a development all the way through to its completion. 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;
- Waste disposal/recycling of C&D wastes at the site;
- Provision of training for waste manager and site crew;
- Details of proposed record keeping system;
- Details of waste audit procedures and plan; and
- Details of proposed consultation with relevant bodies i.e. waste recycling companies, Dublin City Council etc.

Section 3 of the Guidelines identifies thresholds above which there is a requirement for the preparation of a C&DWMP for developments. This development requires a C&DWMP under the following criterion:

- New developments including institutional, educational, health and other public facilities, with an aggregate floor area in excess of 1,250m².

Other guidelines followed in the preparation of this report include *Construction and Demolition Waste Management – a handbook for Contractors and Site Managers*⁸ published by FÁS and the Construction Industry Federation in 2002.

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 Dublin City Council (DCC).

The *EMR Waste Management Plan 2015 – 2021* is the new regional waste management plan for the DCC area published in May 2015. This plan replaces the previous Dublin region plan due to changing National policy as set out in *A Resource Opportunity: Waste Management Policy in Ireland* and changes being enacted by the *Waste Framework Directive (WFD) (2008/98/EC)*⁹. The new regional plan sets out the strategic targets for waste management in the region but does not set a specific target for C&D waste. However, the WFD sets Member States a target 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.

The *Dublin City Development Plan 2011 – 2017*¹⁰ identifies facilitation of the development of recycling in order to minimise the use of landfill as the main objective of the City Council. The development plan also outlines a number of policies and objectives, the most relevant of which in the context in C&D waste are:

Policies:

- *SI30: To prevent and minimise waste.*
- *SI33: To minimise the amount of waste which cannot be prevented and ensure it is disposed of without causing environmental pollution.*

Objectives:

SIO61: To promote the reuse of building materials, recycling of demolition material and the use of materials from renewable sources. In all developments in excess of 10 housing units and commercial developments in excess of 1000 sqm, a materials source and management plan showing type of materials/proportion of reuse/recycled materials to be used shall be implemented by the developer.

2.3 Legislative Requirements

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

- Waste Management Act 1996 (S.I. No. 10 of 1996) as amended by the Waste Management (Amendment) Act 2001. Sub-ordinate legislation includes:
 - European Communities (Waste Directive) Regulations 2011 (SI 126 of 2011) as amended 2011 (S.I. No. 323 of 2011)
 - Waste Management (Collection Permit) Regulations S.I No. 820 of 2007 as amended 2008 (S.I No 87 of 2008)
 - Waste Management (Facility Permit and Registration) Regulations, S.I No. 821 of 2007 as amended 2008 (S.I No. 86 of 2008)
 - Waste Management (Licensing) Regulations 2000 (S.I No. 185 of 2000) as amended 2004 (S.I. No. 395 of 2004), 2010 and (S.I. No. 350 of 2010)
 - Waste Management (Packaging) Regulations 2003 (S.I. No. 61 of 2003) as amended 2004 (S.I. No. 871 of 2004), 2006 (S.I. No. 308 of 2006) and 2007 (S.I. No. 798 of 2007)
 - Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997)
 - Waste Management (Landfill Levy) Regulations 2011 (S.I. No. 434 of 2011), as amended 2015 (S.I. No. 189 of 2015)
 - European Communities (Waste Electrical and Electronic Equipment) Regulations 2011
 - Waste Management (Registration of Brokers and Dealers) Regulations 2008 (S.I. 113 of 2008)
 - Waste Management (Food Waste) Regulations 2009 (S.I. 508 of 2009), as amended 2015 (S.I. 190 of 2015) and European Union (Household Food Waste and Bio-waste) Regulation 2015 (S.I. No. 191 of 2015)
- Protection of the Environment Act 2003 (S.I. No. 413 of 2003)
- Litter Pollution Act 1997 (S.I. No. 12 of 1997)

These Acts and subordinate Regulations enable the transposition of relevant European Union Policy and Directives into Irish law.

One of the guiding principles of European waste legislation, which has in turn been incorporated into the *Waste Management Act 1996 - 2008* 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 National Paediatric Hospital Development Board (NPHDB) ensures that the waste contractors engaged by construction contractors are legally compliant with respect to waste transportation, recycling, recovery and disposal. This includes the requirement that a contractor handle, transport and 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), waste permit granted by the relevant Local Authority under the *Waste Management (Facility Permit & Registration) Regulations 2007 and Amendments* or a waste licence granted by the EPA. The COR/permit/licence 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.

