ARMSTRONG
FENTON
ASSOCIATES

PROJECT: Strategic Housing Development

Environmental Impact Assessment Report - Volume III - APPENDICES

for proposed development at

Boherboy, Saggart, Co. Dublin.

CLIENTS: Durkan Estates Ireland Ltd and Kelland Homes Ltd

DATE: March 2022

Planning &
Development
Consultants

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Appendix 4.1

Protected Sites for Nature Conservation in the Vicinity of the Proposed Development

European sites in the vicinity of the proposed development are listed below in **Table 1**, along with their qualifying/special conservation interests, reference to the most recent conservation objectives document, and their location relative to the proposed development site.

Other nationally protected sites for nature conservation in the vicinity of the proposed development are listed below in **Table 2**, along with the nature conservation interests for which they are designated, and their location relative to the proposed development site

Table 1 - European sites in the vicinity of the proposed development

European Site Name [Code] and its Qualifying interest(s) / Special Conservation Interest(s) (*Priority Annex I Habitats)	Location Relative to the Proposed Development Site	Location Relative to Ringsend WWTP outfall location
Special Area of Conservation (SAC)		
Glenasmole Valley SAC [001209] 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) 6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) 7220 Petrifying springs with tufa formation (Cratoneurion)* NPWS (2021) Conservation objectives for Glenasmole Valley SAC [001209]. Generic Version 8.0. Department of Culture, Heritage and the Gaeltacht.	Located 4.1km south east of the proposed development.	c. 15km south west of the outfall
Wicklow Mountains SAC [002122] 3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) 3160 Natural dystrophic lakes and ponds 4010 Northern Atlantic wet heaths with *Erica tetralix* 4030 European dry heaths 4060 Alpine and Boreal heaths 6130 *Calaminarian* grasslands of the *Violetalia calaminariae* 6230 Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) 7130 Blanket bogs (* if active bog) 8110 Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) 8210 Calcareous rocky slopes with chasmophytic vegetation 8220 Siliceous rocky slopes with chasmophytic vegetation 91A0 Old sessile oak woods with *Ilex* and Blechnum in the British Isles 1355 *Lutra lutra* (Otter) NPWS (2017) *Conservation Objectives: Wicklow Mountains SAC 002122.* Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.	Located 5.3km south east of the proposed development.	c. 13km south west of the outfall

European Site Name [Code] and its Qualifying interest(s) / Special Conservation Interest(s) (*Priority Annex I Habitats)	Location Relative to the Proposed Development Site	Location Relative to Ringsend WWTP outfall location
Rye Water Valley/Carton SAC [001398] [7220] Petrifying springs with tufa formation (Cratoneurion) [1014] Narrow-mouthed Whorl Snail *Vertigo angustior* [1016] Desmoulin's Whorl Snail *Vertigo moulinsiana* NPWS (2021) *Conservation objectives for Rye Water Valley/Carton SAC [001398].* Generic Version 8.0. Department of Culture, Heritage and the Gaeltacht.	Located 10km north west of the proposed development	c. 20km west of the outfall
Red Bog, Kildare SAC [000397] [7140] Transition mires and quaking bogs *NPWS (2019) Conservation Objectives: Red Bog, Kildare SAC 000397. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.*	Located 10.9km south west of the proposed development	c. 27.8km south west of the outfall
South Dublin Bay SAC [000210] 1140 Mudflats and sandflats not covered by seawater at low tide 1210 Annual vegetation of drift lines 1310 *Salicornia* and other annuals colonising mud and sand 2110 Embryonic shifting dunes NPWS (2013) *Conservation Objectives: South Dublin Bay SAC 000210.* Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.	Located 15.5km north east of the proposed development	c. 537m south of the outfall
North Dublin Bay SAC [000206] 1140 Mudflats and sandflats not covered by seawater at low tide 1210 Annual vegetation of drift lines 1310 *Salicornia* and other annuals colonising mud and sand 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) 1395 Petalwort *Petalophyllum ralfsii* 1410 Mediterranean salt meadows (*Juncetalia maritimi*) 2110 Embryonic shifting dunes 2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) 2130 Fixed coastal dunes with herbaceous vegetation (grey dunes) 2190 Humid dune slacks NPWS (2013) *Conservation Objectives: North Dublin Bay SAC 000206.* Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.	Located c. 18.6km north east of the proposed development.	c. 2.3km north east of the outfall
Special Protection Area (SPA)		

European Site Name [Code] and its Qualifying interest(s) / Special Conservation Interest(s) (*Priority Annex I Habitats)	Location Relative to the Proposed Development Site	Location Relative to Ringsend WWTP outfall location
Wicklow Mountains SPA [004040] A098 Merlin *Falco columbarius* A103 Peregrine *Falco peregrinus* NPWS (2021) *Conservation objectives for Wicklow Mountains SPA [004040].* Generic Version 8.0. Department of Culture, Heritage and the Gaeltacht.	Located 8.7km south east of the proposed development.	c. 14km south west of the outfall.
Poulaphouca Reservoir SPA [004063] [A043] Greylag Goose (*Anser anser*) [A183] Lesser Black-backed Gull (*Larus fuscus*) NPWS (2021) *Conservation objectives for Poulaphouca Reservoir SPA [004063].* Generic Version 8.0. Department of Culture, Heritage and the Gaeltacht.	Located c. 11km south west of the proposed development	c. 27km south west of the outfall
South Dublin Bay and River Tolka Estuary SPA [004024] A046 Light-bellied Brent Goose *Branta bernicla hrota* A130 Oystercatcher *Haematopus ostralegus* A137 Ringed Plover *Charadrius hiaticula* A141 Grey Plover *Pluvialis squatarola* A143 Knot *Calidris canutus* A144 Sanderling *Calidris alba* A149 Dunlin *Calidris alpina* A157 Bar-tailed Godwit *Limosa lapponica* A162 Redshank *Tringa totanus* A179 Black-headed Gull *Croicocephalus ridibundus* A192 Roseate Tern *Sterna dougallii* A193 Common Tern *Sterna hirundo* A194 Arctic Tern *Sterna paradisaea* A999 Wetland and Waterbirds NPWS (2015) *Conservation Objectives: South Dublin Bay and River Tolka Estuary SPA 004024*. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.	Located 15.6km north east of the proposed development	*c.* 450m north of the outfall
North Bull Island SPA [004006] A046 Light-bellied Brent Goose *Branta bernicla hrota* A048 Shelduck *Tadorna tadorna* A052 Teal *Anas crecca* A054 Pintail *Anas acuta* A056 Shoveler *Anas clypeata* A130 Oystercatcher *Haematopus ostralegus* A140 Golden Plover *Pluvialis apricaria* A141 Grey Plover *Pluvialis squatarola* A143 Knot *Calidris canutus* A144 Sanderling *Calidris alba* A149 Dunlin *Calidris alpina* A156 Black-tailed Godwit *Limosa limosa*	Located 18.6km north west of the proposed development.	c. 469m north of the outfall

European Site Name [Code] and its Qualifying interest(s) / Special Conservation Interest(s) (*Priority Annex I Habitats)	Location Relative to the Proposed Development Site	Location Relative to Ringsend WWTP outfall location
A157 Bar-tailed Godwit *Limosa lapponica* A160 Curlew *Numenius arquata* A162 Redshank *Tringa totanus* A169 Turnstone *Arenaria interpres* A179 Black-headed Gull *Croicocephalus ridibundus* A999 Wetlands & Waterbirds NPWS (2015) *Conservation Objectives: North Bull Island SPA 004006.* Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht		

Table 2 - Nationally protected sites in the vicinity of the proposed development

Designated Site Name [Code] and its nature conservation features	Location Relative to the Proposed Development Site
proposed Natural Heritage Area (pNHA)	
Lugmore Glen pNHA [001212] The site is important as it is a fine example of wooded glen with a good representation of woodland flora. This type of habitat is scarce in Co. Dublin. The site also holds a Red Data Book species *Lamiastrum galeobdolon*.	c. 1.4km south east of the proposed development
Slade of Saggart and Crooksling Glen pNHA [000211] The site includes a good example of a wooded river valley and a small wetland system. The presence of a rare plant, a rare invertebrate and a variety of wildfowl species adds to the interest of the site.	c. 1.5km south west of the proposed development
Dodder Valley pNHA [000991] The site represents the last remaining stretch of natural riverbank vegetation on the River Dodder in the built-up Greater Dublin Area. Includes a diversity of flora and bird species as well.	c. 4.7km east of the proposed development
Glenasmole Valley pNHA [001209] Listed under similar conservation objectives as its SAC designation.	c. 4.1km south east of the proposed development
Grand canal pNHA [002104] The Grand Canal is a man-made waterway linking the River Liffey at Dublin with the Shannon at Shannon Harbour and the Barrow at Athy. The ecological value of the canal lies more in the diversity of species it supports along its linear habitats than in the presence of rare species. It crosses through agricultural land and therefore provides a refuge for species threatened by modern farming methods.	c. 5.5km north of the proposed development
Kilteel Wood pNHA [001394] The site is a fine example of a largely deciduous wood. Its elevated position gives it scenic value.	c. 7.6km south west of the proposed development

Designated Site Name [Code] and its nature conservation features	Location Relative to the Proposed Development Site
Liffey Valley pNHA [000128] The site is important for its diversity of habitats within, ranging from terrestrial to aquatic. A number of rare and threatened plant species, such as *Scrophularia umbrosa*, *Hypericum hirsutum* and *Lamiastrum caleobdolon* have been recorded from the site.	c. 8.5km north of the proposed development
Rye Water Valley/Carton pNHA [0001398] Listed under similar conservation objectives as its SAC designation.	c. 10km north west of the proposed development
Royal Canal pNHA [002103] The Royal Canal is a man-made waterway linking the River Liffey at Dublin to the River Shannon near Tarmonbarry. The ecological value of the canal lies more in the diversity of species it supports along its linear habitats than in the presence of rare species. It crosses through agricultural land and therefore provides a refuge for species threatened by modern farming methods.	c. 10.4km north of the proposed development
Poulaphouca Reservoir pNHA [000731] Listed under similar conservation objectives as its SPA designation.	c. 10.9km south west of the proposed development
Red Bog, Kildare pNHA [000397] Listed under similar conservation objectives as its SAC designation.	c. 10.6km south west of the proposed development
Fitzsimon's Wood pNHA [001753] The site is listed for its birch woodland which is very rare in Co. Dublin and of ecological importance.	c. 12.7km east of the proposed development
Glencree Valley pNHA [001755] The site is designated for its good example of deciduous woodland and for its habitat diversity which includes the presence of upland river and boggy flushes.	c. 13.8km south east of the proposed development
South Dublin Bay pNHA [000210] Listed under similar conservation objectives as its SAC and SPA designations.	c. 15.5 km north east of the proposed development
Booterstown Marsh pNHA [001205] The site is designated for its tidal habitats, rare flora and wintering bird populations.	c. 15.6km north east of the proposed development
North Dublin Bay pNHA [000206] Listed under similar conservation objectives as its SAC and SPA designation.	c. 15.8km north east of the proposed development

Appendix 4.2

Desk Study Fauna Records

Desktop records of protected, rare, or other notable fauna species are listed below in **Table 1**. In relation to amphibian, reptile and mammal species those which are protected under the Wildlife Acts, the Habitats Directive and/or are listed as threatened (Vulnerable to Critically Endangered) on the relevant national Red Lists are included. In the case of bird species, only those species listed in Annex I of the Birds Directive or on the Birds of Conservation Concern in Ireland (BoCCI) Red List are included in the table below. For invertebrate species, those which are listed as threatened (Vulnerable to Critically Endangered) on the relevant national Red List are included.

Table 1 - Records of protected, red-listed or notable fauna from the desktop study in the vicinity of the study area

Common Name/ Scientific Name	Legal Status[1]	Red List Status[2]	Source
Amphibians			
Common frog *Rana temporaria*	HD_V, WA	Least concern	NBDC online database record
Smooth newt *Triturus vulgaris*	WA	Least concern	NBDC online database recor
Mammals (Terrestrial)			
Badger	WA	Least concern	NBDC online database record
Otter *Lutra lutra*	HD_II & IV, WA	Least concern	NBDC online database record
Brown long-eared bat *Plecotus auritus*	HD_IV, WA	Least concern	BCI database record NBDC online database record
Daubenton's bat *Myotis daubentonii*	HD_IV, WA	Least concern	BCI database record NBDC online database record

[1] HD_II/IV/V = Habitats Directive Annexes II/IV/V; WA = Wildlife Acts; BD_I/II/III = Birds Directive Annex I/II/III; OSPAR = Convention for the protection of the marine environment of the North-east Atlantic 1992

[2] Mammal Red-list from Marnell, F., Kingston, N. & Looney, D. (2009) *Ireland Red List No. 3: Terrestrial Mammals* and Marnell, F., Looney, D. & Lawton, C. (2019) *Ireland Red List No. 12: Terrestrial Mammals*.

Birds from Gilbert, G., Stanbury A., & Lewis L. (2021) Birds of Conservation Concern in Ireland 2020-2026. *Irish Birds 43*: 1-22.

Amphibians, reptiles and fish from King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., Fitzpatrick, Ú., Gargan, P.G., Kelly, F.L., O'Grady, M.F., Poole, R., Roche, W.K. & Cassidy, D. (2011) Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish.

Non-Marine Molluscs from Byrne, A., Moorkens, E.A., Anderson, R., Killeen, I.J. & Regan, E.C. (2009) *Ireland Red List No. 2 – Non-Marine Molluscs*.

Butterflies from Regan, E.C., Nelson, B., Aldwell, B., Bertrand, C., Bond, K., Harding, J., Nash, D., Nixon, D., & Wilson, C.J. (2010) Ireland Red List No. 4 – Butterflies.

Moths from Allen, D., O'Donnell, M., Nelson, B., Tyner, A., Bond, K.G.M., Bryant, T., Crory, A., Mellon, C., O'Boyle, J., O'Donnell, E., Rolston, T., Sheppard, R., Strickland, P., Fitzpatrick, U., & Regan, E. (2016) *Ireland Red List No. 9: Macro-moths (Lepidoptera).*

Damselflies and dragonflies from Nelson, B., Ronayne, C. & Thompson, R. (2011) *Ireland Red List No.6: Damselflies & Dragonflies (Odonata).*

Water beetles from Foster, G. N., Nelson, B. H. & O Connor, Á. (2009) *Ireland Red List No. 1 – Water beetles.*

Common Name/ Scientific Name	Legal Status[1]	Red List Status[2]	Source
Leisler's bat *Nyctalus leisleri*	HD_IV, WA	Least concern	BCI database record NBDC online database record
Soprano pipistrelle *Pipistrellus pygmaeus*	HD_IV, WA	Least concern	BCI database record NBDC online database record
Common pipistrelle *Pipistrellus pipistrellus*	HD_IV, WA	Least concern	BCI database record NBDC online database record
Hedgehog *Erinaceus europaeus*	WA	Least concern	NBDC online database record
Irish hare *Lepus timidus subsp. hibernicus*	HD_V, WA	Least concern	NBDC online database record
Pine marten *Martes martes*	HD_V, WA	Least concern	NBDC online database record
Red deer *Cervus elaphus*	WA	Least concern	NBDC online database record
Red squirrel *Sciurus vulgaris*	WA	Least concern	NBDC online database record
Pygmy shrew *Sorex minutus*	WA	Least concern	NBDC online database record
Irish Stoat *Mustela erminea subsp. hibernica*	WA	Least concern	NBDC online database record
Birds			
Barn owl *Tyto alba*	WA	Red	NBDC online database record
Black-headed gull *Larus ridibundus*	WA	Amber	NBDC online database record
Corncrake *Crex crex*	BD_I, WA	Red	NBDC online database record
Curlew *Numenius arquata*	BD_II (II), WA	Red	NBDC online database record
Golden plover *Pluvialis apricaria*	BD_I, II (II), III (III), WA	Red	NBDC online database record
Goldeneye *Bucephala clangula*	BD_II (II), WA	Red	NBDC online database record
Grey wagtail *Motacilla cinerea*	WA	Red	NBDC online database record
Herring gull *Larus argentatus*	WA	Amber	NBDC online database record
Lapwing *Vanellus vanellus*	BD_II (II), WA	Red	NBDC online database record
Meadow pipit *Anthus pratensis*	WA	Red	NBDC online database record

Common Name/ Scientific Name	Legal Status[1]	Red List Status[2]	Source
Pintail *Anas acuta*	BD_II (I), III (II), WA	Amber	NBDC online database record
Pochard *Aythya ferina*	BD_II (I), III (II), WA	Red	NBDC online database record
Redshank *Tringa totanus*	WA	Red	NBDC online database record
Tufted duck *Aythya fuligula*	BD_II (I), III (II), WA	Amber	NBDC online database record
Wigeon *Anas penelope*	BD_II (I), III (II), WA	Amber	NBDC online database record
Woodcock *Scolopax rusticola*	BD_II (I), III (III), WA	Red	NBDC online database record
Yellowhammer *Emberiza citrinella*	WA	Red	NBDC online database record
Barn swallow *Hirundo rustica*	WA	Amber	NBDC online database record
Greylag goose *Anser anser*	BD_II (I), BD_III (II), WA	Amber	NBDC online database record
Coot *Fulica atra*	BD_II (I), BD_III (II), WA	Amber	NBDC online database record
Hen harrier *Circus cyaneus*	BD_I, WA	Amber	NBDC online database record
Kestrel *Falco tinnunculus*	BD_I, WA	Amber	NBDC online database record
Kingfisher *Alcedo atthis*	BD_I, WA	Amber	NBDC online database record
Linnet *Carduelis cannabina*	WA	Amber	NBDC online database record
Little egret *Egretta garzetta*	BD_I, WA	Green	NBDC online database record
Merlin *Falco columbarius*	BD_I, WA	Amber	NBDC online database record
Sandpiper *Actitis hypolecuos*	WA	Amber	NBDC online database record
Snipe *Gallinago gallinago*	BD_II(I), BD_III (III), WA	Amber	NBDC online database record
Starling *Sturnus vulgaris*	WA	Amber	NBDC online database record
Teal *Anas crecca*	BD_II (I), BD_III (II), WA	Amber	NBDC online database record

Common Name/ Scientific Name	Legal Status[1]	Red List Status[2]	Source
Peregrine *Falco peregrinus*	BD_I, WA	Green	NBDC online database record
Whooper swan *Cygnus cygnus*	BD_I, WA	Amber	NBDC online database record
Invertebrates			
White-clawed crayfish *Austropotamobius pallipes*	HD_II & V, WA	Endangered	NBDC online database record
Wall butterfly *Lasiommata megera*	none	Endangered	NBDC online database record
Andrena (Melandrena) nigroaenea	none	Vulnerable	NBDC online database record
Andrena semilaevis	none	Vulnerable	NBDC online database record
Great yellow bumble bee *Bombus distinguendus*	none	Endangered	NBDC online database record
Large red tailed bumble bee *Bombus lapidarius*	None	Near threatened	NBDC online database record
Moss Carder-bee *Bombus muscorum*	None	Near threatened	NBDC online database record
Red-tailed carder bee *Bombus ruderarius*	None	Vulnerable	NBDC online database record

Appendix 4.3

Examples of Valuing Important Ecological Features

International Importance:

'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation.

Proposed Special Protection Area (pSPA).

Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended).

Features essential to maintaining the coherence of the Natura 2000 Network.[1]

Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive.

Resident or regularly occurring populations (assessed to be important at the national level)[2] of the following:

- Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or
- Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.

Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971).

World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972).

Biosphere Reserve (UNESCO Man & The Biosphere Programme).

Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979).

Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).

Biogenetic Reserve under the Council of Europe.

European Diploma Site under the Council of Europe.

Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 1988).[3]

National Importance:

Site designated or proposed as a Natural Heritage Area (NHA).

Statutory Nature Reserve.

Refuge for Fauna and Flora protected under the Wildlife Acts.

National Park.

Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.

[1] See Articles 3 and 10 of the Habitats Directive

[2] It is suggested that, in general, 1% of the national population of such species qualifies as an internationally important population. However, a smaller population may qualify as internationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

[3] Note that such waters are designated based on these waters' capabilities of supporting salmon (Salmo salar), trout (Salmo trutta), char (Salvelinus) and whitefish (Coregonus)

Resident or regularly occurring populations (assessed to be important at the national level)[4] of the following:

- Species protected under the Wildlife Acts; and/or
- Species listed on the relevant Red Data list.