3.0 DESCRIPTION OF THE PROJECT

3.1 Location, Size and Scale of the Development

The National Paediatric Hospital Project proposes a number of developments within the grounds of the existing St. James's Hospital campus in Dublin 8. These comprise the construction of:

- A new children's hospital;
- A Family Accommodation Unit; and
- A Children's Research and Innovation Centre (CRIC).

In addition, a site at Davitt Road is intended as a construction compound which will be made available to the contractor during the construction works. It will be used as a store for dry materials (steel, cladding, precast concrete etc.) and potentially as a staging area for the works.

3.2 Details of the Non-Hazardous Wastes to be produced

It is anticipated that there will be no waste generated at the Davitt Road site. There will be no requirement for demolition at the site as there are no existing buildings in the compound site so there will be no demolition waste. There are no groundworks required with the exception of some minor site clearance and local relocation of part of an existing mound to move it outside the proposed contractor compound area. It is not proposed to remove any soil or subsoil material from the site. There will be no construction required to prepare the site.

There will be a significant volume of waste generated from demolition works at the development sites within the St James's Hospital campus and it is anticipated that this material will be more difficult to segregate than waste generated from the construction phase, as many of the building materials will be bonded together or integrated, i.e. steel reinforcement in concrete and metal or timber stud partition walls.

A small quantity of archaeological and architectural heritage material will also be salvaged for re-use elsewhere, especially from buildings such as the chapel, the old school building and Garden Hill house.

Waste asphalt and concrete will be generated from excavation of existing access routes and footpaths across the development areas. Additionally, shrubbery and green waste will be generated from removal / excavation of landscaped areas.

Based on earthworks data provided by the project engineers (O'Connor Sutton and Cronin (OCSC)), there will be a significant surplus of made ground and soil/stones generated from excavations and site clearance required to facilitate construction of foundations, basements, realignment of access routes and general landscaping. Where possible, excavated topsoil will be reused on site.

During the construction phase there will be a surplus of materials, such as off-cuts from timber, concrete blocks, tiles and bricks. Waste from packaging and oversupply of materials will also be generated. There may also be excess concrete delivered to site during construction which will need to be disposed of.

3.3 Anticipated Hazardous Wastes to be produced

3.3.1 Contaminated Soil

A site investigation and assessment was carried out at the Davitt Road site. The assessment report concludes that the contamination encountered does not pose a significant risk to site users and the environment and overall the site was found to be in good condition for a brownfield site with a history of industrial use. Further detail is provided in Chapter 7 (Soils and Geology). There will be no soil removed from the Davit Road site.

A number of site investigations have been undertaken at the St. James's Hospital site since 2014. Site investigations have established that some localised contamination of the made ground/subsoils has occurred. Based on samples collected and the analysis results, OCSC have classified the soil as either non-hazardous or hazardous using the *HazWasteOnline* application and further classified the soil into five main categories for disposal purposes i.e. inert natural, inert, non-hazardous, stable non-reactive hazardous for disposal in non-hazardous landfill or hazardous, in accordance with *European Communities (EC) Council Decision 2003/33/EC*¹¹. Classification has been carried out on a horizontal 25m x 25m grid basis at 1m intervals vertically through the soil profile. The classification categories and the estimated volumes/quantum of each category as determined by OCSC are presented in Table 3.1.

Waste Category	Description	Estimated Volume (m ³)	Estimated Weight (Tonnes) ¹
Category A1	Inert Natural	332,500 . 343,500	665,000 . 687,000
Category A2	Inert	33,500 . 39,000	67,000 . 78,000
Category B	Non-Hazardous	36,000 . 40,500	72,000 . 81,000
Category C	Stable non-reactive hazardous for disposal in non-hazardous landfill	400 - 500	800 . 1,000
Category D	Hazardous		

Table 3.1 Soil classification at St James's Hospital campus (provided by OCSC)

Note: ¹ Typical density of 2 tonnes/m³ used based on Dublin boulder clay density range of 2.2 – 2.4 tonnes/m³ (Long, Brangan, Menkiti, Looby and Casey) Retaining Walls in Dublin Boulder Clay, Ireland – Geotechnical Engineering, Volume 165, Issue GE4 (2012). Total excavation volume will also include some made ground and non-boulder clay material.

The classification of a small quantity of material as Category C or Category D is based on the identification of two small contamination hotspots at the site. The first is in the location of a former pump house which operated at the site in the early 1900s and the second is an area where soil with a high pH was detected. Once the site work commences, further testing and soil analysis will be required to confirm if the material is hazardous and to establish the actual quantity of material.

The excavations should be carefully monitored by a suitably qualified person to ensure potentially contaminated soil is correctly identified and segregated, where encountered.

A small area of Japanese Knotweed (*Fallopia japonica*), an invasive weed species, was identified at the eastern end of the landscape corridor behind Donnellan Avenue / McDowell Avenue. The plant is an invasive alien species as listed on the Third Schedule (Part 1: Plants) of the *European Communities (Birds and Natural Habitats) Regulations, 2011* (SI No 477 of 2011, also known as the *Habitats Regulations*). In particular, Regulations 49 and 50 prohibit the introduction, dispersal, trading and keeping of certain this non-native invasive species. The affected area has been fenced-off and is excluded from construction works associated with the proposed development. A programme of management and treatment towards the eradication of the plant is being put in place under the supervision of a qualified ecologist and in accordance with best practice. No plant materials, soils or other arising will be removed from the infected area. This affected area will be maintained as a construction exclusion zone during the proposed development. Further detail is provided in Chapter 9 (Flora and Fauna) of the EIS.

3.3.2 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 and located in a dedicated, secure area of the site. Provided that these requirements are adhered to and the site crew are trained in the appropriate refuelling techniques, it is not expected that there will be any fuel/oil wastage at the site.

3.3.3 Asbestos

An asbestos survey will be carried out on existing buildings to be demolished at the St James's Hospital campus in advance of commencement of any soft strip or demolition works. The survey will be carried out on a staged basis in line with the proposed decant process as works to remove asbestos can only be carried out once the buildings have been vacated. Removal of asbestos or asbestos containing material (ACM) will be carried out by a suitably qualified contractor and ACM will only be removed from site by a suitably permitted/licenced waste contractor. The Health and Safety Authority (HSA) should be contacted in relation to the handling of asbestos and material should be dealt with in accordance with the *Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006*, as amended.

3.3.4 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.

3.4 **Main C&D Waste Categories**

The main non-hazardous and hazardous waste streams that could be generated by the construction and demolition activities at a typical site are shown in Table 3.2. The List of Waste (LoW) code (also referred to as the European Waste Code or EWC) for each waste stream is also shown.

Waste Material	LoW Code
Non-Hazardous:	
Concrete, bricks, tiles, ceramics	17 01
Wood, glass and plastic	17 02
Bituminous mixtures	17 03 02
Metals (including their alloys)	17 04
Soil and stones	17 05
Gypsum-based construction material	17 08
Paper and cardboard	20 01 01
Mixed C&D waste	17 09 04
Hazardous:	
Electrical and electronic components	20 01 35
Batteries and accumulators	20 01 33-34
Wood preservatives	03 02
Liquid fuels	13 07
Waste construction material containing asbestos	17 06 05
Chemicals (solvents, pesticides, paints, adhesives, detergents etc.)	20 01 13/1927-28/29-30
Soil and stones containing dangerous substances (if encountered)	17 05 03
Other construction and demolition wastes containing dangerous substances	17 09 03

Table 3.2 Typical waste types generated and LoW codes

4.0 WASTE MANAGEMENT

4.1 Demolition Waste Generation

The total gross area of existing buildings within the St James's Hospital campus to be demolished has been estimated by the project architects as approximately 20,539m². It is understood that the majority of buildings to be demolished at the site are constructed with brick and concrete. However, there are also some portacabin type buildings to be demolished. Waste figures from similar projects have been used to estimate the approximate breakdown of waste to be generated from the demolition works. The waste is segregated by type and estimates have also been made for indicative reuse (offsite), recycling and disposal targets. This breakdown is shown in Table 4.1.

Waste Type	Tonnes	Reuse/Recovery		Recycle		Disposal	
		%	Tonnes	%	Tonnes	%	Tonnes
Glass	862	0	0	85	733	15	129
Concrete, brick, tiles and ceramics	7,024	30	2,107	60	4,215	10	702
Plasterboard	494	5	25	75	370	20	99
Metals	1,725	5	86	80	1,380	15	259
Timber	1,848	10	185	40	739	50	924
Others	370	0	0	0	0	100	370
Total	12,323		2,403		7,437		2,483

Table 4.1 Predicted off-site reuse, recycle and disposal rates for demolition waste

It should be noted that until a detailed survey of the buildings to be demolished is carried out, it is difficult to predict with a high level of accuracy the demolition waste that will be generated from the proposed works. A demolition plan will be prepared by the contractor prior to commencement of the demolition phase which will refine the demolition waste figures detailed in Table 4.1.