Site containing 'viable areas'[5] of the habitat types listed in Annex I of the Habitats Directive

County Importance:

Area of Special Amenity.[6]

Area subject to a Tree Preservation Order.

Area of High Amenity, or equivalent, designated under the County Development Plan.

Resident or regularly occurring populations (assessed to be important at the County level)[7] of the following:

- Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
- Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
- Species protected under the Wildlife Acts; and/or
- Species listed on the relevant Red Data list.

Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance.

County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local Biodiversity Action Plan, if this has been prepared.

Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county.

Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.

Local Importance (higher value):

Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared;

Resident or regularly occurring populations (assessed to be important at the Local level)[8] of the following:

- Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
- Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
- Species protected under the Wildlife Acts; and/or

[4] It is suggested that, in general, 1% of the national population of such species qualifies as a nationally important population. However, a smaller population may qualify as nationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

[5] A 'viable area' is defined as an area of a habitat that, given the particular characteristics of that habitat, was of a sufficient size and shape, such that its integrity (in terms of species composition, and ecological processes and function) would be maintained in the face of stochastic change (for example, as a result of climatic variation).

[6] It should be noted that whilst areas such as Areas of Special Amenity, areas subject to a Tree Preservation Order and Areas of High Amenity are often designated on the basis of their ecological value, they may also be designated for other reasons, such as their amenity or recreational value. Therefore, it should not be automatically assumed that such sites are of County importance from an ecological perspective.

[7] It is suggested that, in general, 1% of the County population of such species qualifies as a County important population. However, a smaller population may qualify as County important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

[8] It is suggested that, in general, 1% of the local population of such species qualifies as a locally important population. However, a smaller population may qualify as locally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

- Species listed on the relevant Red Data list.

Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;

Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.

Local Importance (lower value):

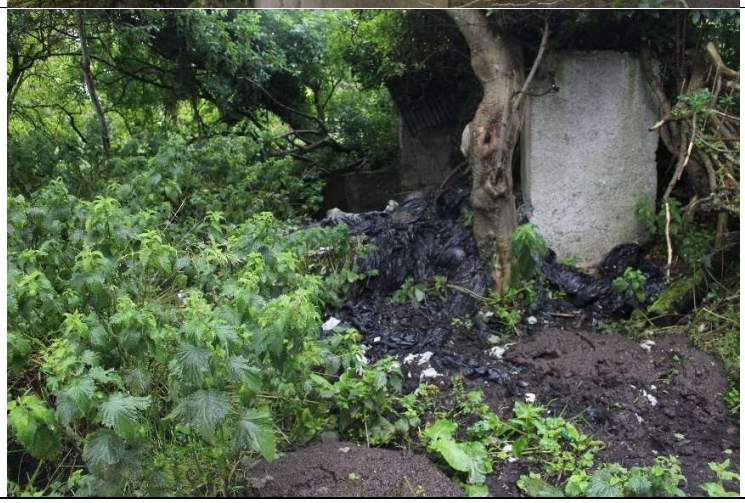
Sites containing small areas of semi-natural habitat that are of some local importance for wildlife;

Sites or features containing non-native species that are of some importance in maintaining habitat links.

Appendix 4.4

Buildings with potential roost features within the proposed development site

Building	PRFs (Potential Roost Features)	Suitability	Plate
1 (Barn shed in south of site)	Between corrugated sheeting and wall, very small gaps where wall had come away.	Low – Most of this building is missing a roof and has collapsed in on itself. Features present would not fit more than 1-2 bats within, and very unlikely to be used as main roosts due to fluctuations in temperature from the delapidated and open nature of the building	 

2 (Small building in south of eastern field)	None	Negligable due to absence of any roosting features	 
3 (Shed in south east of eastern field)	None	Negligible due to lack of roosting features	

4 (Shed in south of eastern field)	Gaps where walls meet corrugated roofing, dense ivy on western gable end, gaps between wooden beams and roofing within shed.	Low – very open and susceptible to temperature fluctuations, small roost features capable of housing low numbers of bats.	

Trees with potential roost features within the proposed development site

Tree no.[11]	Tree type & condition	Tree status	Suitability	PRF feature	Plate
32	Ash (*Fraxinus excelsior*) Mature tree	Removed	Low	Dense ivy stems covering main stem and peripheral branches	 
4	Ash (*Fraxinus excelsior*) In poor condition and declining, splitting on primary stem indicates internal decay.	Removed	Low	Dense ivy, large knot hole extending into branch	

[11] Tree number, type and condition corresponds with the project arborist report (Arborist Assocaites, 2021)

Tree no.[11]	Tree type & condition	Tree status	Suitability	PRF feature	Plate
12	Ash (*Fraxinus excelsior*) Large mature specimen along central hedgerow	Removed	Low	Dense ivy across main stem and branches	
44	Ash (*Fraxinus excelsior*) Large mature specimen along central hedgerow	Removed	Low	Dense ivy across main stem and branches	
20	Beech (*Fagus sylvatica*) Mature, well-established tree	Removed	Low	A number of knot holes on main stem and canker features also evident	

Tree no.[11]	Tree type & condition	Tree status	Suitability	PRF feature	Plate
15	Ash (*Fraxinus excelsior*) Mature tree, mostly obscured by ivy	Removed	Low	Dense ivy across whole of tree	

APPENDIX 5 – LAND, SOIL & GEOLOGY

Appendix 5.1 – Ground Investigations Ireland – Site Investigation report

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GROUND INVESTIGATIONS IRELAND LTD

BOHERBOY SAGGART

GROUND INVESTIGATION REPORT

DOCUMENT CONTROL SHEET

Engineer	Roger Mularkey
Project Title	Boherboy Saggart
Project No	4019-11-13
Document Title	Ground Investigation Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A	Final	C Finnerty	F McNamara	F McNamara	Dublin	3rd February 2014

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1.0 Preamble

On the instructions of Roger Mularkey Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd., between the 9th and the 12th of December 2013 on a site in Boherboy, Saggart, Co. Dublin.

2.0 Overview

2.1 Background

The site consists of two greenfield sites which have been combined for the purpose of the proposed development. The site is located on the outskirts of Saggart as shown in the location plan in Appendix 1. It is proposed to develop a portion of the site closest to the road and to construct two and three story residential dwellings. The site slopes from the southern boundary along the road towards the north with the highest point at the south west corner. Earthworks and a retaining wall are proposed along the highest portion of the site to make it more accessible and suitable for construction. There are a series of two large diameter water mains passing through the centre of the site from east to west and a second series of three large diameter water mains along the same axis in the northern portion of the site.

2.2 Purpose and Scope

The purpose of the site investigation was to investigate subsurface soil conditions by means of trial pitting, dynamic probing and slit trenching. The scope of the work undertaken for this project included the following:

- Visit project site to observe existing conditions
- Carry out 8 No. Trial Pit to a maximum depth of 3.5m BGL
- Carry out 6 No. Slit Trenches to a maximum depth of 2.5m BGL
- Carry out 9 No. Dynamic Probes to a maximum depth of 3.3m BGL
- Carry out 4 No. Soakaway tests to BRE Digest 365
- Geotechnical and Environmental Laboratory testing

3.0 Desk Study

3.1 Sources of Information

A desk study has been carried out for the site and the surrounding area to determine the nature of the underlying bedrock geology and overburden materials, relevant geomorphological features, previous land use for the site and to identify any other geotechnical considerations for the area. This study comprised a search of relevant geotechnical, geological and hydrogeological information. The Geological Survey of Ireland (GSI) was consulted for this purpose and the following sources of information were reviewed:

GSI Publications:

- Geology of Kildare Wicklow, GSI, 1994, B. McConnell, M.E. Philcox,

- Bedrock Geology 1:100,000 Scale Map Series, Sheet 16: Kildare - Wicklow.

GSI Online Mapping:

- GSI Drift Geology Maps
- GSI Hydrogeological Mapping
- GSI Groundwater Well Database
- GSI Karst Database
- GSI Quarries Database

In addition, the Ordnance Survey of Ireland (OSI) was also consulted and the following sources of information reviewed.

OSI Online Mapping:

- Historical Mapping – 6 Inch Sheets
- Historical Mapping – 25 Inch Sheets
- Ortho Mapping
- Historical Land Use Mapping Database

3.2 Land Use

The OSI mapping indicates that the site has historically been used as agricultural land. A number of agricultural and/or accommodation buildings are shown on the 6" and 25" Historic Mapping close to the road, with little change from the current site layout. A drain or watercourse is shown on the 25" Mapping feeding into the current watercourse from the west between the two field boundaries. Based on the current

Orthophotographs this section of the drain or watercourse has been in-filled. Caution should be exercised with foundations in area of this in-filled stream. The 1995, 200 and 2005 Orthophotographs show little or no discernable change to the land use in the recent past.

3.3 Superficial Geology

The GSI publications and mapping indicate that the estate and surrounding area is underlain primarily by glacial till derived from Sandstone and Shale. The soils mapping indicates that glacial till derived from Limestone are present to the north of the site and rock outcrops or is very near to the surface to the north and north west of the site, coinciding with areas of extreme groundwater vulnerability and the locations of historic quarries on the historic mapping.

3.4 Regional Bedrock Geology

The site is mapped as being underlain by coarse greywacke & shale of the Pollaphuca Formation. The Calp or Lucan formation is present to the north of the site.

3.5 Hydrogeology

GSI mapping indicates that the bedrock underlying the site (Pollaphuca Formation) is classified as a Poor Aquifer (P) - bedrock which is generally unproductive except only in local zones.

The aquifer vulnerability for the area ranges from Low to Extreme. At the site location, the area is classified as having a Low Vulnerability. An area of Moderate and High Vulnerability is present surrounding the area of the site area. Generally, the High/Extreme Vulnerability areas are close to areas where bedrock is shallow or where sand and gravel deposits are expected and/or there is a thin cover of cohesive material above the bedrock. The Moderate/Low Vulnerability areas are likely to coincide with areas where sufficient thicknesses of cohesive glacial deposits are present above the bedrock or where deeper bedrock is expected.

The GSI Karst database mapping confirms that no karst features are present on or around the site location.

There are no recorded mineral or aggregate extractive licences sites in the immediate vicinity of the site as shown in the GSI Quarries Database, however there are a number of metallic and non-metallic mineral locations in Belgard to the east and in Lugmore to the south east of the site.

4.0 Subsurface Exploration

4.1 General

During the ground investigation in December 2013 a programme of trial pitting, dynamic probing and slit trenching was undertaken to determine the sub surface conditions at the proposed site. Soakway testing was carried out in accordance with BRE Digest 365 to determine the infiltration characteristics of the site. Regular sampling and in-situ testing was undertaken in the trial pits to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation.

4.2 Trial Pits

Eight trial pits were excavated using a JCB 3 CX at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were logged and photographed by a Geotechnical Engineer prior to backfilling with arisings.

The trial pit logs are provided in Appendix 2 of this Report.

4.3 Dynamic Probes

The dynamic probe tests (DPH) were carried out beside the trial pits using Terrier 2000 rig in accordance with B.S. 1377: Part 9 1990. The test consists of mechanically driving a cone with a 50kg weight in 100mm intervals and monitoring the number of blows required. An equivalent Standard Penetration Test (SPT) 'N' value may be calculated by dividing the total number of blows over a 300mm drive length by 2. The probes DP1 to DP8 were undertaken adjacent to the trial pits locations while DP9 was carried out beside SP4.

The dynamic probe logs are provided in Appendix 3 of this Report.

4.4 Soakaway Testing

The soakaway pits were excavated to a maximum depth of 2.2m BGL and filled with water to assess the infiltration characteristics of the proposed site. The pits were allowed to drain and the drop in water level recorded over time as required by BRE Digest 365. The pits were logged and photographed prior to completing the soakaway test and were backfilled with arisings and reinstated upon completion.

The soakaway test results are provided in Appendix 4 of this Report.

4.5 Slit Trenching

A number of slit trenches were excavated to determine the line and location of the large diameter water services which cross the site. Some of the trenches were

completed as separate excavations to locate the services with minimum disturbance to the ground surface. Each of the services shown on the local authority plans were identified and logged. The services were marked using 6 foot posts and were surveyed by the project topographical surveyors. The line, depth and location of the services located are shown on the plan in Appendix 1.

The slit trench logs are provided in Appendix 5 of this Report.

The above notes outline the procedures used in this site investigation and are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:1999 + A2:2010.

4.6 Laboratory Testing

Samples were selected from the trial pits for a range of geotechnical and chemical testing to assist in the classification of soils and to provide information for the proposed design. Testing consisting of Particle Size Distribution (PSD), moisture content, atterberg limits, CBR and compaction testing were sent to NTML's Geotechnical Laboratory for analysis. Environmental laboratory testing was carried out on samples of soil by Jones Environmental Laboratory in the UK. The results of the laboratory testing is included in Appendix 6 of this Report.

5.0 Ground Conditions

5.1 General

The recommendations given and opinions expressed in this report are based on the findings as detailed in the borehole and trial pit records. Where an opinion is expressed on the material between exploratory hole locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the exploratory holes.

5.2 Ground Conditions

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the trial pit and dynamic probe records included in the appendices of this report. The sequence of strata encountered are generally consistent across the site and are generally consisted of;

- Topsoil
- Cohesive Deposits
- Granular Deposits

Topsoil: Topsoil was encountered in the majority of exploratory holes and was present to a maximum depth of 0.3m BGL.

Cohesive Deposits: Cohesive deposits were encountered beneath the Topsoil and were quite variable, described typically as brown, grey brown or occasionally as black *slightly sandy slightly gravelly CLAY*, *slightly gravelly sandy CLAY/SILT*, *Laminated sandy SILT* and *sandy gravelly slightly organic CLAY*. The strength of the cohesive deposits generally increased with depth and was typically soft or soft to firm at shallow depths increasing to stiff or stiff to very stiff at the base of the majority of the trial pits. These deposits had occasional cobble and rare boulder content where noted on the trial pit logs.

Granular Deposits: Granular deposits were encountered in the trial pits in the south of the site either as lenses within the cohesive deposits or as strata underlying upper cohesive deposits to the base of the trial pits. These deposits were typically described as brown or dark grey *gravelly fine to coarse SAND and clayey sandy sub angular to sub rounded fine to coarse GRAVEL*. These deposits had occasional cobble and rare boulder content where noted on the trial pit logs.

5.3 **Groundwater**

The groundwater strikes were noted during the investigation and were generally encountered as slow seepage at depths between 2.0m and 3.0m BGL. We would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the time of year, rainfall nearby construction and other factors.

5.4 Soakaway Testing

At the test locations a trial pit was excavated and filled with water to a nominal invert level. The pits were allowed to drain and the rate of fall in water level was monitored to determine the time for the water level to drop from 75% to 25% the pit volume.

Based on the soakaway test results we would recommend that the soakaway design be based on a soil infiltration rate of $f = 1.38 \times 10^{-5}$ m/s in the vicinity of SP1.

The remaining test locations SP2 to SP4, indicate that the ground conditions are not favourable for soakaway design.

5.5 Laboratory Testing

A series of tests were completed on samples collected from the trial pits and were sent to GSTL's geotechnical laboratory in the UK.

The classification test results generally confirm the descriptions on the logs with the primary constituent for the cohesive deposits plotting as a CLAY of low to intermediate plasticity. The Particle Size Distribution tests confirm that generally the cohesive overburden strata have variable clay, silt, sand and gravel content. The granular deposits were generally well graded and had high fines content, typical of the granular glacial till deposits in the region.

Four samples were selected from the boreholes and trial pits and sent to Jones Environmental Laboratories in the UK for a range of contamination testing.

The results were assessed in accordance with European Council Directive 1999 131/EC Article 16 Annex II 'Criteria and procedures for the acceptance of waste at landfills which lays down guidelines for the classification of waste as "Inert' 'Non Hazardous' and 'Hazardous'. The results classify the material tested as below the limits for inert waste at Murphy Environmental Landfill in Co. Dublin. Any material removed off site should be disposed of at a suitable licenced facility. The results of this testing can be found at the rear of this report.

6.0 Recommendations and Conclusions

6.1 General

The recommendations given and opinions expressed in this report are based on the findings as detailed in the trial pit records. Where an opinion is expressed on the material between exploratory hole locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the exploratory holes.

Earthworks are proposed in the south west corner of the site and a retaining wall is proposed to be constructed. The material excavated in this area, based on TP1 and TP2, will be suitable for re-use as landscaping fill within the proposed development. The material has a high fines content and the optimum moisture content is close to or above the natural moisture content. The CBR test results indicate that material reused from excavations will have a CBR value of 2% or below.

The retaining wall should be designed using the approach advocated in BS8002: Code of Practice for Earth Retaining Structures or Eurocode 7: Geotechnical Design. The appropriate design parameters should be determined from the trial pit logs for the depths retained.

Due to the presence of loose granular deposits and/or soft cohesive deposits foundations in the vicinity of TP1, TP2 & TP5 foundations are recommended to be taken to the firm to stiff cohesive deposits, or the medium dense granular deposits at a depth of 2.0m BGL. An allowable bearing capacity of 70kN/m^2 is recommended at this depth based on the dynamic probe records in Appendix 5. Vibro compaction or other forms of ground improvement may be more economical than deep excavations for foundations, however depending on the proposed development levels and the earthworks proposed in the south west corner of the site, the proposed foundation levels may be more achievable.

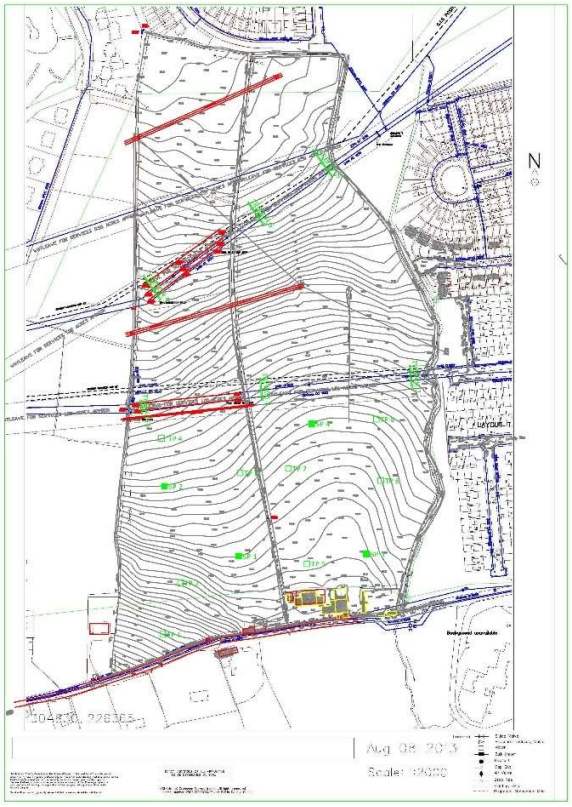
An allowable bearing capacity of 70kN/m^2 is recommended for the foundations at 1.0m BGL on the firm to stiff cohesive deposits in the vicinity of TP3, TP4 & TP6. An increased value of 100kN/m^2 is recommended at 1.0m BGL for TP7 & TP8. Any soft spots encountered at this depth should be excavated and replaced with lean mix concrete.

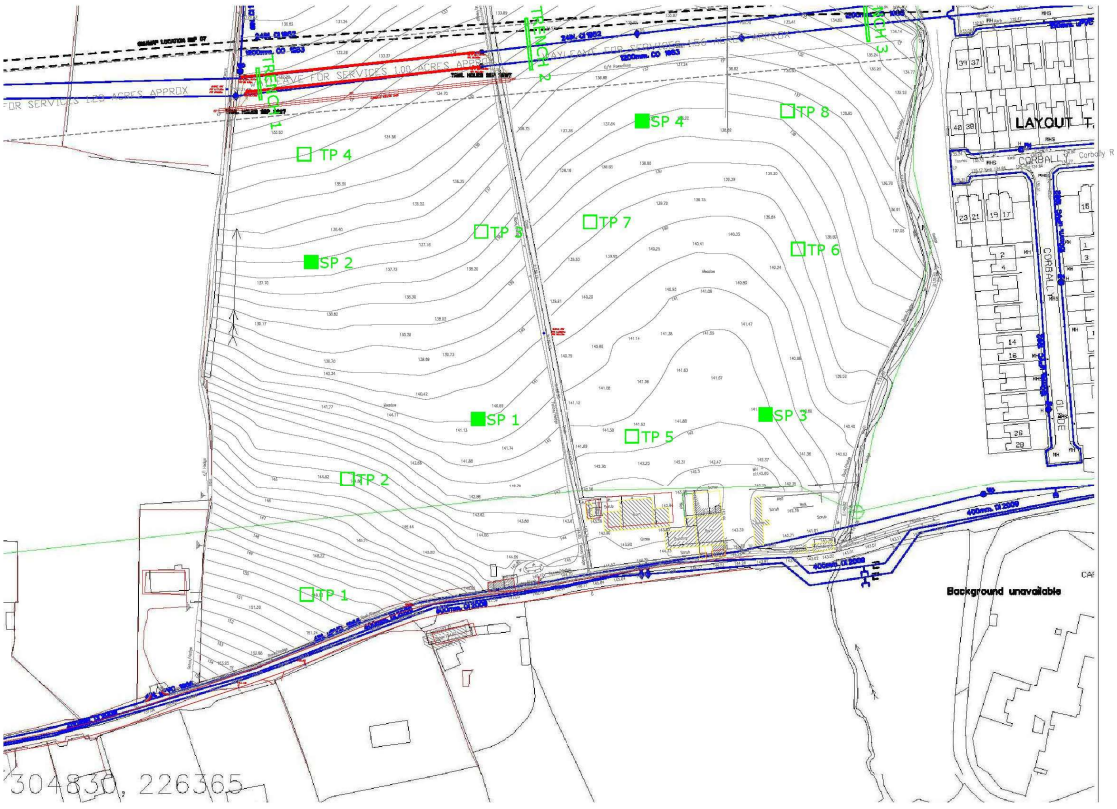
Excavations for services which are required to be installed in the water bearing granular deposits may require temporary support and dewatering. Note should be taken of the stability of the trial pits recorded on the logs in Appendix 2.

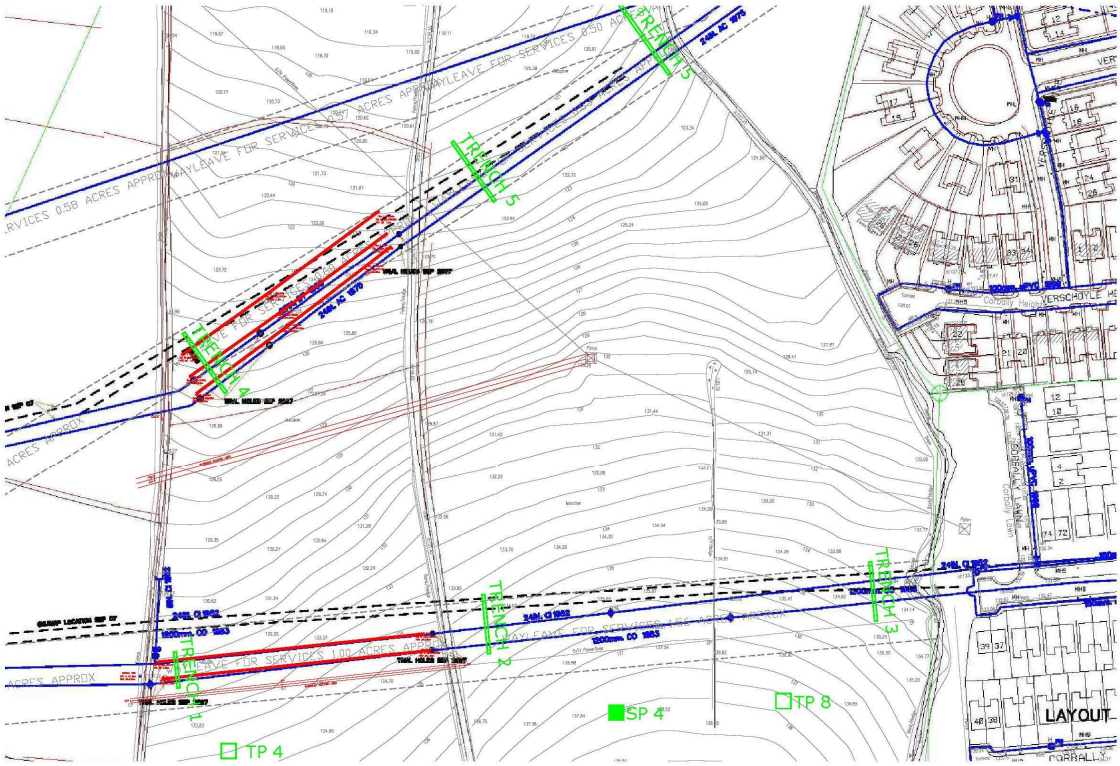
The recommendations provided in this report should be verified in the design of the proposed buildings, using the full details of the loading conditions and taking into consideration the allowable tolerable settlements/movements that the building can accommodate. The founding strata should be inspected and verified by a suitably qualified engineer prior to construction of the building foundations.

****

Appendix 1: Site Location Plan




TP 1
TP 2
TP 3
TP 4
TP 5
TP 6
TP 7
TP 8
SP 1
SP 2
SP 3
SP 4
LAYOUT
Background unavailable
304830, 226365


TRENCH 5
TRENCH 4
TRENCH 2
TRENCH 1
TRENCH 3
TP 4
SP 4"
TP 8
LAYOUT

Appendix 2: Trial Pit Records

TRIAL PIT RECORD

Project Name: Saggart, Boherboy — **Hole ID: TP1**

Client: Pinnacle
Consultant: Roger Mullarkey & Associates
Location: Saggart
Date: 09/12/2013
Excavator used: JCB 3CX

Co-ordinates: 304720.00, 226091.00
Elevation: 149.930
Project no. 4040-11-13
Logged by: C Finnerty

Strata Description	Legend	Depth	Level (mOD)	Samples / tests: Type	Samples / tests: Depth	Samples / tests: Result	Water Depth	Date
TOPSOIL								
Soft dark brown slightly sandy slightly gravelly CLAY		0.30	149.63					
Firm laminated brown and light brown slightly sandy slightly gravelly CLAY/SILT		0.60	149.33					
Loose brown slightly gravelly fine to medium SAND with lenses of slightly clayey slightly gravelly SAND		0.90	149.03	T	0.90			
		1		B	1.00			
				T	1.00			
		2		B	2.00			
Stiff dark brown sandy gravelly CLAY with occasional cobbles and rare boulders		2.70	147.23	B	2.70			
		3		B	3.00			
End of Trial pit at 3.20 m		3.20	146.73					
		4						

Remarks:

Stability: Stable
Water: Slow seepage at 3.1m bgl
Remarks:

KEY

B	Bulk disturbed sample
D	Small disturbed sample
U	Undisturbed sample

Dimensions: 3.00
Depth: 0.70
3.20

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TRIAL PIT RECORD

Project Name: Saggart, Boherboy — **Hole ID: TP2**

Client: Pinnacle
Consultant: Roger Mullarkey & Associates
Location: Saggart
Date: 09/12/2013
Excavator used: JCB 3CX

Co-ordinates: 304727.00, 226146.00
Elevation: 144.800
Project no. 4040-11-13
Logged by: C Finnerty

Strata Description	Legend	Depth	Level (mOD)	Samples / tests: Type	Samples / tests: Depth	Samples / tests: Result	Water Depth	Date
TOPSOIL								
		0.30	144.50					
Soft to firm grey brown slightly sandy slightly gravelly CLAY		0.50	144.30	T	0.50			
Firm grey sandy gravelly slightly organic CLAY		0.90	143.90					
Firm brown sandy gravelly CLAY with occasional cobbles and rare boulders		1		B	1.00			
		2		B	2.00			
Dark grey slightly gravelly fine to coarse SAND (wet)		2.20	142.60					
		2.50	142.30	B	2.50			
Stiff black slightly sandy gravelly CLAY with occasional cobbles and rare boulders		2.70	142.10					
End of Trial pit at 2.70 m		3						
		4						

Remarks:
Stability: Collapsing below 1.5m bgl
Water: Slow seepage at 2.0m bgl
Remarks:

KEY
B Bulk disturbed sample.
D Small disturbed sample
U Undisturbed sample

Dimensions: 3.00
Depth: 2.70 — 0.70

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TRIAL PIT RECORD

Project Name: Saggart, Boherboy — **Hole ID: TP3**

Client: Pinnacle
Consultant: Roger Mullarkey & Associates
Location: Saggart
Date: 09/12/2013
Excavator used: JCB 3CX

Co-ordinates: 304802.00, 226242.00
Elevation: 137.700
Project no. 4040-11-13
Logged by: C Finnerty

Strata Description	Legend	Depth	Level (mOD)	Samples / tests: Type	Samples / tests: Depth	Samples / tests: Result	Water Depth	Date
TOPSOIL								
Soft to firm brown slightly sandy slightly gravelly CLAY with occasional cobbles and rare boulders		0.30	137.40	T B LB	1.00 1.00 1.00			
Firm to stiff brown sligthly sandy gravelly CLAY with occasional cobbles and rare boulders		1.50	136.20	B	2.00			
Stiff to very stiff dark brown slightly sandy gravelly CLAY		2.20	135.50					
End of Trial pit at 3.00 m		3.00	134.70	B	3.00			

Remarks:

Stability: Stable
Water: No groundwater encountered
Remarks:

KEY

B Bulk disturbed sample.
D Small disturbed sample
U Undisturbed sample

Dimensions: 3.00
Depth: 3.00
0.70

GROUND INVESTIGATIONS IRELAND
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TRIAL PIT RECORD

Project Name: Saggart, Boherboy — **Hole ID: TP4**

Client: Pinnacle
Consultant: Roger Mullarkey & Associates
Location: Saggart
Date: 09/12/2013
Excavator used: JCB 3CX

Co-ordinates: 304714.00, 226270.00
Elevation: 134.700
Project no. 4040-11-13
Logged by: C Finnerty

Strata Description	Legend	Depth	Level (mOD)	Samples / tests: Type	Samples / tests: Depth	Samples / tests: Result	Water Depth	Date
TOPSOIL		0.20	134.50					
Soft orange brown sandy slightly gravelly CLAY		0.30	134.40					
Soft to firm brown slightly sandy slightly gravelly CLAY with occasional cobbles and rare boulders								
		0.90	133.80					
Firm brown slightly sandy slightly gravelly CLAY with occasional cobbles and rare boulders		1		T B	1.00 1.00			
		1.50	133.20	LB	1.50			
Medium dense brown clayey sandy sub rounded to sub angular fine to coarse GRAVEL with occasional cobbles and rare boulders		2						
		2.70	132.00					
Medium dense to dense brown sligthly sandy clayey sub angular to sub rounded fine to coarse GRAVEL with frequent cobbles (wet)		3.00	131.70	LB	3.00			
End of Trial pit at 3.00 m								
		4						

Remarks:
Stability: Stable
Water: No groundwater encountered
Remarks:

KEY
B Bulk disturbed sample.
D Small disturbed sample
U Undisturbed sample

Dimensions: 3.00
Depth: 3.00 — 0.70

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TRIAL PIT RECORD

Project Name: Saggart, Boherboy — **Hole ID: TP5**

Client: Pinnacle
Consultant: Roger Mullarkey & Associates
Location: Saggart
Date: 09/12/2013
Excavator used: JCB 3CX

Co-ordinates: 304883.00, 226244.00
Elevation: 141.630
Project no. 4040-11-13
Logged by: C Finnerty

Strata Description	Legend	Depth	Level (mOD)	Samples / tests: Type	Samples / tests: Depth	Samples / tests: Result	Water Depth	Date
TOPSOIL								
Soft orange brown sandy slightly gravelly CLAY		0.30	141.33					
				B	0.70			
Soft grey brown slightly sandy slightly gravelly CLAY		0.80	140.83					
		1						
Soft laminated grey brown sandy CLAY/SILT		1.20	140.43					
				B	1.50			
Soft to firm grey brown slightly gravelly sub fine to medium SAND with occasional lenses of sandy SILT		1.70	139.93					
		2		LB	2.00			
Medium dense grey brown sandy sub angular to sub rounded fine to coarse GRAVEL with occasional cobbles		2.30	139.33					
		3		LB	3.00			
End of Trial pit at 3.50 m		3.50	138.13					
		4						

Remarks:

Stability: Stable
Water: No groundwater encountered
Remarks:

KEY

B Bulk disturbed sample.
D Small disturbed sample
U Undisturbed sample

Dimensions: 3.00
Depth: 0.70
3.50

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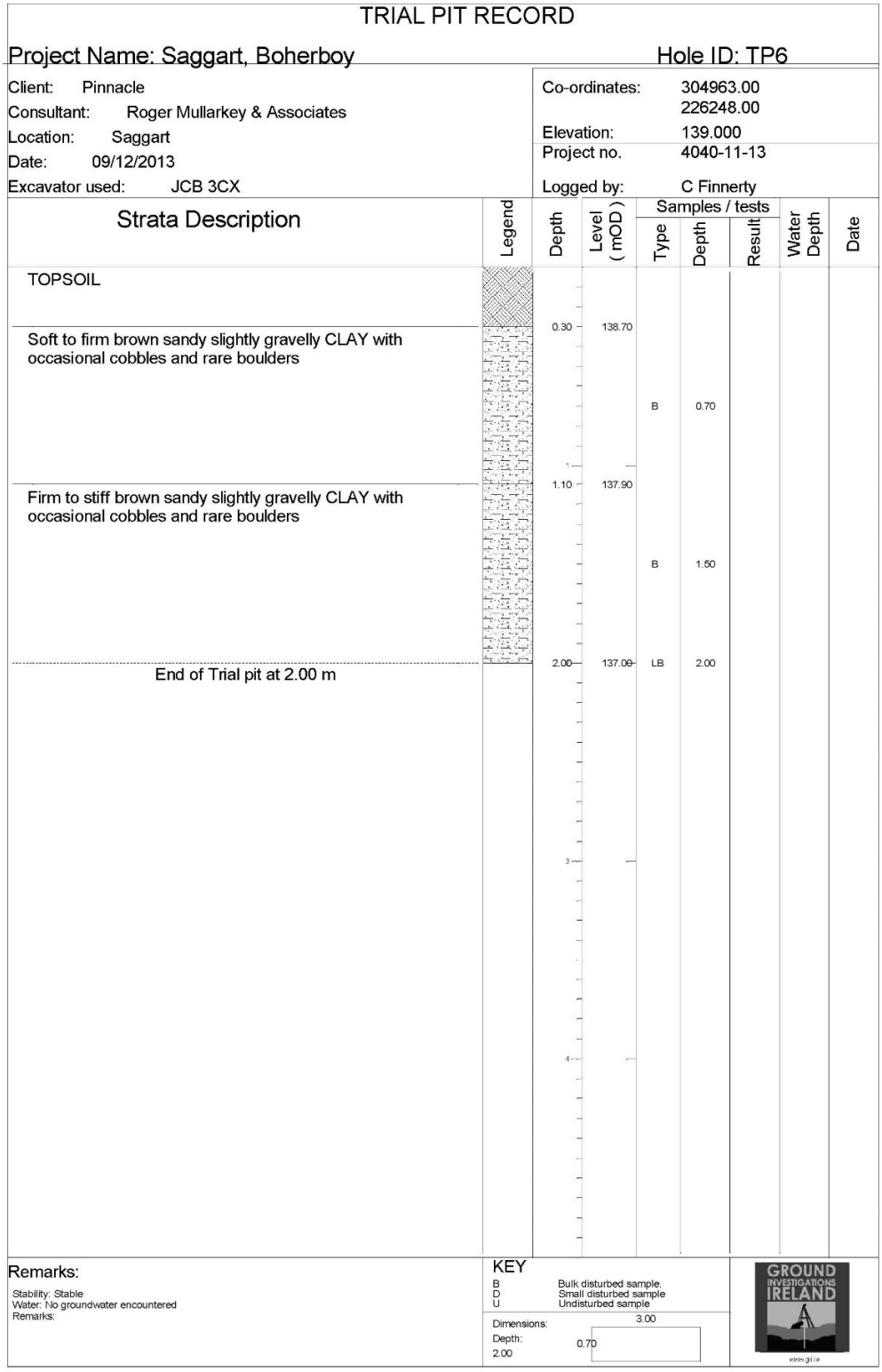
TRIAL PIT RECORD
Project Name: Saggart, Boherboy
Hole ID: TP6
Client: Pinnacle
Consultant: Roger Mullarkey & Associates
Location: Saggart
Date: 09/12/2013
Excavator used: JCB 3CX
Co-ordinates: 304963.00 226248.00
Elevation: 139.000
Project no. 4040-11-13
Logged by: C Finnerty
Strata Description
Legend
Depth
Level (mOD)
Samples / tests
Type
Depth
Result
Water Depth
Date
TOPSOIL
0.30 138.70
Soft to firm brown sandy slightly gravelly CLAY with occasional cobbles and rare boulders
B 0.70
1.10 137.90
Firm to stiff brown sandy slightly gravelly CLAY with occasional cobbles and rare boulders
B 1.50
2.00 137.00 LB 2.00
End of Trial pit at 2.00 m
Remarks:
Stability: Stable
Water: No groundwater encountered
Remarks:
KEY
B Bulk disturbed sample.
D Small disturbed sample
U Undisturbed sample
Dimensions:
Depth:
2.00
3.00
0.70
GROUND INVESTIGATIONS IRELAND
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TRIAL PIT RECORD

Project Name: Saggart, Boherboy — **Hole ID: TP7**

Client: Pinnacle
Consultant: Roger Mullarkey & Associates
Location: Saggart
Date: 09/12/2013
Excavator used: JCB 3CX

Co-ordinates: 304883.00, 226244.00
Elevation: 139.390
Project no. 4040-11-13
Logged by: C Finnerty

Strata Description	Legend	Depth	Level (mOD)	Samples / tests: Type	Samples / tests: Depth	Samples / tests: Result	Water Depth	Date
TOPSOIL								
Soft to firm brown sandy slightly gravelly CLAY with occasional cobbles and rare boulders		0.30	139.09					
Stiff brown sandy slightly gravelly CLAY with occasional cobbles and rare boulders		0.70	138.69					
		1		B	1.00			
				T	1.50			
				LB	1.50			
		2		B	2.00			
End of Trial pit at 2.60 m		2.60	136.79	B	2.60			
		3						
		4						

Remarks:
Stability: Stable
Water: No groundwater encountered
Remarks:

KEY
B Bulk disturbed sample.
D Small disturbed sample
U Undisturbed sample

Dimensions: 3.00
Depth: 0.70
2.60

GROUND INVESTIGATIONS IRELAND
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TRIAL PIT RECORD

Project Name: Saggart, Boherboy — **Hole ID: TP8**

Client: Pinnacle
Consultant: Roger Mullarkey & Associates
Location: Saggart
Date: 09/12/2013
Excavator used: JCB 3CX

Co-ordinates: 304957.00, 226309.00
Elevation: 137.000
Project no. 4040-11-13
Logged by: C Finnerty

Strata Description	Legend	Depth	Level (mOD)	Samples / tests: Type	Samples / tests: Depth	Samples / tests: Result	Water Depth	Date
TOPSOIL								
		0.30	136.70					
Soft to firm brown sandy slightly gravelly CLAY with occasional cobbles and rare boulders								
		0.70	136.30	LB	0.70			
Stiff brown sandy slightly gravelly CLAY with occasional cobbles and rare boulders				T	1.00			
		1.50	135.50					
End of Trial pit at 2.00 m								

Remarks:
Stability: Stable
Water: No groundwater encountered
Remarks:

KEY
B Bulk disturbed sample.
D Small disturbed sample
U Undisturbed sample

Dimensions: 3.00
Depth: 0.70
2.00

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TRIAL PIT RECORD

Project Name: Saggart, Boherboy — **Hole ID: SP1**

Client: Pinnacle
Consultant: Roger Mullarkey & Associates
Location: Saggart
Date: 09/12/2013
Excavator used: JCB 3CX

Co-ordinates: 304814.00, 226147.00
Elevation: 141.000
Project no. 4040-11-13
Logged by: C Finnerty

Strata Description	Legend	Depth	Level (mOD)	Samples / tests: Type	Samples / tests: Depth	Samples / tests: Result	Water Depth	Date
TOPSOIL								
Soft to firm orange brown slightly sandy gravelly CLAY		0.30	140.70					
Soft brown slightly sandy slightly gravelly CLAY		0.70	140.30					
Brown gravelly fine to coarse SAND		1.50	139.50					
Brown sandy sub angular to sub rounded fine to coarse GRAVEL with occasional cobbles		2.00	139.00					
End of Trial pit at 2.20 m		2.20	138.80					

Remarks:
Stability: Stable
Water: No groundwater encountered
Remarks: Soakaway test completed in accordance with BRE365.