4.2 Construction Waste Generation

Table 4.2 shows the breakdown of C&D waste types produced on a typical site based on data from the EPA *National Waste Reports*¹².

Waste Types	%
Soil & Stones	83
Concrete, Bricks, Tiles, Ceramics, Plasterboard	11
Asphalt, Tar and Tar Products	1
Metals	1
Other	4
Total	100

Table 4.2 Waste materials generated on a typical Irish construction site

Notwithstanding the information in Table 4.2, there will be soil/stones and made ground excavated to facilitate the construction of the new building foundations, basements, installation of underground services and realignment of access routes. The volume of soil/stones and made ground to be excavated has been estimated by the project engineers (OCSC) as approximately 413,000m³ (equivalent to approximately 826,000 tonnes). OCSC have advised that it is unlikely that any of this material will be suitable for reuse onsite so it will require removal offsite for reuse, recovery and/or disposal, as appropriate. However, suitable topsoil will be stockpiled on-site and reused in landscaping works, where appropriate. It may also be feasible to reuse a small amount of suitable excavated material as backfill around drainage and service excavations.

Table 4.3 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 m², using the waste breakdown rates shown in Table 4.2.

Waste Type	Tonnes	Reuse/Recovery		Recycle		Disposal	
		%	Tonnes	%	Tonnes	%	Tonnes
Concrete, bricks, tiles, ceramics and plasterboard	435	40	174	40	174	20	87
Asphalt, tar and tar Products	159	0	0	25	40	75	119
Metals	40	5	2	90	36	5	2
Other	158	10	16	40	63	50	79
Total	792		192		313		287

Table 4.3 Predicted on and off-site reuse, recycle and disposal rates for construction waste

It should be noted that until final materials and detailed construction methodologies have been confirmed, it is difficult to predict with complete 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.

4.3 Proposed Waste Management Options

4.3.1 Waste Management Options for Excavated Materials

The total estimated volume of material required to be excavated at the St. James's Hospital campus has been classified by OCSC into the five main categories for disposal purposes, in accordance with *EC Council Decision 2003/33/EC*, as per Table 3.1. The five categories are inert (Category A1), inert (suitable for Murphy Environmental Landfill, Category A2), non-hazardous (Category B), stable non-reactive hazardous for disposal in non-hazardous landfill (Category C) or hazardous (Category D).

The Waste Management Hierarchy states that the most preferred option for waste management is prevention and minimisation of waste, followed by re-use and recycling/recovery, energy recovery (i.e. incineration) and, least favoured of all, disposal. The excavations are required to facilitate construction so the preferred option (prevention and minimisation) cannot be accommodated for the bulk excavation phase.

The next option (beneficial re-use) may be possible for some and potentially all of the inert natural material (Category A1). This material could be used as fill material in other construction projects or engineering fill for waste licensed sites. Beneficial re-use 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 (e.g. in respect of sulphate content, pyrites etc.).

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 of the *European Communities (Waste Directive) Regulations 2011*. Article 27 requires that certain conditions are met and that by-product decisions are made to the EPA, via their online notification form.

If the material is deemed to be a waste, removal and reuse/recycling/ recovery/disposal of the material will be carried out in accordance with the *Waste Management Acts 1996 - 2008*, the *Waste Management (Collection Permit) Regulations 2007 and Amendments* and the *Waste Management (Facility Permit & Registration) Regulations 2007 and Amendments*. The volume of waste removed will dictate whether a Certificate of Registration (COR), permit or licence is required by the receiving facility.

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.

Once all available beneficial re-use options have been exhausted, the options of recycling and recovery at waste permitted and licensed sites will be considered. Recycling and recovery options for inert natural material include, but are not limited to:

- the reinstatement of quarries; and
- raising land for site improvement or development.

The option of disposal of inert natural material to landfill will only be considered once all available re-use options have been explored and where void capacity cannot be secured at appropriately permitted/licensed facilities for recycling or recovery purposes. Landfill disposal options for inert natural soil include Murphy Concrete Manufacturing Limited at Sarsfieldtown, Gormanstown, Co. Meath. It should be noted

however that acceptance of the material to any landfill will be subject to the landfills approval. Landfill details are discussed below.