KEY
B Bulk disturbed sample.
D Small disturbed sample
U Undisturbed sample

Dimensions: 2.50
Depth: 0.70
2.20

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TRIAL PIT RECORD

Project Name: Saggart, Boherboy — **Hole ID: SP2**

Client: Pinnacle
Consultant: Roger Mullarkey & Associates
Location: Saggart
Date: 09/12/2013
Excavator used: JCB 3CX

Co-ordinates: 304714.00, 262220.00
Elevation: 137.000
Project no. 4040-11-13
Logged by: C Finnerty

Strata Description	Legend	Depth	Level (mOD)	Samples / tests: Type	Samples / tests: Depth	Samples / tests: Result	Water Depth	Date
TOPSOIL								
Soft to firm orange brown slightly sandy gravelly CLAY		0.30	136.70					
Soft brown sandy gravelly CLAY with occasinal cobbles and boulders (damp)		0.50	136.50					
Brown clayey sandy sub angular to sub rounded fine to coarse GRAVEL with occasional cobbles and rare boulders (wet)		1.50	135.50					
End of Trial pit at 1.90 m		1.90	135.10					

Remarks:

Stability: Collapsing beow 0.5m BGL
Water: Slow groundwater seepage encountered below 2.0m BGL
Remarks: Soakaway test completed in accordance with BRE365.

KEY

B	Bulk disturbed sample.
D	Small disturbed sample
U	Undisturbed sample

Dimensions: 2.30
Depth: 1.90 — 0.70

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TRIAL PIT RECORD

Project Name: Saggart, Boherboy — **Hole ID: SP3**

Client: Pinnacle
Consultant: Roger Mullarkey & Associates
Location: Saggart
Date: 09/12/2013
Excavator used: JCB 3CX

Co-ordinates: 304939.00, 226195.00
Elevation: 141.500
Project no. 4040-11-13
Logged by: C Finnerty

Strata Description	Legend	Depth	Level (mOD)	Samples / tests: Type	Samples / tests: Depth	Samples / tests: Result	Water Depth	Date
TOPSOIL								
Soft to firm brown sandy slightly gravelly CLAY with occasional cobbles and rare boulders		0.30	141.20					
Firm to stiff grey brown sandy slightly gravelly CLAY with occasional cobbles and rare boulders		1.00	140.50					
End of Trial pit at 2.00 m		2.00	139.50					

Remarks:
Stability: Stable
Water: No groundwater encountered
Remarks: Soakaway test completed in accordance with BRE365.

KEY
B Bulk disturbed sample.
D Small disturbed sample
U Undisturbed sample

Dimensions: 2.20
Depth: 2.00 — 0.70

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TRIAL PIT RECORD

Project Name: Saggart, Boherboy — **Hole ID: SP4**

Client: Pinnacle
Consultant: Roger Mullarkey & Associates
Location: Saggart
Date: 09/12/2013
Excavator used: JCB 3CX

Co-ordinates: 304886.00, 226304.00
Elevation: 138.000
Project no. 4040-11-13
Logged by: C Finnerty

Strata Description	Legend	Depth	Level (mOD)	Samples / tests: Type	Samples / tests: Depth	Samples / tests: Result	Water Depth	Date
TOPSOIL								
Soft to firm brown sandy slightly gravelly CLAY with occasional cobbles and rare boulders		0.30	137.70					
Firm to stiff grey brown sandy slightly gravelly CLAY with occasional cobbles and rare boulders		1.20	136.80					
End of Trial pit at 2.10 m		2.10	135.90					

Remarks:
Stability: Stable
Water: No groundwater encountered
Remarks: Soakaway test completed in accordance with BRE365.

KEY
B Bulk disturbed sample.
D Small disturbed sample
U Undisturbed sample

Dimensions: 2.30
Depth: 2.10
0.70

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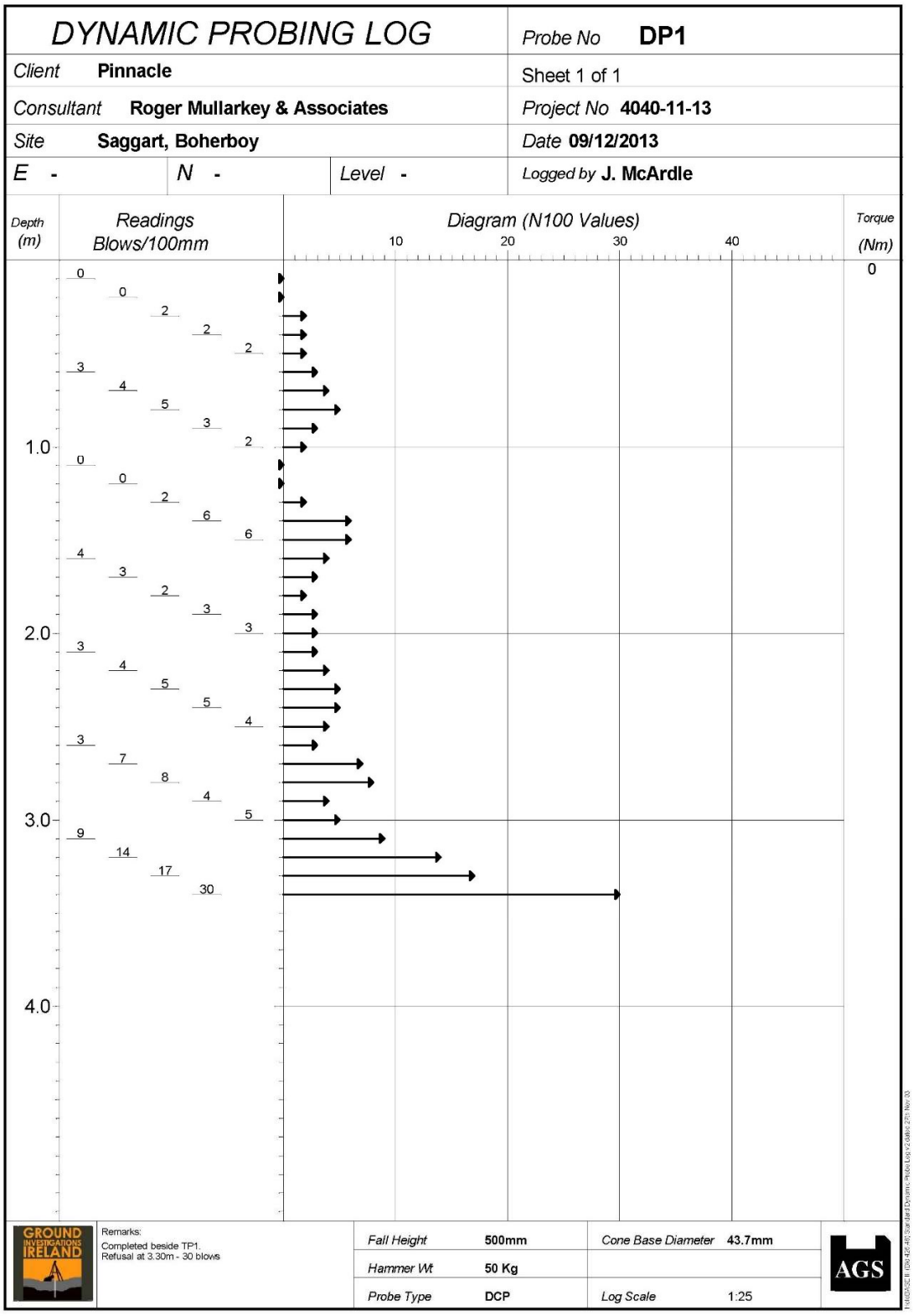
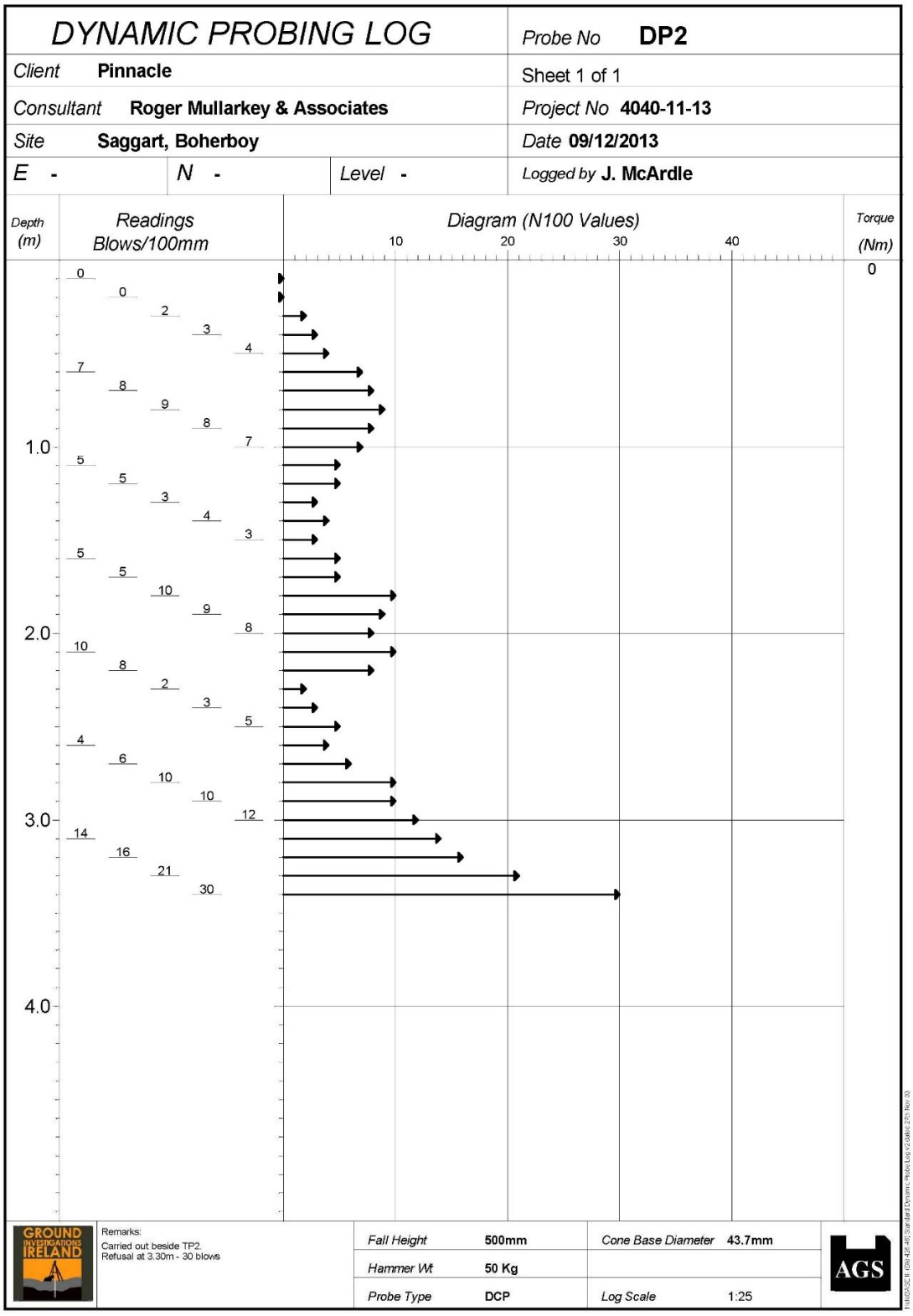
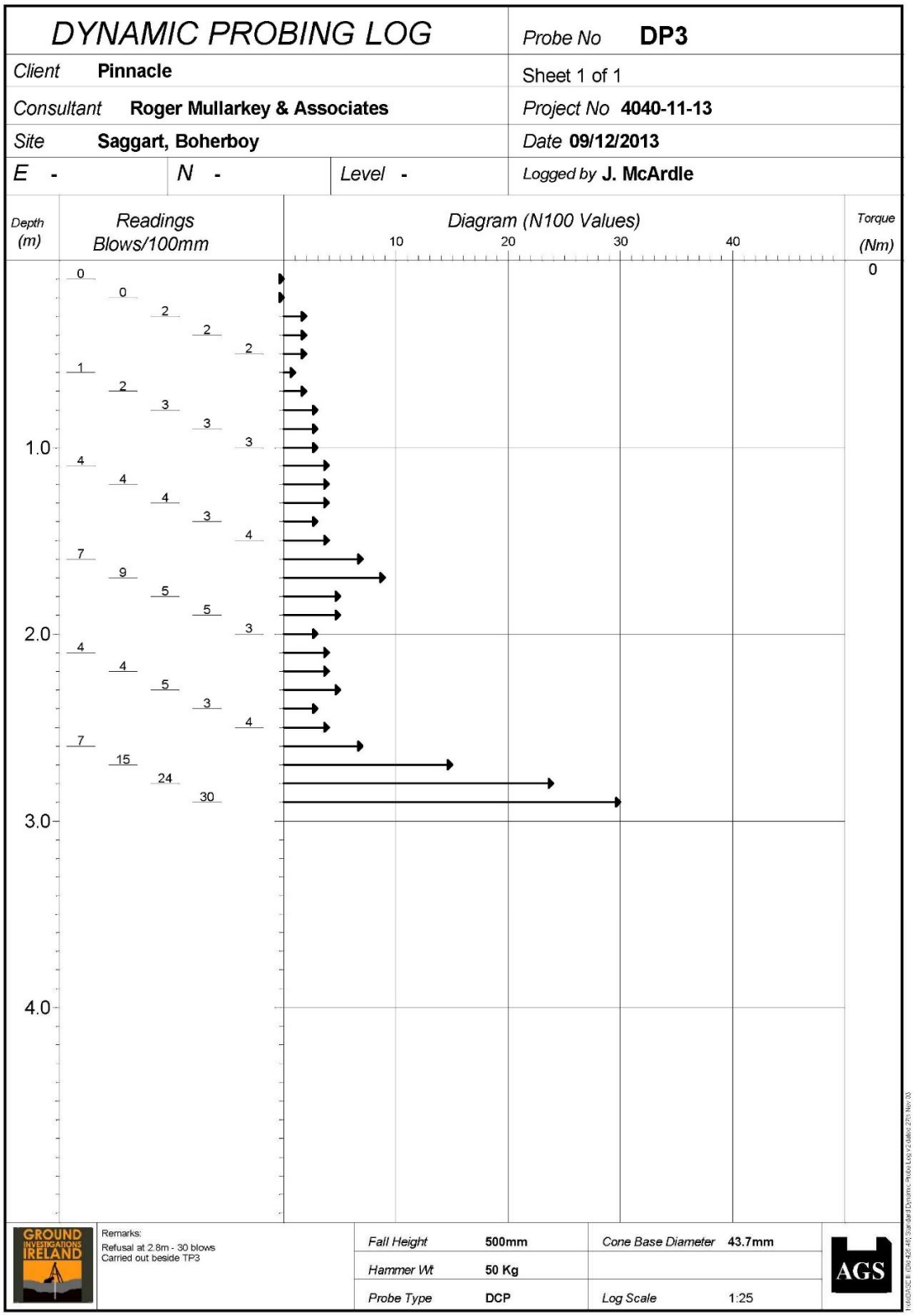
Appendix 3: Dynamic Probe Records

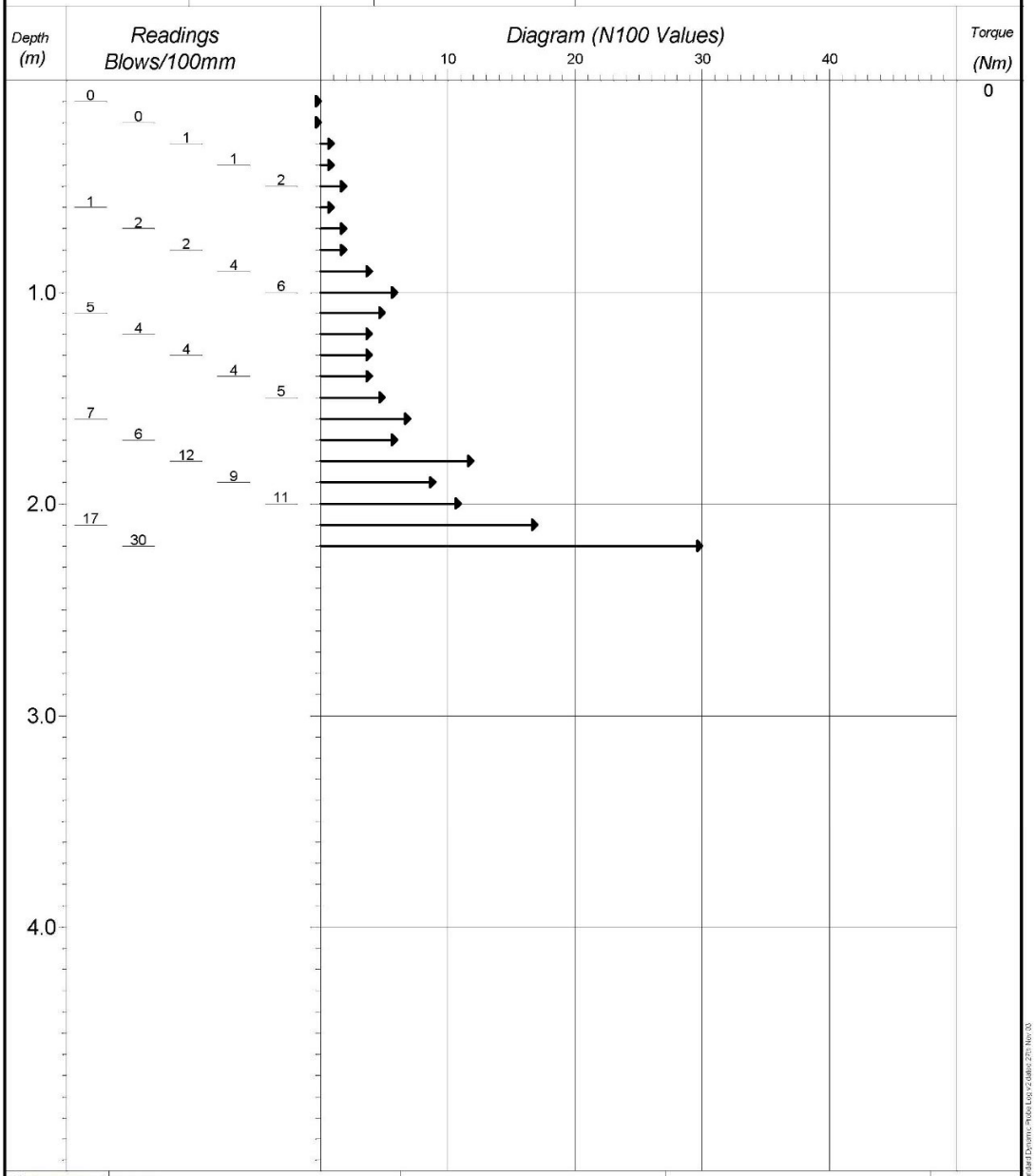

DYNAMIC PROBING LOG
Probe No DP1
Client Pinnacle
Sheet 1 of 1
Consultant Roger Mullarkey & Associates
Project No 4040-11-13
Site Saggart, Boherboy
Date 09/12/2013
E -
N -
Level -
Logged by J. McArdle
Depth (m)
Readings Blows/100mm
Diagram (N100 Values)
10
20
30
40
Torque (Nm)
0
1.0
2.0
3.0
4.0
0 0 2 2 2 3 4 5 3 2
0 0 2 6 6 4 3 2 3 3
3 4 5 5 4 3 7 8 4 5
9 14 17 30
Remarks:
Completed beside TP1.
Refusal at 3.30m - 30 blows
Fall Height 500mm
Hammer Wt 50 Kg
Probe Type DCP
Cone Base Diameter 43.7mm
Log Scale 1:25
GROUND INVESTIGATIONS IRELAND
AGS


DYNAMIC PROBING LOG
Probe No DP2
Client Pinnacle
Sheet 1 of 1
Consultant Roger Mullarkey & Associates
Project No 4040-11-13
Site Saggart, Boherboy
Date 09/12/2013
E -
N -
Level -
Logged by J. McArdle
Depth (m)
Readings Blows/100mm
Diagram (N100 Values)
Torque (Nm)
10
20
30
40
0
1.0
2.0
3.0
4.0
0 0 2 3 4
7 8 9 8 7
5 5 3 4 3
5 5 10 9 8
10 8 2 3 5
4 6 10 10 12
14 16 21 30
Remarks:
Carried out beside TP2.
Refusal at 3.30m - 30 blows
Fall Height 500mm
Hammer Wt 50 Kg
Probe Type DCP
Cone Base Diameter 43.7mm
Log Scale 1:25
GROUND INVESTIGATIONS IRELAND
AGS


DYNAMIC PROBING LOG
Probe No DP3
Client Pinnacle
Sheet 1 of 1
Consultant Roger Mullarkey & Associates
Project No 4040-11-13
Site Saggart, Boherboy
Date 09/12/2013
E -
N -
Level -
Logged by J. McArdle
Depth (m)
Readings Blows/100mm
Diagram (N100 Values)
10
20
30
40
Torque (Nm)
0
1.0
2.0
3.0
4.0
0 0 2 2 2 1 2 3 3 3 4 4 4 3 4 7 9 5 5 3 4 4 5 3 4 7 15 24 30
Remarks:
Refusal at 2.8m - 30 blows
Carried out beside TP3
Fall Height 500mm
Hammer Wt 50 Kg
Probe Type DCP
Cone Base Diameter 43.7mm
Log Scale 1:25
AGS

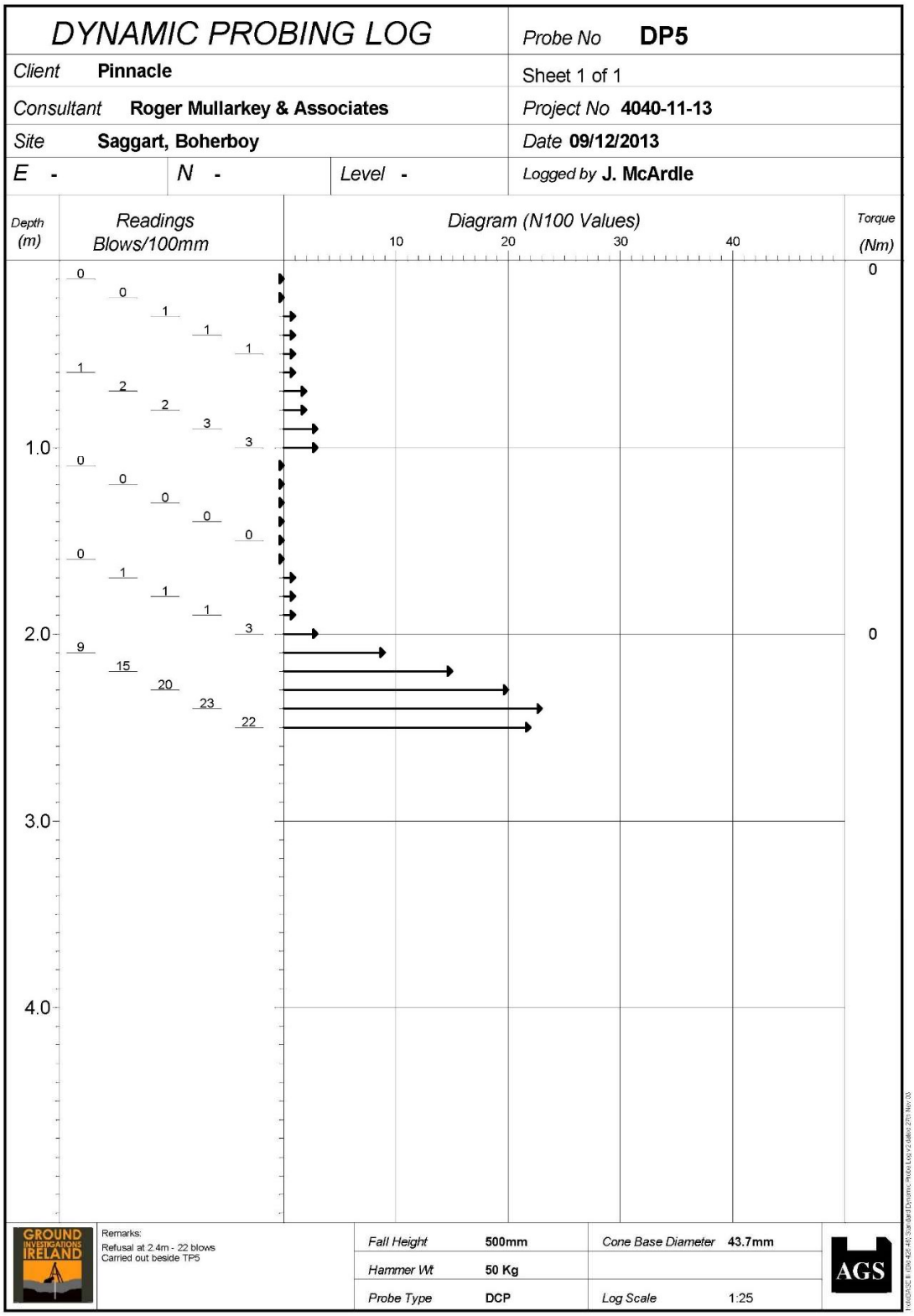
DYNAMIC PROBING LOG

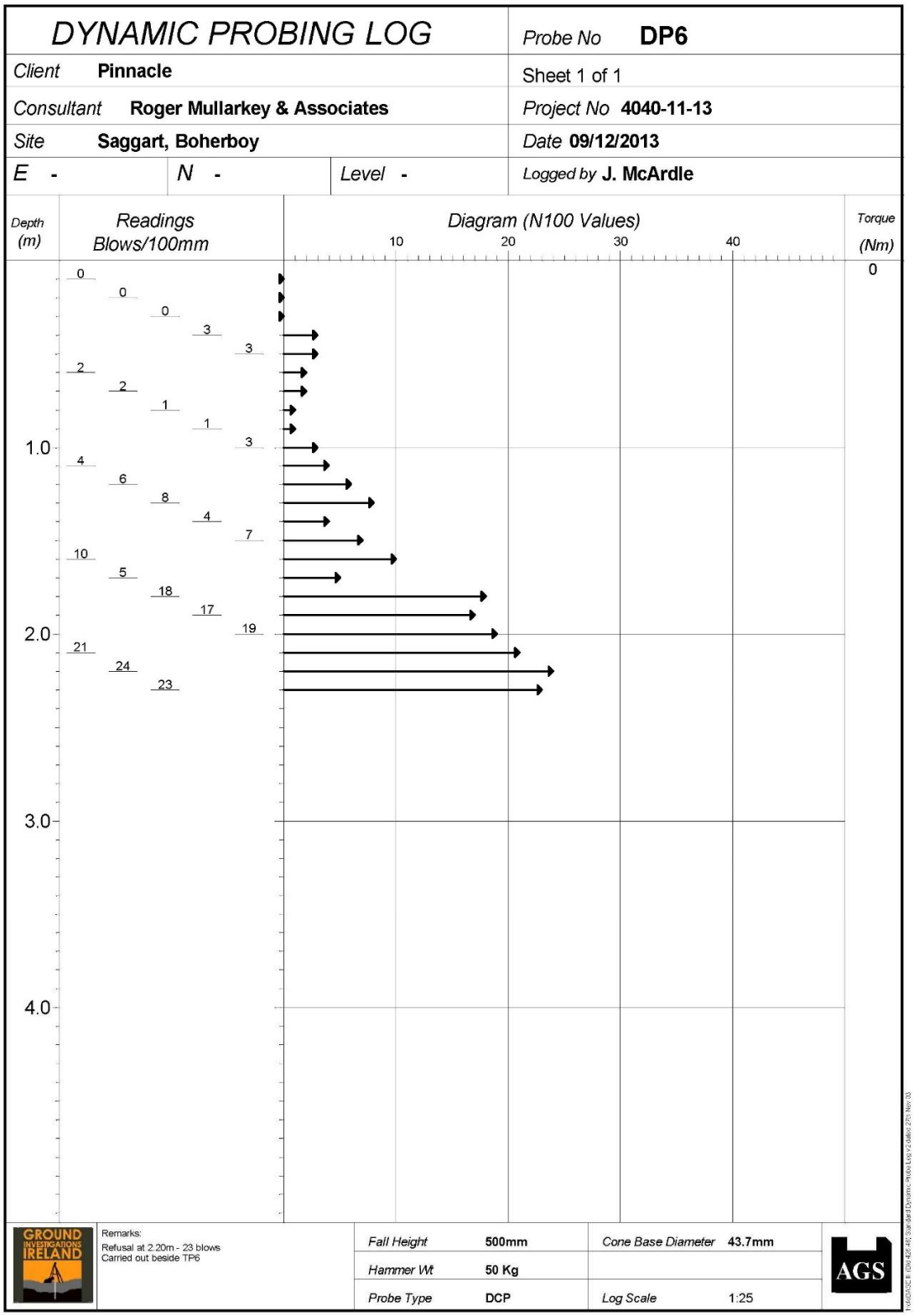
Probe No **DP4**	
Client **Pinnacle**	Sheet 1 of 1
Consultant **Roger Mullarkey & Associates**	Project No **4040-11-13**
Site **Saggart, Boherboy**	Date **09/12/2013**
E - N - Level -	Logged by **J. McArdle**



Remarks:
Refusal at 2.10m - 30 blows

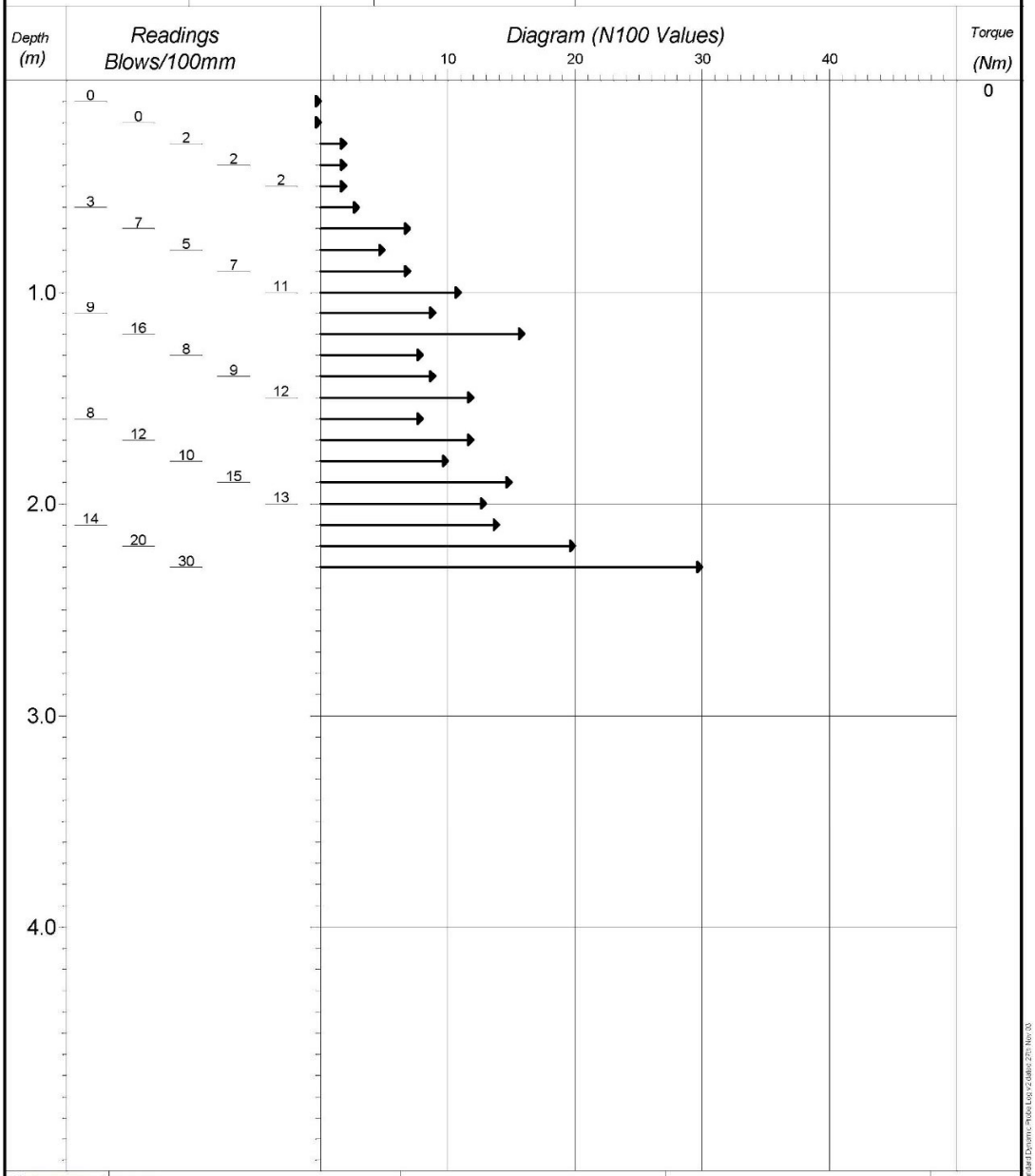
Fall Height	500mm	Cone Base Diameter	43.7mm
Hammer Wt	50 Kg		
Probe Type	DCP	Log Scale	1:25


DYNAMIC PROBING LOG
Probe No DP5
Client Pinnacle
Sheet 1 of 1
Consultant Roger Mullarkey & Associates
Project No 4040-11-13
Site Saggart, Boherboy
Date 09/12/2013
E -
N -
Level -
Logged by J. McArdle
Depth (m)
Readings Blows/100mm
Diagram (N100 Values)
Torque (Nm)
10
20
30
40
1.0
2.0
3.0
4.0
0
0
1
1
1
1
2
2
3
3
0
0
0
0
0
0
1
1
1
3
9
15
20
23
22
Remarks:
Refusal at 2.4m - 22 blows
Carried out beside TP5
Fall Height 500mm
Hammer Wt 50 Kg
Probe Type DCP
Cone Base Diameter 43.7mm
Log Scale 1:25
AGS


DYNAMIC PROBING LOG
Probe No DP6
Client Pinnacle
Sheet 1 of 1
Consultant Roger Mullarkey & Associates
Project No 4040-11-13
Site Saggart, Boherboy
Date 09/12/2013
E -
N -
Level -
Logged by J. McArdle
Depth (m)
Readings Blows/100mm
Diagram (N100 Values)
10
20
30
40
Torque (Nm)
0
1.0
2.0
3.0
4.0
0 0 0 3 3
2 2 1 1 3
4 6 8 4 7
10 5 18 17 19
21 24 23
Remarks:
Refusal at 2.20m - 23 blows
Carried out beside TP6
Fall Height 500mm
Hammer Wt 50 Kg
Probe Type DCP
Cone Base Diameter 43.7mm
Log Scale 1:25
AGS

DYNAMIC PROBING LOG

Probe No **DP7**	
Client **Pinnacle**	Sheet 1 of 1
Consultant **Roger Mullarkey & Associates**	Project No **4040-11-13**
Site **Saggart, Boherboy**	Date **09/12/2013**
E - N - Level -	Logged by **J. McArdle**

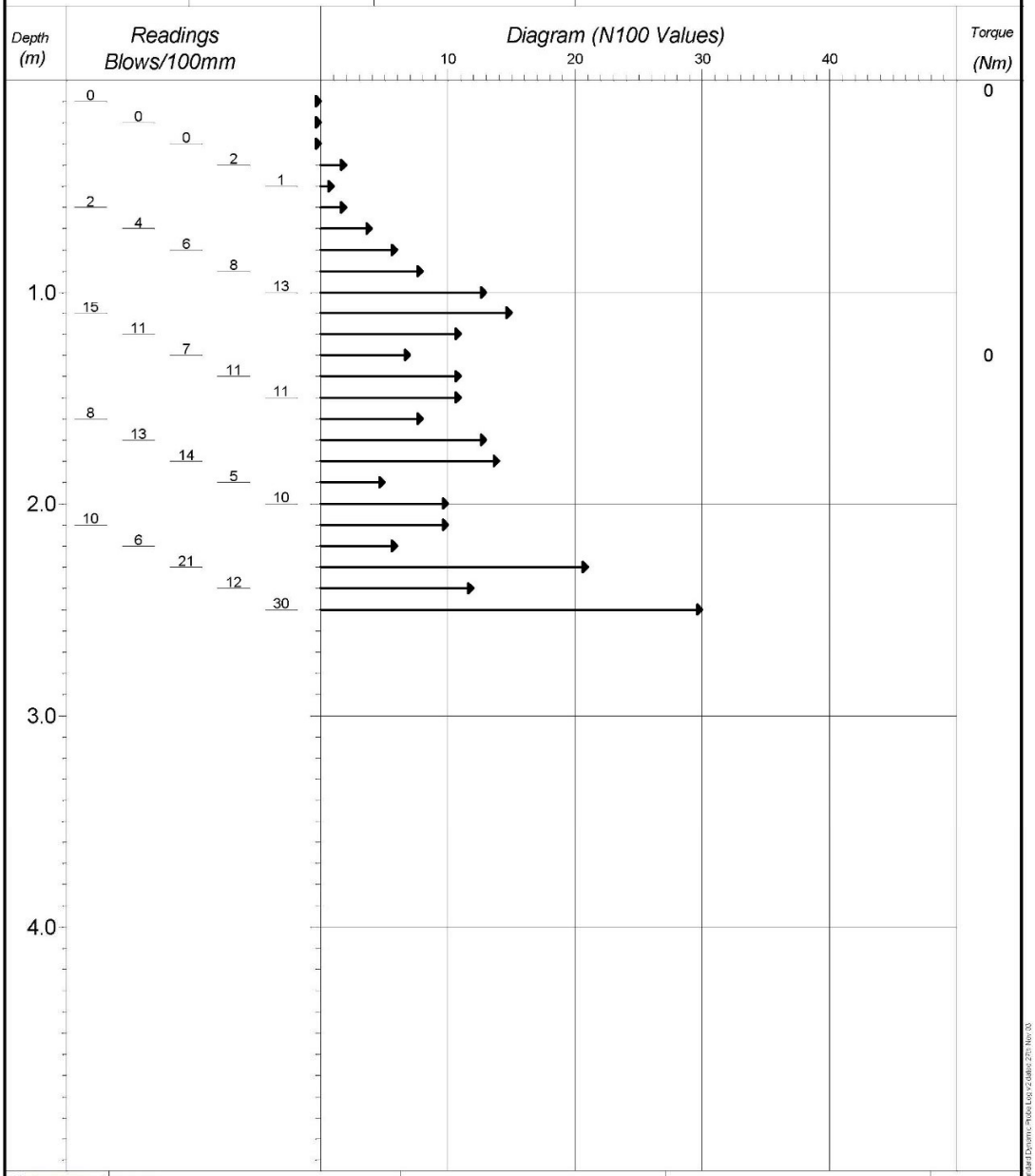


Remarks:
Refusal at 2.20m - 30 blows
Carried out beside TP7

Fall Height	500mm	Cone Base Diameter	43.7mm
Hammer Wt	50 Kg		
Probe Type	DCP	Log Scale	1:25