The Category A2 inert material is made ground and gravelly fill with minor waste elements (red brick, concrete, hardcore fill, cinders and other mixed C&D). This material would be unsuitable for disposal at the Murphy Gormanstown landfill but would be suitable for disposal at Murphy Environmental Hollywood Limited (MEHL) which is suitable to accept inert material with Total PAH concentrations of less than 100mg/kg. As previously noted, acceptance of the material to any landfill will be subject to the landfills approval procedures. If any waste timber, plastic, metals and organic material are encountered in this material during excavations, it would need to be screened prior to disposal at MEHL. It is understood that very little, and in most cases none of the Category A2 soil was found to contain these wastes during the site investigation works.

Category B non-hazardous material exceeded the Category A criteria but was less than the non-hazardous waste criteria set out in *EC Council Decision 2003/33/EC*. It is understood that some of this material is natural material and the remaining is made ground. The natural material may be suitable for recovery as capping material at non-hazardous landfills. The made ground material classed as non-hazardous may be suitable for recovery or disposal at a non-hazardous landfill subject to the landfills approval.

A small portion of the excavated material has been classed as Categories C and D i.e. stable non-reactive hazardous for disposal in a non-hazardous landfill and hazardous. This material will require disposal abroad via Transfrontier Shipment of Wastes (TFS). There a number of suitable receiving facilities available in Europe. The following sites would be suitable and would have sufficient capacity to accept the material:

- **ATM, Vlasweg 12, 4782 PW Moerdijk, Netherlands**
ATM is a soil thermal treatment facility which is suitable for waste with high hydrocarbon contamination including PAHs, it is generally not suitable for soil with high levels of metal contamination.
- **Terracon GmbH, Hovestraße 74, 20539 Hamburg, Germany**
Terracon is a soil treatment and transfer facility which allows access to the wide range of waste treatment facilities available in Germany.

Landfill Options Currently Available

AWN undertook research to determine if permitted/licensed capacity is likely to exist at authorised and regulated facilities for acceptance of surplus material generated from the construction of the National Paediatric Hospital Project. The case studies presented identify a number of named facilities in the Greater Dublin Area. These case studies are provided on a demonstrative basis only. It will be the responsibility of the appointed contractor to secure agreements for acceptance of the surplus material in similar authorised and regulated facilities, in accordance with the acceptance criteria the facilities.

Lists of local authority permitted waste facilities were reviewed as possible destinations for surplus material from the developments. However, these were discounted as they did not have sufficient facility capacity remaining to accept the amount of surplus material estimated.

A list of licensed and operating facilities in Counties Dublin, Meath, Kildare, and Wicklow was obtained from *Eastern Midlands Region Waste Management Plan 2015-2021* (Figure 4.1). Five suitable facilities were identified following a review of licensed

available recovery and disposal capacity and the viability of their use as a destination for surplus excavation material from the project.



Figure 4.1 Map showing the active landfill sites in the Eastern Midlands Region – taken from the EMR Waste Management Plan 2015-2021

The following information was obtained from the EPA website and through contacting facility operators directly:

- Waste types accepted;
- Available capacities; and
- Access routes.

Murphy Concrete Manufacturing Limited holds a waste licence (W0151-01) from the EPA for their site at Sarsfieldtown, Gormanstown, Co. Meath. The licence allows for operation of an inert landfill in a sand and gravel quarry which is approximately 33 ha in size. This site is operated in conjunction with the Murphy Environmental Hollywood Ltd (MEHL) site. C&D waste for recovery or disposal is brought to the Hollywood facility initially for testing. Here it is decided if the material is clean enough to be sent to the Gormanstown site for recovery as this site only accepts clean soil and stone and clean concrete.

The facility is licensed to intake a maximum of 750,000 tonnes per annum for recovery either for use at the landfill itself or for use as aggregate material and disposal of inert waste to landfill. Therefore, this facility would provide a viable destination for the estimated volumes of the inert natural (Category A) material which is expected to be generated during the construction of the project.

This facility can be accessed by road from Dublin via the M50, M1 and the R132. The application process for the waste licence involved the submittal of an environmental impact statement to the EPA. Thus, the environmental impacts of delivering surplus material to this site have previously been addressed.

Murphy Environmental Hollywood Limited (MEHL) holds a waste licence (W0129-02) from the EPA for a site at Hollywood, The Naul, Co. Dublin. The licence is for

restoration of a former quarry which is approximately 39.2 ha in size. The maximum amount of construction and demolition waste the facility is licensed to accept per annum is 500,000 tonnes.