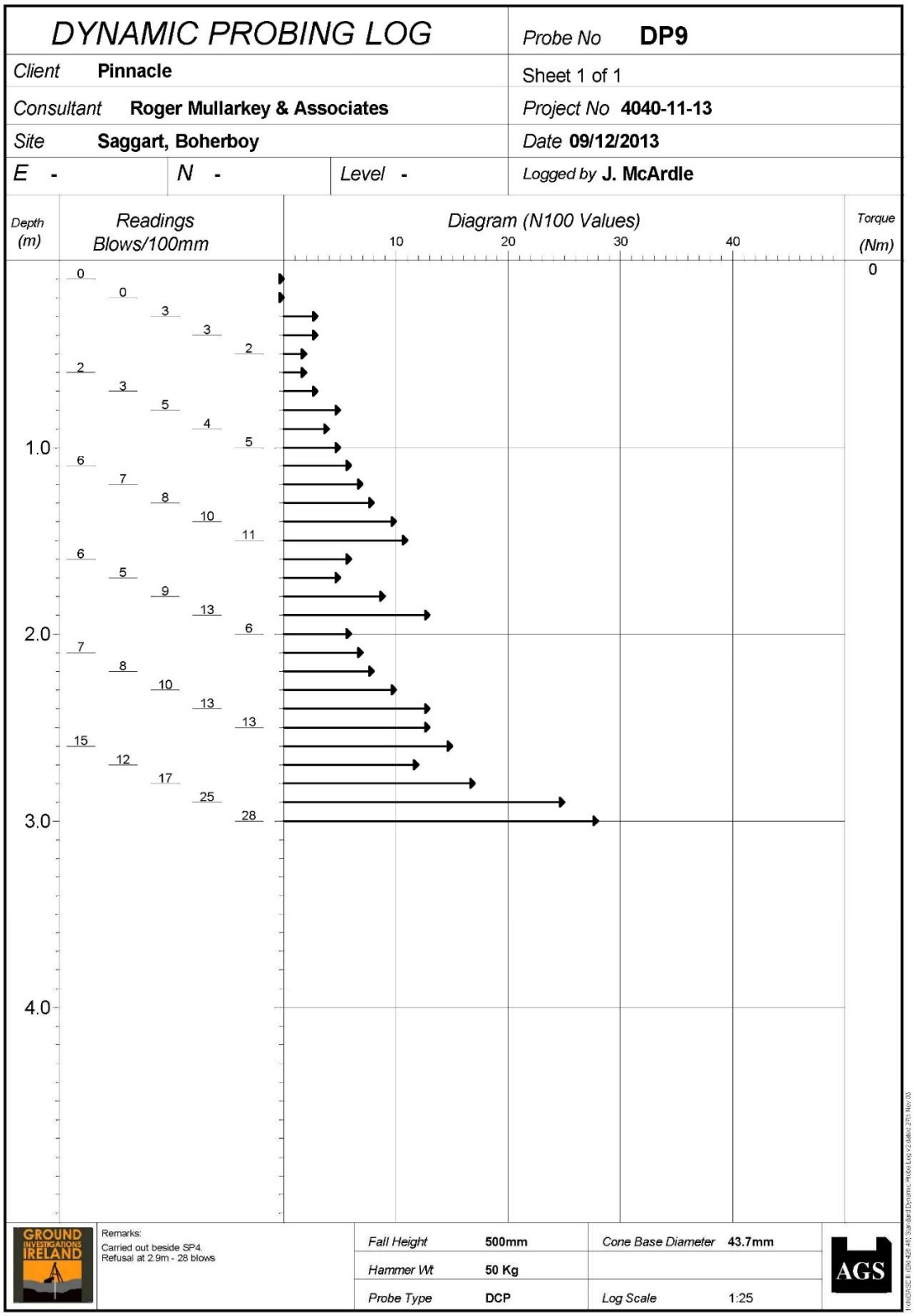
DYNAMIC PROBING LOG

Probe No **DP8**	
Client **Pinnacle**	Sheet 1 of 1
Consultant **Roger Mullarkey & Associates**	Project No **4040-11-13**
Site **Saggart, Boherboy**	Date **09/12/2013**
E - N - Level -	Logged by **J. McArdle**



Remarks:
Refusal at 2.4 - 30 Blows

Fall Height	500mm	Cone Base Diameter	43.7mm
Hammer Wt	50 Kg		
Probe Type	DCP	Log Scale	1:25


DYNAMIC PROBING LOG
Probe No DP9
Client Pinnacle
Sheet 1 of 1
Consultant Roger Mullarkey & Associates
Project No 4040-11-13
Site Saggart, Boherboy
Date 09/12/2013
E -
N -
Level -
Logged by J. McArdle
Depth (m)
Readings Blows/100mm
Diagram (N100 Values)
Torque (Nm)
10
20
30
40
0
1.0
2.0
3.0
4.0
0 0 3 3 2
2 3 5 4 5
6 7 8 10 11
6 5 9 13 6
7 8 10 13 13
15 12 17 25 28
Remarks:
Carried out beside SP4.
Refusal at 2.9m - 28 blows
Fall Height 500mm
Hammer Wt 50 Kg
Probe Type DCP
Cone Base Diameter 43.7mm
Log Scale 1:25
AGS

Appendix 4: Soakaway Records

Saggart Soakaway Testing

SP01

Soakaway Test to BRE Digest 365

The Trial Pit was filled with water to 0.7m BGL and the drop in water level with time was recorded below.
*Note: Effective length of pit includes conservative correction for sloping end wall

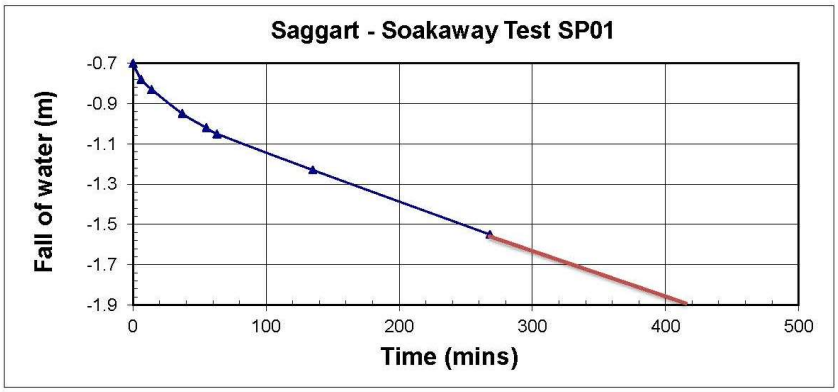
Date	Elapsed Time	Mins	Fall of Water (m)
09/12/2013	12.17	0	-0.7
09/12/2013	12.23	6	-0.78
09/12/2013	12.31	14	-0.83
09/12/2013	12.54	37	-0.95
09/12/2013	13.12	55	-1.02
09/12/2013	13.20	63	-1.05
09/12/2013	14.32	135	-1.23
09/12/2013	16.45	268	-1.55

Start depth to water	Depth of Hole	Δ [m]	75% full	25% full	
0.70	2.200	1.500	**1.075**	**1.825**	**m bgl**

Effective length of pit (m)*	Width of pit (m)	75-25H_t (m)	Vp_{75-25} (m^3)
2.000	0.700	0.750	**1.05**

Effective length of pit (m)*	Width of pit (m)	50% Eff Depth	Ap_{50} (m^2)
2.000	0.700	0.375	**3.95**

	tp_{75-25} seconds (from graph)	
		19200
f =	**1.38E-05**	**m/s**



SP2

Soakaway Test to BRE Digest 365

The Trial pit was filled with water to 0.94m BGL and the drop in water level with time was recorded below.

Elapsed Time Minutes	**Water Level mBGL**	**Remarks**
0	0.94	Hole filled with water
6	0.92	
20	0.89	
50	0.88	
90	0.87	
150	0.86	
210	0.85	Test Failed

Water level is rising due to location of soakaway at the base of a hill. This Soakaway failed.

SP3

Soakaway Test to BRE Digest 365

The Trial pit was filled with water to 0.61m BGL and the drop in water level with time was recorded below.

Elapsed Time Minutes	**Water Level mBGL**	**Remarks**
0	0.55	Hole filled with water
48	0.61	
98	0.65	
173	0.69	
220	0.77	Test Failed

Test failed due to insufficient drop in water level to calculate infiltration value.

SP4

Soakaway Test to BRE Digest 365

The Trial pit was filled with water to 0.5m BGL and the drop in water level with time was recorded below.

Elapsed Time Minutes	**Water Level mBGL**	**Remarks**
0	0.5	Hole filled with water
20	0.55	
98	0.6	
173	0.68	
220	0.75	Test Failed

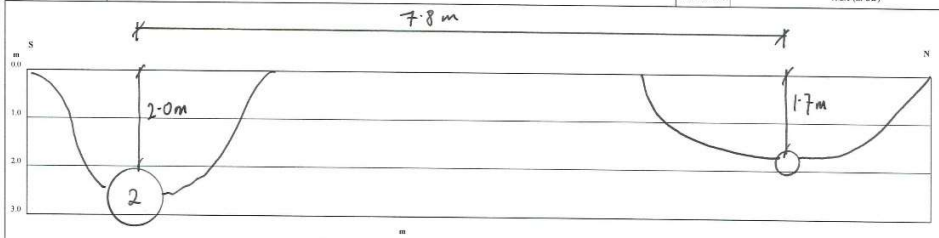
Test failed due to insufficient drop in water level to calculate infiltration value.

Appendix 5: Slit Trench Records

SLIT TRENCH RECORD - SLIT TRENCH ST01

Contract No.:	4040.11.13
Client:	Pinnacle
Site Address:	Saggart, Boherboy
Date Commenced:	11/12/2013
Date Completed:	12/12/2013
Logged by:	C Finnerty

Survey Point: Peg	
E	304695.00
N	226322.00
Ground Level	132.6 (m OD)



Trench Profile: (m)

Topsoil	0-6.3

Zero taken at	Trench Edge
Start of ST	0.00
End of ST	3.1+3.2
ST Length	6.30
Max Depth	2.00
Facing Direction	S-N
Width of ST	0.40

Notes
Slit trench completed in two separate trenches to minimise disturbance
Services marked with stakes and surveyed by Land Surveys Ltd
First to moderate seepage at 1.5m BGL

Pipe No.	ø (mm)	Colour - Material	Utility	Depth	Distance from zero	Angle
1	600 (24")	Grey Cast Iron	Water	1.70	0.00	90
2	1200	Concrete	Water	2.00	7.80	90

Soil Profile:

From (m)	To (m)	Description
0.00	0.30	Topsoil
0.30	1.70	Made Ground: Soft to firm brown and black slightly sandy gravelly CLAY with occasional cobbles and boulders

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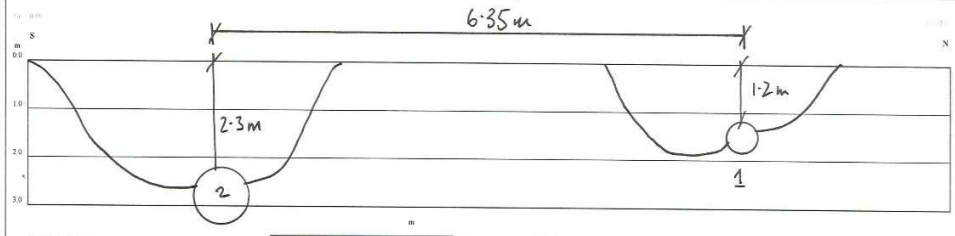
Tel: 353-1-601-5176
Fax: 353-1-601-5175
Email: info@gii.ie

SLIT TRENCH RECORD - SLIT TRENCH ST02

Contract No.:	4040.11.13
Client:	Pinnacle
Site Address:	Saggart, Boherboy
Date Commenced:	10/12/2013
Date Completed:	10/12/2013
Logged by:	C Finnerty

Survey Point: Peg	
E	304981.00
N	226360.00
Ground Level	136 (m OD)



Trench Profile: (m)

Topsoil	0-6.6

Zero taken at	Trench Edge
Start of ST	0.00
End of ST	3.4+3.0
ST Length	6.60
Max Depth	2.40
Facing Direction	S-N
Width of ST	0.40

Notes
Slit trench completed in two separate trenches to minimise disturbance
Services marked with stakes and surveyed by Land Surveys Ltd

Pipe No.	ø (mm)	Colour - Material	Utility	Depth	Distance from zero	Angle
1	600 (24")	Grey Cast Iron	Water	1.20		90
2	1200	Concrete	Water	2.30		90

Soil Profile:

From (m)	To (m)	Description
0.00	0.30	Topsoil
0.30	2.30	Made Ground: Soft to firm brown and black slightly sandy gravelly CLAY with occasional cobbles and boulders
0.00	0.30	Topsoil
0.30	1.70	Firm to stiff brown slightly sandy gravelly CLAY with with occasional cobbles and boulders
1.70	2.00	Stiff black slightly sandy gravelly CLAY with occasional cobbles and boulders

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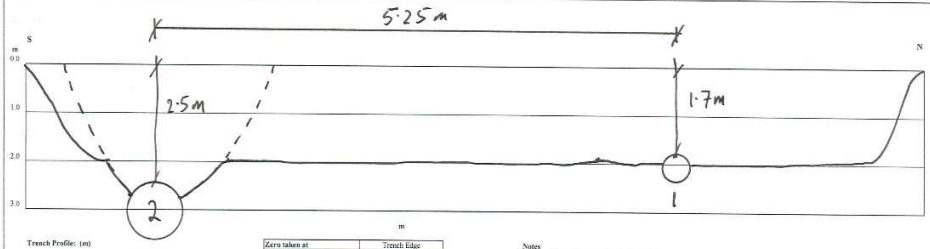
Tel: 353-1-601-5176
Fax: 353-1-601-5175
Email: info@gii.ie

SLIT TRENCH RECORD - SLIT TRENCH ST03

Contract No.:	4040.11.13
Client:	Pinnacle
Site Address:	Saggart, Boherboy
Date Commenced:	10/12/2013
Date Completed:	10/12/2013
Logged by:	C Finnerty

Survey Point: Peg	
E	304981.00
N	226360.00
Ground Level	133.84 (m OD)



Trench Profile: (m)

Topsoil	0-14.8

Zero taken at	Trench Edge
Start of ST	0.00
End of ST	14.80
ST Length	14.80
Max Depth	2.50
Facing Direction	S-N
Width of ST	0.40

Notes
Trench collapse between 8 - 11m in Made Ground
Slit trench completed in two separate trenches
Services marked with stakes and surveyed by Land Surveys Ltd

Pipe No.	ø (mm)	Colour - Material	Utility	Depth	Distance from zero	Angle
1	600 (24")	Grey Cast Iron	Water	1.70	0.00	90
2	1200	Concrete	Water	2.50	5.25	90

Soil Profile:

From (m)	To (m)	Description
0.00	0.30	Topsoil
0.30	2.50	Made Ground: Soft to firm brown and black slightly sandy gravelly CLAY with occasional cobbles and boulders
0.00	0.30	Topsoil
0.30	2.00	Firm to stiff brown slightly sandy gravelly CLAY with occasional cobbles and boulders

GROUND INVESTIGATIONS IRELAND

Tel: 353+1-601-5176
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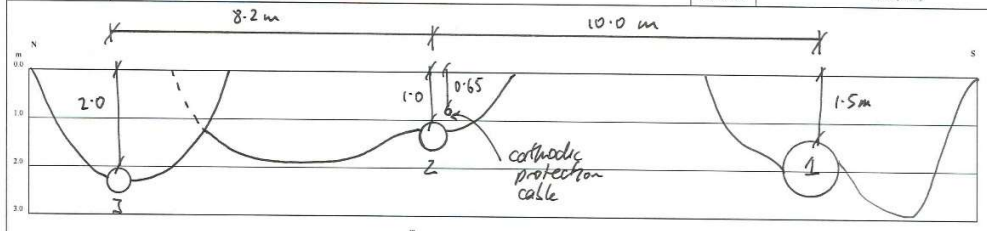
Email: info@gii.ie

SLIT TRENCH RECORD - SLIT TRENCH ST04

Contract No.:	4040.11.13
Client:	Pinnacle
Site Address:	Saggart, Boherboy
Date Commenced:	12/12/2013
Date Completed:	12/12/2013
Logged by:	C Finnerty

Survey Point: Trench Edge	
E	304706.00
N	226445.00
Ground Level	126.49 (m OD)



Trench Profile: (m)

Topsoil	0-13.5

Zero taken at	Trench Edge
Start of ST	0.00
End of ST	4+10.5=14.1
ST Length	13.50
Max Depth	2.00
Facing Direction	N-S
Width of ST	0.40

Notes
Three separate trenches excavated to maximise disturbance
Dimensions between services taken as straight line
Services marked with stakes and surveyed by Land Surveys Ltd
Variable seepage between 1.5 at 1.8m BGL

Pipe No.	ø (mm)	Colour - Material	Utility	Depth	Distance from zero	Angle
1	1200	Concrete	Water	1.50	0.00	90
2	675 (27")	Black bitumen coated steel	Water	1.60	10.00	90
3	600 (24")	Asbestos concrete	Water	2.00	18.20	90

Soil Profile:

From (m)	To (m)	Description
0.00	0.30	Topsoil
0.30	1.20	Made Ground: Soft dark brown & black slightly sandy slightly gravelly SILTY CLAY
		Lens of orange & white laminated slightly gravelly silty SAND encountered in centre trench
		Ground conditions variable over three trenches
		Trench collapsing due to seepage in backfill material

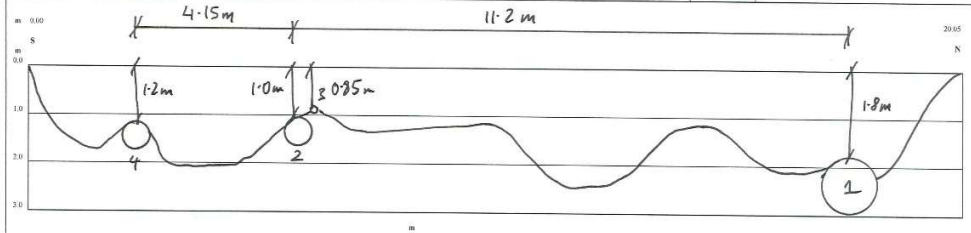
GROUND INVESTIGATIONS IRELAND

Tel: 353+1-601-5176
Fax: 353+1-601-5175
Email: info@gii.ie

SLIT TRENCH RECORD - SLIT TRENCH ST05

Contract No.:	4040.11.13
Client:	Pinnacle
Site Address:	Saggart, Boherboy
Date Commenced:	11/12/2013
Date Completed:	11/12/2013
Logged by:	C Finnerty

Survey Point: Peg	
E	304820.00
N	226516.00
Ground Level	126.5 (m OD)



Trench Profile: (m)

Topsoil	0-20.05

Zero taken at	Trench edge
Start of ST	0.00
End of ST	20.05
ST Length	20.05
Max Depth	2.40
Facing Direction	N-S
Width of ST	0.40

Notes
Trench changed direction as noted above
Dimensions between services taken as straight line
Two separate trenches excavated to locate services
Services marked with stakes and surveyed by Land Surveys Ltd

Pipe No.	ø (mm)	Colour - Material	Utility	Depth	Distance from zero	Angle
1	1200	Concrete	Water	1.80		90
2	675 (27")	Black bitumen coated steel	Water	1.00		90
3	25 (1")	Steel braided cable	Cathodic protection	0.85		90
4	600 (24")	Asbestos concrete	Water	1.20		90

Soil Profile:

From (m)	To (m)	Description
0.00	0.30	Topsoil
0.30	1.80	Made Ground: Soft to firm brown and black slightly sandy gravelly CLAY with occasional cobbles and boulders
0.00	0.40	Topsoil
0.40	0.47	Black Peat
0.47	0.80	Light brown mottled slightly sandy slightly gravelly CLAY/SILT
0.80	2.40	Firm to stiff dark grey slightly sandy slightly gravelly CLAY with occasional cobbles

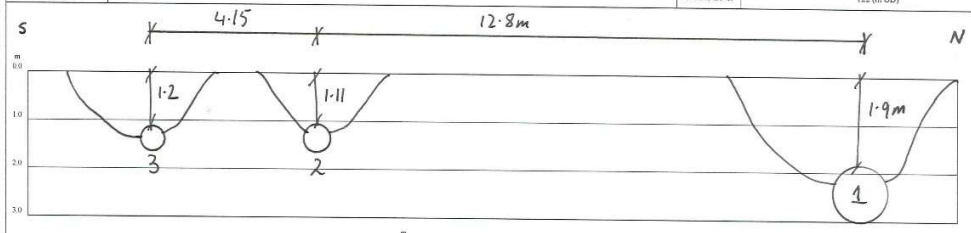
GROUND INVESTIGATIONS IRELAND

Tel: 353-1-601-5176
Fax: 353-1-611-5175
Email: info@gii.ie

SLIT TRENCH RECORD - SLIT TRENCH ST06

Contract No.:	4040.11.13
Client:	Pinnacle
Site Address:	Saggart, Boherboy
Date Commenced:	11/12/2013
Date Completed:	11/12/2013
Logged by:	C Finnerty

Survey Point: Trench Edge	
E	304894.00
N	226570.00
Ground Level	122 (m OD)



Trench Profile: (m)

Topsoil	0-8.4

Zero taken at	Trench Edge
Start of ST	0.00
End of ST	2.8+2.7=2.9
ST Length	8.40
Max Depth	1.90
Facing Direction	N-S
Width of ST	0.40

Notes
Three separate trenches excavated to minimise disturbance
Dimensions between services taken as straight line
Services marked with stakes and surveyed by Land Surveys Ltd
Slow seepage at 1.0m BGL

Pipe No.	ø (mm)	Colour - Material	Utility	Depth	Distance from zero	Angle
1	1200	Concrete	Water	1.90	0.00	90
2	675 (27")	Black bitumen coated steel	Water	1.11	12.80	90
3	600 (24")	Asbestos concrete	Water	1.20	16.95	90

Soil Profile:

From (m)	To (m)	Description
0.00	0.40	Topsoil
0.40	0.60	Soft grey brown slightly sandy slightly gravelly SILT/CLAY
0.60	1.00	Soft dark brown pseudo fiberous PEAT
1.00	1.45	Loose greenish grey mottled slightly silty sa GRAVEL
1.45	1.90	Soft grey brown slightly sandy CLAY/SILT
		Ground conditions variable over three trenches

GROUND INVESTIGATIONS IRELAND

Tel: 353-1-601-5176
Fax: 353-1-611-5175
Email: info@gii.ie

Appendix 6: Laboratory Test Results

National Materials Testing Laboratory Ltd.