This licence allows for disposal of inert waste arising from construction and demolition projects, including soil and stones. The facility is also licensed to accept Category A2 soil and stones in accordance with Schedule A.2 of the waste licence which includes a derogation of a maximum PAH value of 100mg/kg. Therefore, the Category A2 inert soil could be brought to this facility.

The site is located in the North County Dublin townland of Hollywood Great at Nags Head. Access to the site is gained via the R108 off the R132 Balbriggan exit from the M1. The environmental impacts of traffic from operation of the facility have been taken into consideration in the EIS which was submitted to the EPA as part of the application for the waste licence. Therefore, the impacts of delivering surplus material have previously been addressed during the licensing process.

Bord na Móna (BnM) PLC holds a waste licence (W0201-03) from the EPA for a site at Drehid Waste Management Facility at Cadbury, Co. Kildare.

The facility is approximately 179 ha in size. This facility is licensed to accept non-hazardous, solid, residual waste for disposal in accordance with Schedule A.2 of the waste licence. From 2016 onwards, the facility will be licensed to accept a maximum of 120,000 tonnes of waste per annum and an unlimited amount of inert waste accepted to be used in landfill engineering activities. Category B material could be brought to this facility for recovery and/or disposal subject to the landfills approval. All waste being delivered for recovery as inert and inert non-natural material must be screening to remove timber, plastic, metals and organic material if any is encountered during the excavations.

This site can be accessed via a network of regional routes which in turn link with the national motorway network. An EIS accompanied the waste licence application on submission to the EPA. The EIS considered the environmental impacts of traffic from operation of the facility and so impacts of delivering surplus material from the project have been addressed during the licensing process.

Knockharley Landfill Ltd. holds a waste licence (W146-02) for the operation of a non-hazardous landfill site in Navan, Co. Meath.

The licence allows the facility to accept 200,000 tonnes of waste per annum including a maximum of 25,000 tonnes of construction and demolition waste per annum. The facility is currently operational and is likely to remain open during the execution of the project. Thus the facility will provide a viable destination for disposal of non-hazardous surplus excavation material arising from the development.

The Knockharley Landfill site is accessed via a 1.5km dedicated access road off the N2 in Co. Meath. The application for the waste licence was accompanied by an EIS on submission to the EPA. This considered the environmental impacts of traffic from operation of the facility and so the impacts of delivering surplus material have been addressed during the licensing process.

Ballynagran Landfill Ltd. holds a waste licence (W165-02) for the operation and development of a landfill at Ballynagran, Coolbeg and Kilcandra, Co. Wicklow.

The facility is licensed to accept 175,000 tonnes of waste per annum for disposal and a maximum of 28,000 tonnes of C&D waste for recovery, restoration and site development works per annum. The site is currently operational and is expected to remain operational during the timespan of the proposed project. This site provides a

viable destination for disposal of non-hazardous surplus material excavated from the development.

An EIS accompanied the submission of the application for the waste licence to the EPA in 2001. The environmental impacts of traffic from operation of the facility were considered in this EIS. Thus, the impacts of delivering surplus material from the project have, in accordance with the conditions of waste licence W165-02, been addressed during the licensing process.

Conclusion

The facilities presented are viable destinations for excavation waste arising from the construction works for the National Paediatric Hospital Project. In summary, the preferred option for waste material generated from the project is offsite re-use. When re-use options have been exhausted for inert and non-hazardous material, recovery options will be availed of with disposal to landfill only used as a last resort. Based on the facilities outlined herein, there will be sufficient capacity available at authorised waste facilities in Ireland in 2016 for recovery and disposal of the inert and non-hazardous material. Hazardous waste material will require disposal abroad via TFS. There are numerous suitable facilities available in Europe with sufficient capacity to accept this waste.

4.3.2 Wastes Management Options for other C&D Wastes

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. All waste receptacles leaving site will be covered or enclosed. The appointed waste contractor will collect and transfer the wastes as receptacles are filled. There are numerous waste contractors in the Dublin Region that provide this service.

All waste arisings will be handled by an approved waste contractor holding a current waste collection permit. All waste arisings requiring disposal off-site will be disposed of at a facility holding the appropriate COR, licence or permit, as required.

Mixed C&D waste (classified under EWC code 17 09 04) can be accepted at a number of facilities in the region including Murphy Environmental Hollywood Ltd., Knockharley Landfill Ltd. and Ballynagran Landfill Ltd.

Other segregated C&D waste will consist of concrete blocks, bricks, tiles, ceramics, hard plastic, metal and glass. A number of waste transfer stations have been identified close to the development which will accept these waste streams for recycling:

- W0079-01: Starus Eco Holding Ltd. (Greenstar Ltd.) . Tallaght;
- W183-01: Starus Eco Holding Ltd. (Greenstar Ltd.) . Ballycoolin;
- W0044-02: Thornton Recycling Ltd. . Ballyfermot;
- W0152-03: Oxigen Environmental Ltd. . Ballymount; and
- W0227-01: Lawlor Brothers Waste Disposal Ltd. (Access Skip Hire) . Dublin 12.

Plasterboard will be accepted at some of these transfer stations or can be brought to Allied Recycling (Allied) in Naas (WFP-KE-08-0347-01). Allied is one of the three facilities in Ireland that currently recycle plasterboard. The others are McNabb Waste in Downpatrick, NI (LN/09/111/M) and Evirogrind in Co. Donegal (WFP-DL-11-004-01).

Written records will be maintained by the contractor(s) detailing the waste arising throughout the demolition, excavation and construction phases, the classification of

each waste type, the contact details and waste collection permit number of all waste contactors who collect waste from the site and the end destination details for all waste removed and disposed off-site.

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 are detailed as follows:

Bedrock

Excavation of a small volumes of bedrock in some isolated areas in the south of the site will be required to facilitate basement construction. Excavation of rock will be a maximum of c.2m deep into rock and will likely constitute the upper weathered zone only. Further details of the extent of bedrock are presented in Chapter 7 (Soils and Geology) of this EIS. Excavated bedrock will be reused or disposed of off-site. If it is to be reused on another site as by-product (and not as a waste), this will need to be done in accordance with Article 27 of the EC (Waste Directive) Regulations, 2011.

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.

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.

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.

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.

Plasterboard

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

Glass

Glass materials will be segregated for recycling, where possible.

Waste Electrical and Electronic Equipment (WEEE)

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

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 offsite.

Non-Recyclable Waste

Construction 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 (see Section 6.0) 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.

Hazardous Wastes

On-site storage of any hazardous wastes produced (i.e. contaminated soil 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.

Any asbestos or ACMs discovered on site will be removed by a suitably qualified contractor and collected from site by a waste contractor that is appropriately permitted to transport asbestos or ACMs and brought to a suitably licenced facility. There are currently two facilities in the country licensed to accept asbestos waste, which are Veolia, Fermoy, Co. Cork (W0050-2) and Rilta, Rathcoole, Co. Dublin (W0192-03).

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

4.4 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 project contractor.

All movement of waste and the use of waste contractors will be undertaken in accordance with the *Waste Management Acts 1996 - 2008, Waste Management (Collection Permit) Regulations 2007 and Amendments* and *Waste Management (Facility Permit & Registration) Regulations 2007 and Amendments*. This includes the requirement for all waste contractors to have a waste collection permit issued by the NWCPO. The nominated project Waste Manager (see Section 6.0) 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 COR, waste permit or EPA Waste Licence for that site will be provided to the nominated project Waste Manager. If the waste is being shipped abroad, a copy of the Transfrontier Shipping (TFS) document will be obtained from Dublin City Council (as the relevant authority on behalf of all local authorities in Ireland) and kept on-site along with details of the final destination (permits, licences etc.). A receipt from the final destination of the material will be kept as part of the on-site waste management records.

If any surplus soils/stones is being removed from the site for reuse on another construction site as a by-product, this will need to be done in accordance with *Article 27 of the EC (Waste Directive) Regulations, 2011 (S.I. No. 126 of 2011)*. Similarly, if any soils/stones are imported onto the site from another construction site as a by-product, this will be also be done in accordance with Article 27.

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

5.0 ESTIMATED COST OF WASTE MANAGEMENT

An outline of the costs associated with different aspects of waste management is provided below.

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.

5.1 Reuse

By reusing materials on site, there will be a reduction in the transport and disposal costs associated with the requirement for a waste contractor to take the material away to landfill.

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

5.2 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.

A small quality of archaeological and architectural heritage material will also be salvaged for re-use off-site and, as such, this material may also have some additional value.