SUMMARY OF TEST RESULTS

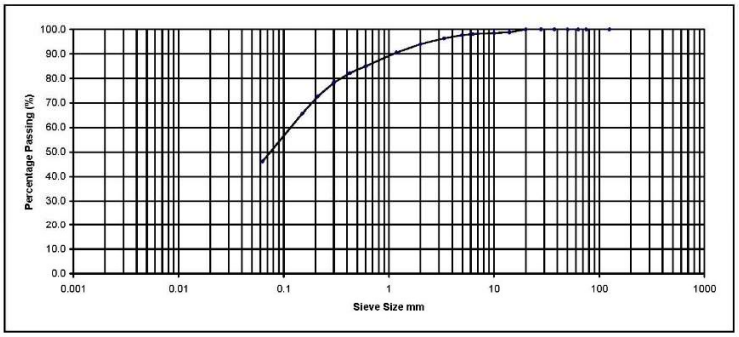
			Particle			Index Properties		Bulk	Cell	Undrained Triaxial Tests		Shear Strength	
BH/TP	Depth	Moisture	Density	<425um	LL	PL	PI	Density	Presssure	Compressive	Strain at	Cu	Mode of
No	m	%	Mg/m3	%	%	%	%	Mg/m3	kPa	Stress kPa	Failure %	kPa	Failure
TP1	1.50			82.2	26	20	6						
TP1	2.70	20.0											
TP2	1.00			52.8	23	15	8						
TP2	2.50	10.1											
TP3	1.00-2.00			45.2	29	17	12						
TP4	1.50-2.00			46.2	32	17	15						
TP5	2.00			87.7	25	17	8						
TP6	1.00			42.5	48	27	21						
TP7	1.50			45.4	30	18	12						
NMTL	Notes :									Job ref No.	NMTL1034		Table
	1. All BS tests carried out using preferred (definitive) method unless otherwise stated.									Location	Saggart - 4040-11-13		

NMTL Ltd

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	98.9
10.000	98.5
6.300	98.1
5.000	97.7
3.350	96.4
2.000	94.0
1.180	90.6
0.600	85.0
0.425	82.2
0.300	78.2
0.212	72.8
0.150	65.7
0.063	46.2

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
0.0		46.2			47.8			6.0		0.0	0.0

Sample Description	Brown slightly gravelly sandy clayey SILT.							Project No.	NMTL1034
								BH/TP No.	TP1
Project	Saggart - 4040-11-13							Sample No.	B
Operator	TZR	Checked	Nc	Approved	Bc	Date sample tested	07/01/2014	Depth	1.50m

NM TL Ltd

NMTL Ltd

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	90.4
50.000	90.4
37.500	88.5
28.000	87.2
20.000	85.8
14.000	83.5
10.000	82.3
6.300	80.4
5.000	79.8
3.350	78.9
2.000	77.9
1.180	76.8
0.600	75.1
0.425	74.0
0.300	72.3
0.212	69.3
0.150	65.1
0.063	55.4

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
0.0		55.4			22.5			12.5		9.6	0.0

Sample Description: Brown slightly gravelly sandy silty CLAY with cobbles

Project: Saggart - 4040-11-13

Operator	TZR	Checked	Nc	Approved	Bc	Date sample tested	07/01/2014

Project No.	NMTL1034
BH/TP No.	TP1
Sample No.	B
Depth	2.70m

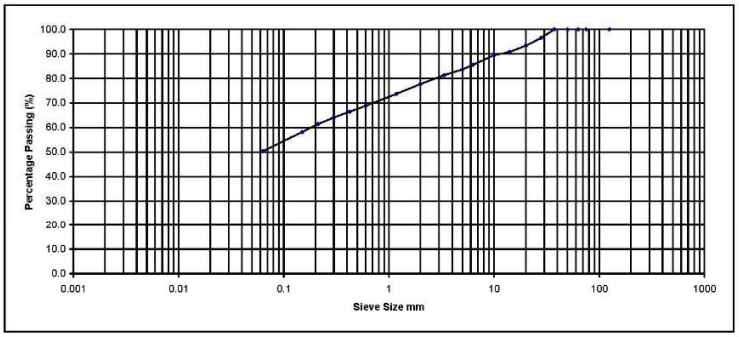
NM TL Ltd

NMTL Ltd

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	96.5
20.000	93.4
14.000	90.8
10.000	89.5
6.300	85.6
5.000	83.6
3.350	81.3
2.000	77.7
1.180	73.7
0.600	68.8
0.425	66.5
0.300	64.1
0.212	61.4
0.150	58.2
0.063	50.3

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
0.0		50.3			27.4			22.3		0.0	0.0

Sample Description	Dark grey sandy slightly gravelly sily CLAY.							Project No.	NMTL1034
								BH/TP No.	TP2
Project	Saggart - 4040-11-13							Sample No.	B
Operator	TZR	Checked	Nc	Approved	Bc	Date sample tested	07/01/2014	Depth	2.50m

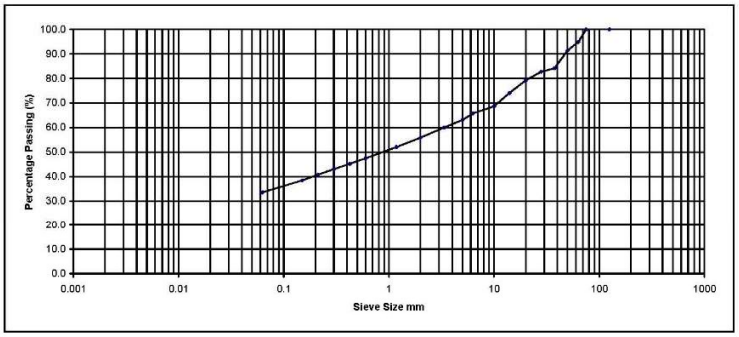
NM TL Ltd

NMTL Ltd

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	94.8
50.000	91.3
37.500	84.1
28.000	82.7
20.000	79.2
14.000	74.1
10.000	68.6
6.300	65.8
5.000	63.1
3.350	60.0
2.000	55.9
1.180	52.0
0.600	47.5
0.425	45.2
0.300	43.1
0.212	40.8
0.150	38.4
0.063	33.6

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
0.0		33.6			22.3			38.9		5.2	0.0

Sample Description: Brown sandy gravelly clayey SILT with some cobbles.

Project: Saggart - 4040-11-13

Operator	TZR	Checked	Nc	Approved	Bc	Date sample tested	07/01/2014

Project No.	NMTL1034
BH/TP No.	TP3
Sample No.	LB
Depth	1.00-2.00m

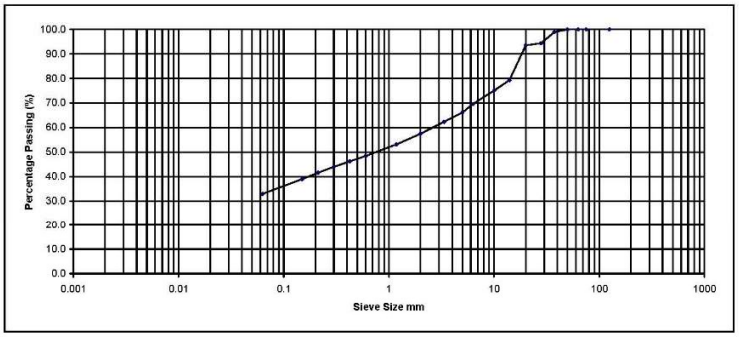
NM TL Ltd

NMTL Ltd

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	98.9
28.000	94.4
20.000	93.5
14.000	79.3
10.000	75.0
6.300	69.6
5.000	66.1
3.350	62.3
2.000	57.5
1.180	53.1
0.600	48.4
0.425	46.2
0.300	44.0
0.212	41.6
0.150	38.9
0.063	32.9

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
0.0		32.9			24.5			42.5		0.0	0.0

Sample Description	Brown very sandy clayey silty GRAVEL.							Project No.	NMTL1034
								BH/TP No.	TP4
Project	Saggart - 4040-11-13							Sample No.	LB
Operator	TZR	Checked	Nc	Approved	Bc	Date sample tested	07/01/2014	Depth	1.50-2.00m

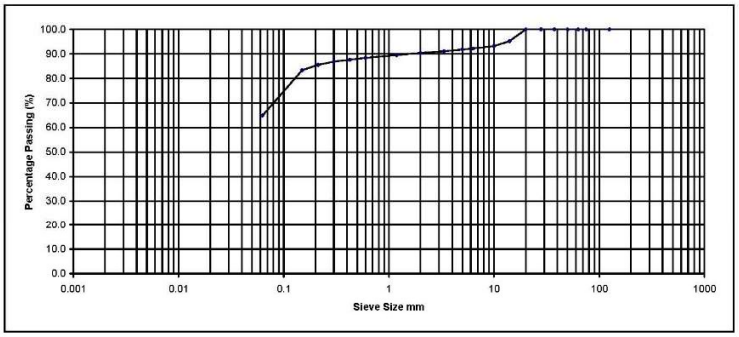
NM TL Ltd

NMTL Ltd

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	100.0
20.000	100.0
14.000	95.2
10.000	93.2
6.300	92.3
5.000	91.8
3.350	91.1
2.000	90.4
1.180	89.5
0.600	88.4
0.425	87.7
0.300	86.9
0.212	85.6
0.150	83.4
0.063	64.9

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
0.0		64.9			25.5			9.6		0.0	0.0

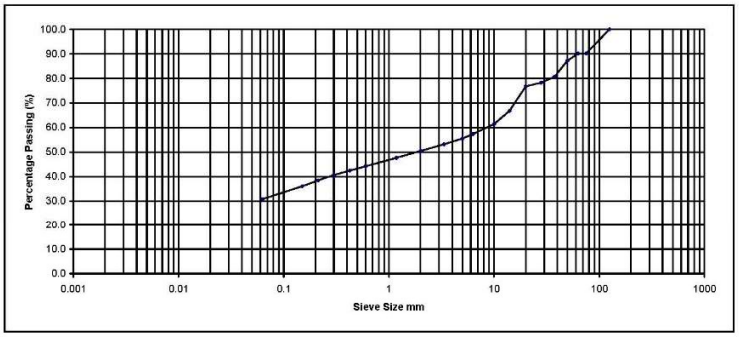
Sample Description	Brown slightly gravelly slightly sandy silty CLAY					Project No.	NMTL1034
						BH/TP No.	TP5
Project	Saggart - 4040-11-13					Sample No.	LB
Operator	TZR	Checked	Nc	Approved	Bc	Date sample tested	07/01/2014	Depth	2.00m

NMTL Ltd

Sieve Size mm	% Passing
125.000	100.0
75.000	90.2
63.000	90.2
50.000	87.3
37.500	80.6
28.000	78.3
20.000	76.8
14.000	66.8
10.000	61.4
6.300	57.3
5.000	55.5
3.350	53.2
2.000	50.5
1.180	47.6
0.600	44.2
0.425	42.5
0.300	40.6
0.212	38.5
0.150	36.0
0.063	30.8

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
0.0		30.8			19.6			39.8		9.8	0.0

Sample Description: Brown sandy clayey silty GRAVEL with cobbles

Project: Saggart - 4040-11-13

Operator	TZR	Checked	Nc	Approved	Bc	Date sample tested	07/01/2014

Project No.	NMTL1034
BH/TP No.	TP6
Sample No.	LB
Depth	1.00m

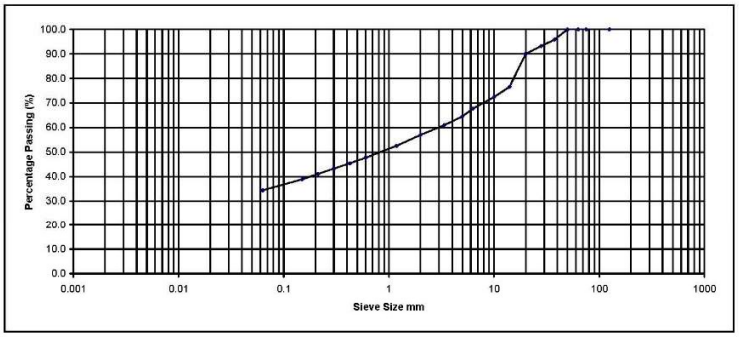
NM TL Ltd

NMTL Ltd

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	95.8
28.000	93.2
20.000	90.0
14.000	76.5
10.000	72.4
6.300	67.7
5.000	64.5
3.350	61.0
2.000	57.0
1.180	52.6
0.600	47.7
0.425	45.4
0.300	43.3
0.212	41.1
0.150	38.9
0.063	34.4

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
		Silt			Sand			Gravel			
0.0		34.4			22.6			43.0		0.0	0.0

Sample Description	Brown sandy clayey silty GRAVEL					Project No.	NMTL1034
						BH/TP No.	TP7
Project	Saggart - 4040-11-13					Sample No.	LB
Operator	TZR	Checked	Nc	Approved	Bc	Date sample tested	07/01/2014	Depth	1.50m

NM TL Ltd

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description: Firm grey brown gravelly very sandy silty clay

Date: 8-Jan-14

Test Method: BS 1377: Part 4 : 1990 : 7.4

Force Measuring Device: VJT-08211 — Test 1

Preparatio Remoulded with 2.5 kg rammer at natural moisture content

Surcharge: 10 kPa — Mean Calibration: 4.19 kN/Div

Penetration of plunger mm | Force Gauge reading divisions Top | Bottom | Force on plunger kN Top | Bottom

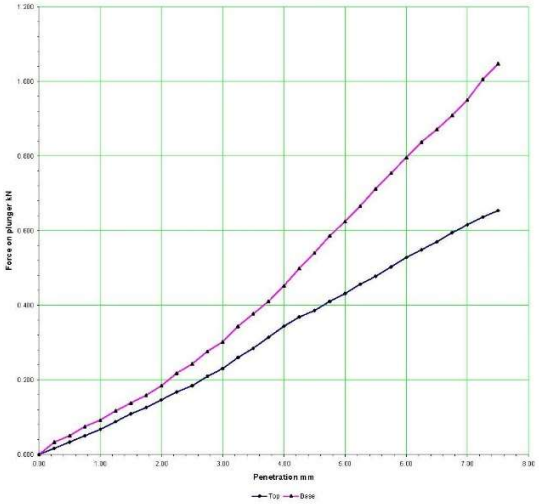
Penetration of plunger mm	Force Gauge reading divisions Top	Force Gauge reading divisions Bottom	Force on plunger kN Top	Force on plunger kN Bottom
0.00	0.0	0.0	0.000	0.000
0.25	4.0	0.0	0.017	0.004
0.50	8.0	12.0	0.034	0.050
0.75	12.0	18.0	0.050	0.075
1.00	16.0	22.0	0.067	0.092
1.25	21.0	28.0	0.088	0.117
1.50	26.0	33.0	0.109	0.138
1.75	30.0	38.0	0.126	0.159
2.00	35.0	44.0	0.147	0.184
2.25	40.0	52.0	0.169	0.218
2.50	**44.0**	**59.0**	**0.184**	**0.247**
2.75	50.0	66.0	0.210	0.277
3.00	55.0	72.0	0.230	0.302
3.25	62.0	82.0	0.260	0.344
3.50	68.0	90.0	0.285	0.377
3.75	75.0	98.0	0.314	0.411
4.00	82.0	108.0	0.344	0.453
4.25	88.0	118.0	0.369	0.495
4.50	92.0	129.0	0.385	0.541
4.75	98.0	140.0	0.411	0.587
5.00	**103.0**	**149.0**	**0.432**	**0.624**
5.25	108.0	159.0	0.457	0.666
5.50	114.0	170.0	0.478	0.712
5.75	120.0	180.0	0.503	0.754
6.00	126.0	190.0	0.528	0.796
6.25	131.0	200.0	0.549	0.838
6.50	136.0	208.0	0.570	0.872
6.75	142.0	217.0	0.595	0.909
7.00	147.0	227.0	0.616	0.951
7.25	152.0	240.0	0.637	1.006
7.50	158.0	250.0	0.662	1.048

CBR Top	CBR Base
1.40	**1.84**
2.16	**3.12**

Moisture content after test

Container No.		Top Tray	Middle Tray	Base Tray
Mass of wet soil + container	g	1768.80	1838.50	2092.10
Mass of dry soil + container	g	1610.87	1671.80	1881.30
Weight of container	g	145.10	166.30	141.10
Mass of moisture	g	165.93	166.70	200.80
Dry weight	g	1465.77	1505.50	1750.20
Moisture content	%	10.84	11.07	11.47

Specimen wt g: 6275
Diameter mm: 152
Length mm: 127.0
Average MC %: 11.09
Density Mg/m3: 2.28
Dry Density Mg/m3: 2.06



NMTL

Project: Saggart

		Date	Project No.	NMTL1004
Operator	DC	8-Jan-14	Trial Pit No.	TP4
Checked	NC		Sample No.	B
Approved	BC		Depth	1.00m

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description: Firm brown slightly gravelly slightly sandy silty clay