5.3 Disposal

Landfill charges in the Leinster region are currently at around " 160/tonne (which includes a " 75 per tonne landfill levy introduced under the *Waste Management (Landfill Levy) (Amendment) Regulations 2012*. 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.

6.0 TRAINING PROVISIONS

A member of the construction team will be appointed as the waste manager to ensure commitment, operational efficiency and accountability during the construction and demolition phases of the project.

6.1 Waste Manager Training and Responsibilities

The nominated waste manager will be given responsibility and authority to select a waste team if required, i.e. members of the site crew that will aid him/her in the organisation, operation and recording of the waste management system implemented on site. The waste manager 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 waste manager 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 waste manager 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 waste manager 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 C&D WMP.

6.2 Site Crew Training

Training of site crew is the responsibility of the waste manager and, as such, a waste training program should be organised. A basic awareness course will be held for all site crew to outline the C&D WMP 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.

7.0 RECORD KEEPING

Records will 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 construction waste arisings on site. A copy of the Waste Collection Permits, Certificates of Registration, Waste Facility Permits and Waste Licences will be maintained on site at all times.

The waste manager or delegate will record the following;

1. Waste taken for reuse off-site;
2. Waste taken for recycling;
3. Waste taken for disposal; and
4. Reclaimed waste materials brought on-site for reuse.

For each movement of waste on or off-site, a signed docket will be obtained by the Waste Manager from the contractor, detailing the weight and type of the material and the source and destination of the material. This will be carried out for each material type. This system will also be linked with the delivery records. In this way, the percentage of construction waste generated for each material can be determined.

The system will allow the comparison of these figures with the targets established for the recovery, reuse and recycling of construction waste presented earlier and to highlight the successes or failures against these targets.

8.0 OUTLINE WASTE AUDIT PROCEDURE

8.1 Responsibility for Waste Audit

The appointed Waste Manager will be responsible for conducting a waste audit at the site during the construction phase of the development.

8.2 Review of Records and Identification of Corrective Actions

A review of all the records for the waste generated and transported on or 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.

9.0 CONSULTATION WITH RELEVANT BODIES

9.1 Local Authority

Once a construction contractor has been appointed and prior to removal of any waste materials offsite, details of the proposed destination of each waste stream will be provided to DCC for their approval.

DCC will also be consulted, as required, throughout the demolition, 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.

9.2 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. 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.

10.0 REFERENCES

1. Waste Management Act 1996 (S.I. No. 10 of 1996) as amended by the Waste Management (Amendment) Act 2001.
 - European Communities (Waste Directive) Regulations 2011 (SI 126 of 2011) as amended 2011 (S.I. No. 323 of 2011);
 - Waste Management (Collection Permit) Regulations S.I No. 820 of 2007 as amended 2008 (S.I No 87 of 2008);
 - Waste Management (Facility Permit and Registration) Regulations, S.I No. 821 of 2007 as amended 2008 (S.I No. 86 of 2008);
 - Waste Management (Licensing) Regulations 2000 (S.I No. 185 of 2000) as amended 2004 (S.I. No. 395 of 2004), 2010 and (S.I. No. 350 of 2010);
 - Waste Management (Packaging) Regulations 2003 (S.I. No. 61 of 2003) as amended 2004 (S.I. No. 871 of 2004), 2006 (S.I. No. 308 of 2006) and 2007 (S.I. No. 798 of 2007);
 - Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997);
 - Waste Management (Landfill Levy) (Amendment) Regulations 2013 (S.I. No. 194 of 2013), as amended 2015 (S.I. No. 189 of 2015);
 - European Communities (Waste Electrical and Electronic Equipment) Regulations 2011;
 - Waste Management (Registration of Brokers and Dealers) Regulations 2008 (SI 113 of 2008).
 - Waste Management (Food Waste) Regulations 2009 (S.I. No. 508 of 2009), as amended 2015 (S.I. No. 190 of 2015) and European Union (Household Food Waste and Bio-waste) Regulations 2015 (S.I. No. 191 of 2015).
2. Litter Pollution Act 1997 (S.I. No. 12 of 1997).
3. Eastern-Midlands Waste Region, *Eastern-Midlands Region (EMR) Waste Management Plan 2015 – 2021* (2015).
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5. Forum for the Construction Industry, *Recycling of Construction and Demolition Waste*.
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10. Dublin City Council, *Dublin City Development Plan 2011 – 2017* (2011).
11. 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.
12. Environmental Protection Agency (EPA), *National Waste Database Reports 1998 – 2012*.