Date: 8-Jan-14

Test Method: BS 1377: Part 4 : 1990 : 7.4

Force Measuring Device: VJT-08211 — Test 1

Preparatio Remoulded with 2.5 kg rammer at natural moisture content

Surcharge: 10 kPa — Mean Calibration: 4.19 kN/Div

Force on plunger: 4.19 kN/Div

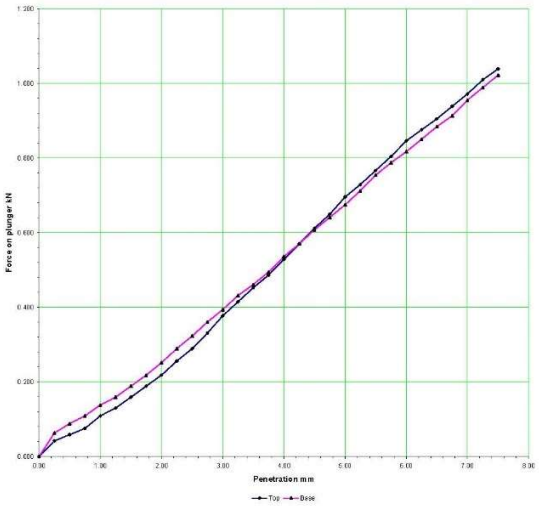
Penetration of plunger mm	Force Gauge reading divisions Top	Bottom	Force on plunger kN Top	Bottom
0.00	0.0	0.0	0.000	0.000
0.25	10.0	15.0	0.042	0.063
0.50	14.0	21.0	0.059	0.088
0.75	18.0	26.0	0.075	0.109
1.00	26.0	33.0	0.109	0.139
1.25	31.0	39.0	0.130	0.159
1.50	38.0	45.0	0.159	0.188
1.75	45.0	52.0	0.189	0.218
2.00	52.0	60.0	0.218	0.251
2.25	61.0	69.0	0.256	0.289
2.50	**69.0**	**77.0**	**0.289**	**0.323**
2.75	79.0	86.0	0.331	0.360
3.00	90.0	94.0	0.377	0.394
3.25	99.0	103.0	0.415	0.432
3.50	108.0	110.0	0.453	0.461
3.75	116.0	118.0	0.486	0.494
4.00	128.0	128.0	0.536	0.536
4.25	136.0	136.0	0.570	0.570
4.50	148.0	145.0	0.812	0.608
4.75	155.0	153.0	0.649	0.641
5.00	**166.0**	**161.0**	**0.696**	**0.675**
5.25	174.0	170.0	0.729	0.712
5.50	183.0	180.0	0.767	0.754
5.75	192.0	188.0	0.804	0.788
6.00	202.0	195.0	0.846	0.817
6.25	209.0	203.0	0.876	0.851
6.50	216.0	211.0	0.905	0.884
6.75	224.0	218.0	0.939	0.913
7.00	232.0	228.0	0.972	0.955
7.25	241.0	236.0	1.010	0.989
7.50	248.0	244.0	1.039	1.022

		Top	Middle	Base
Moisture content after test				
Container No.		Tray	Tray	Tray
Mass of wet soil + container	g	1741.70	2084.70	1959.80
Mass of dry soil + container	g	1565.59	1905.00	1769.06
Weight of container	g	148.70	197.40	186.70
Mass of moisture	g	160.11	179.40	171.54
Dry weight	g	1438.89	1717.90	1601.36
Moisture content	%	10.95	10.44	10.71

Specimen wt g	6270
Diameter mm	152
Length mm	127.0
Average MC %	10.67
Density Mg/m3	2.28
Dry Density Mg/m3	2.07

Bearing Ratio Results %

Top	Base
2.19	**2.44**
3.48	**3.37**



NMTL

Project: Saggart

		Date	Project No.	NMTL1004
Operator	DC	8-Jan-14	Trial Pit No.	TP7
Checked	NC		Sample No.	B
Approved	BK		Depth	1.00m

NATIONAL MATERIALS TESTING LABORATORY LTD.

DETERMINATION OF THE CALIFORNIA BEARING RATIO TEST
BS 1377 : PART 4 : CLAUSE 7 : 1990

Soil Description: Soft to firm grey brown very gravelly slightly sandy silty clay with cobbles

Date: 8-Jan-14

Test Method: BS 1377: Part 4 : 1990 : 7.4

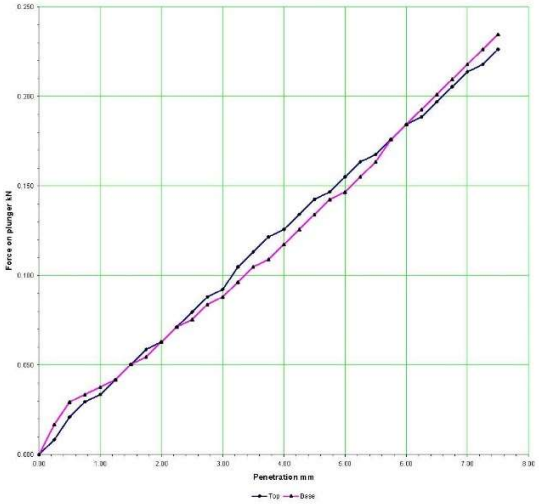
Force Measuring Device: VJT-08211 — Test 1

Preparatio Remoulded with 2.5 kg rammer at natural moisture content

Surcharge: 10 kPa — Mean Calibration: 4.19 kN/Div, 4.19 kN/Div

Penetration of plunger mm	Force Gauge reading divisions Top	Bottom	Force on plunger kN Top	Bottom	California Bearing Ratio Results % Top	Base
0.00	0.0	0.0	0.000	0.000		
0.25	2.0	4.0	0.008	0.017		
0.50	5.0	7.0	0.021	0.029		
0.75	7.0	8.0	0.029	0.034		
1.00	8.0	9.0	0.034	0.038		
1.25	10.0	10.0	0.042	0.042		
1.50	12.0	12.0	0.050	0.050		
1.75	14.0	13.0	0.059	0.054		
2.00	16.0	15.0	0.063	0.063		
2.25	17.0	17.0	0.071	0.071		
2.50	**19.0**	**18.0**	**0.080**	**0.075**	**0.60**	**0.57**
2.75	21.0	20.0	0.088	0.084		
3.00	22.0	21.0	0.092	0.088		
3.25	25.0	23.0	0.105	0.096		
3.50	27.0	25.0	0.113	0.105		
3.75	29.0	26.0	0.122	0.109		
4.00	30.0	28.0	0.126	0.117		
4.25	32.0	30.0	0.134	0.126		
4.50	34.0	32.0	0.142	0.134		
4.75	35.0	34.0	0.147	0.142		
5.00	**37.0**	**35.0**	**0.155**	**0.147**	**0.78**	**0.73**
5.25	39.0	37.0	0.163	0.155		
5.50	40.0	39.0	0.168	0.163		
5.75	42.0	42.0	0.176	0.176		
6.00	44.0	44.0	0.184	0.184		
6.25	46.0	46.0	0.193	0.193		
6.50	47.0	48.0	0.197	0.201		
6.75	49.0	50.0	0.205	0.210		
7.00	51.0	52.0	0.214	0.218		
7.25	52.0	54.0	0.218	0.226		
7.50	54.0	56.0	0.226	0.235		

Moisture content after test		Top	Middle	Base	Specimen wt g	6510
Container No.		Tray	Tray	Tray	Diameter mm	152
Mass of wet soil + container	g	1820.90	1895.30	1823.90	Length mm	127.0
Mass of dry soil + container	g	1617.80	1770.20	1621.41		
Weight of container	g	165.20	186.90	188.30		
Mass of moisture	g	203.30	225.10	202.49	Average MC %	14.11
Dry weight	g	1452.40	1684.30	1433.11	Density Mg/m3	2.39
Moisture content	%	14.00	14.21	14.13	Dry Density Mg/m3	2.10



NM TL Ltd

Project: Saggart

		Date	Project No.	NMTL1004
Operator	DC	8-Jan-14	Trial Pit No.	TP8
Checked	NC		Sample No.	UB
Approved	BK		Depth	1.00m

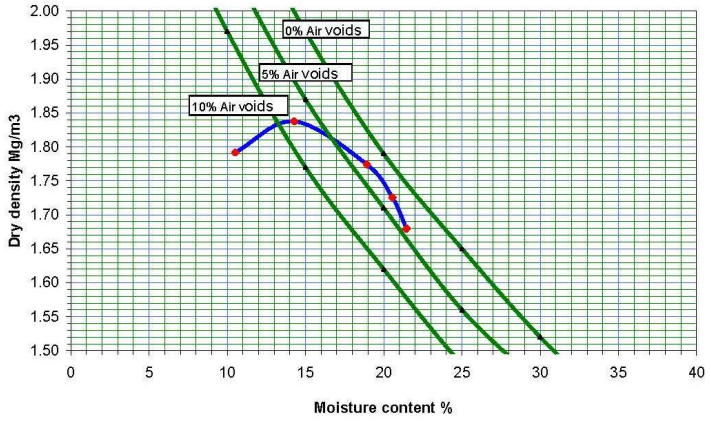
Determination of dry density / moisture content relationship

BS 1377: Part 4: 1990 : Clause 3.3

Location: Saggart - 4040-11-13

Soil description: **Brown slightly gravelly sandy silty CLAY with cobbles**

Test No.		1	2	3	4	5
Bulk Density	Mg/m3	1.98	2.10	2.11	2.08	2.04
Moisture Content	%	10.5	14.3	18.9	20.6	21.5
Dry Density	Mg/m3	1.79	1.84	1.77	1.73	1.68



Maximum Dry Density	1.84	Mg/m3	% passing 37.5 mm sieve	88.5
Optimum Moisture content	14.3	%	% passing 20 mm sieve	85.8
Particle Density	2.70	Assumed		
Natural Moisture content	10.50	%		

NM TL Ltd		Project: Saggart - 4040-11-13				Job No.	NMTL 1034
						Trial pit No.	TP1
						Sample No.	B
Operator	Dc	Checked	Nc	Approved	Bc	Depth m	2.70m

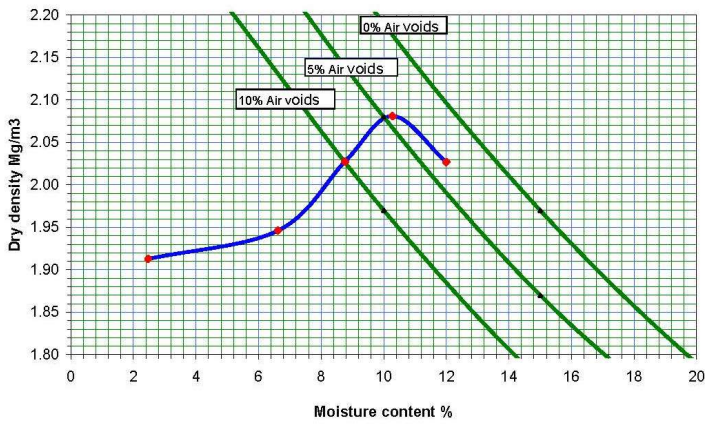
Determination of dry density / moisture content relationship

BS 1377: Part 4: 1990 : Clause 3.3

Location: Saggart - 4040-11-13

Soil description: **Firm dark grey slightly gravelly slightly sandy silty clay**

Test No.		1	2	3	4	5
Bulk Density	Mg/m3	1.96	2.08	2.21	2.30	2.27
Moisture Content	%	2.5	6.6	8.8	10.3	12.0
Dry Density	Mg/m3	1.91	1.95	2.03	2.08	2.03



Maximum Dry Density	2.08	Mg/m3	% passing 37.5 mm sieve	100
Optimum Moisture content	10.3	%	% passing 20 mm sieve	87.7
Particle Density	2.70	Assumed		
Natural Moisture content	10.28	%		

NM TL Ltd		Project: Saggart - 4040-11-13				Job No.	NMTL 1034
						Trial pit No.	TP2
						Sample No.	B
Operator	Dc	Checked	Nc	Approved	Bc	Depth m	1.00m

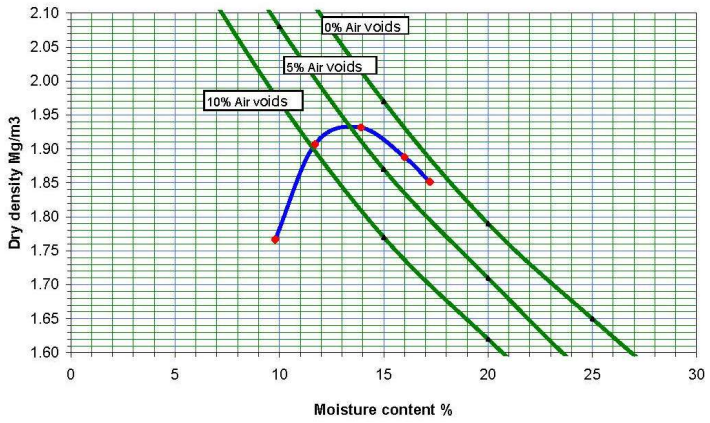
Determination of dry density / moisture content relationship

BS 1377: Part 4: 1990 : Clause 3.3

Location: Saggart - 4040-11-13

Soil description: **Dark grey slightly gravelly sandy silty clay**

Test No.		1	2	3	4	5
Bulk Density	Mg/m3	1.94	2.13	2.20	2.19	2.17
Moisture Content	%	9.8	11.7	13.9	16.0	17.2
Dry Density	Mg/m3	1.77	1.91	1.93	1.89	1.85



Maximum Dry Density	1.93	Mg/m3	% passing 37.5 mm sieve	100
Optimum Moisture content	13.9	%	% passing 20 mm sieve	96.5
Particle Density	2.70	Assumed		
Natural Moisture content	13.90	%		

NM TL Ltd		Project: Saggart - 4040-11-13				Job No.	NMTL 1034
						Trial pit No.	TP2
						Sample No.	B
Operator	Dc	Checked	Nc	Approved	Bc	Depth m	2.50m

Jones Environmental Laboratory

Unit 3 Deeside Point
Zone 3
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Deeside
CH5 2UA

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Fax: +44 (0) 1244 833781

Ground Investigations Ireland
The Grange
12th Lock Road
Lucan
Ireland

Attention :	Conor Finnerty
Date :	8th January, 2014
Your reference :	4040-11-13
Our reference :	Test Report 13/11991 Batch 1
Location :	Saggart
Date samples received :	20th December, 2013
Status :	Final report
Issue :	1

Six samples were received for analysis on 20th December, 2013. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Where Waste Acceptance Criteria Suite (EC Decision of 19 December 2002 (2003/33/EC)) has been requested, all analyses have been performed using the relevant EN methods where they exist.

Compiled By:

Phil Sommerton BSc
Project Manager

Bob Millward BSc FRSC
Principal Chemist

Jones Environmental Laboratory

Client Name: Ground Investigations Ireland
Reference: 4040-11-13
Location: Saggart
Contact: Conor Finnerty
JE Job No.: 13/11991

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1	2	3	4	5	6							
Sample ID	TP1 0.9	TP2 0.5	TP4 1.0	TP8 1.0-1.1	TP7 1.0-1.5	TP6 1.5							
Depth	0.9	0.5	1.0	1.0-1.1	1.0-1.5	1.5							
COC No / misc													
Containers	T	T	T	T	T	T							
Sample Date	<>	<>	<>	<>	<>	<>							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	1	1	1	1	1	1							
Date of Receipt	20/12/2013	20/12/2013	20/12/2013	20/12/2013	20/12/2013	20/12/2013							
											LOD	Units	Method No.
PAH MS													
Naphthalene#	<0.04	<0.04	-	<0.04	<0.04	-					<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	-	<0.03	<0.03	-					<0.03	mg/kg	TM4/PM8
Acenaphthene#	<0.05	<0.05	-	<0.05	<0.05	-					<0.05	mg/kg	TM4/PM8
Fluorene#	<0.04	<0.04	-	<0.04	<0.04	-					<0.04	mg/kg	TM4/PM8
Phenanthrene#	<0.03	<0.03	-	<0.03	<0.03	-					<0.03	mg/kg	TM4/PM8
Anthracene#	<0.04	<0.04	-	<0.04	<0.04	-					<0.04	mg/kg	TM4/PM8
Fluoranthene#	<0.03	<0.03	-	<0.03	<0.03	-					<0.03	mg/kg	TM4/PM8
Pyrene#	<0.03	<0.03	-	<0.03	<0.03	-					<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene#	<0.06	<0.06	-	<0.06	<0.06	-					<0.06	mg/kg	TM4/PM8
Chrysene#	<0.02	<0.02	-	<0.02	<0.02	-					<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene#	<0.07	<0.07	-	<0.07	<0.07	-					<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene#	<0.04	<0.04	-	<0.04	<0.04	-					<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene#	<0.04	<0.04	-	<0.04	<0.04	-					<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene#	<0.04	<0.04	-	<0.04	<0.04	-					<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene#	<0.04	<0.04	-	<0.04	<0.04	-					<0.04	mg/kg	TM4/PM8
Coronene	<0.04	<0.04	-	<0.04	<0.04	-					<0.04	mg/kg	TM4/PM8
PAH 6 Total#	<0.22	<0.22	-	<0.22	<0.22	-					<0.22	mg/kg	TM4/PM8
PAH 17 Total	<0.64	<0.64	-	<0.64	<0.64	-					<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05	-	<0.05	<0.05	-					<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02	-	<0.02	<0.02	-					<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	99	94	-	101	95	-					<0	%	TM4/PM8
Mineral Oil	<30	<30	-	<30	<30	-					<30	mg/kg	TM5/PM16
MTBE#	<5	<5	-	<5	<5	-					<5	ug/kg	TM31/PM12
Benzene#	<5	<5	-	<5	<5	-					<5	ug/kg	TM31/PM12
Toluene#	<5	<5	-	<5	<5	-					<5	ug/kg	TM31/PM12
Ethylbenzene#	<5	<5	-	<5	<5	-					<5	ug/kg	TM31/PM12
m/p-Xylene#	<5	<5	-	<5	<5	-					<5	ug/kg	TM31/PM12
o-Xylene#	<5	<5	-	<5	<5	-					<5	ug/kg	TM31/PM12
PCB 28#	<5	<5	-	<5	<5	-					<5	ug/kg	TM17/PM8
PCB 52#	<5	<5	-	<5	<5	-					<5	ug/kg	TM17/PM8
PCB 101#	<5	<5	-	<5	<5	-					<5	ug/kg	TM17/PM8
PCB 118#	<5	<5	-	<5	<5	-					<5	ug/kg	TM17/PM8
PCB 138#	<5	<5	-	<5	<5	-					<5	ug/kg	TM17/PM8
PCB 153#	<5	<5	-	<5	<5	-					<5	ug/kg	TM17/PM8
PCB 180#	<5	<5	-	<5	<5	-					<5	ug/kg	TM17/PM8
Total 7 PCBs#	<35	<35	-	<35	<35	-					<35	ug/kg	TM17/PM8
Mass of raw test portion	0.1038	0.1002	-	0.0999	0.1011	-						kg	NONE/PM17
Mass of dried test portion	0.09	0.09	-	0.09	0.09	-						kg	NONE/PM17

Jones Environmental Laboratory

Client Name: Ground Investigations Ireland
Reference: 4040-11-13
Location: Saggart
Contact: Conor Finnerty
JE Job No.: 13/11991

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1	2	3	4	5	6					LOD	Units	Method No.
Sample ID	TP1 0.9	TP2 0.5	TP4 1.0	TP8 1.0-1.1	TP7 1.0-1.5	TP6 1.5							
Depth	0.9	0.5	1.0	1.0-1.1	1.0-1.5	1.5							
COC No / misc													
Containers	T	T	T	T	T	T							
Sample Date	<>	<>	<>	<>	<>	<>							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	1	1	1	1	1	1							
Date of Receipt	20/12/2013	20/12/2013	20/12/2013	20/12/2013	20/12/2013	20/12/2013							
Natural Moisture Content	17.1	8.6	-	6.8	12.5	-					<0.1	%	PM4/PM0
% Dry Matter 105°C	86.3	90.0	-	89.7	88.8	-					<0.1	%	NONE/PM4
Sulphate as SO4 (2:1 Ext) #	<0.0015	<0.0015	<0.0015	0.0030	0.0019	<0.0015					<0.0015	g/l	TM38/PM20
Total Organic Carbon #	0.25	0.30	-	0.17	0.18	-					<0.02	%	TM21/PM24
pH #	8.68	8.80	8.54	8.78	8.68	8.60					<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

Jones Environmental Laboratory

Client Name: Ground Investigations Ireland
Reference: 4040-11-13
Location: Saggart
Contact: Conor Finnerty
JE Job No.: 13/11991

Report : MURPHY

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1	2	4	5												
Sample ID	TP1 0.9	TP2 0.5	TP8 1.0-1.1	TP7 1.0-1.5												
Depth	0.9	0.5	1.0-1.1	1.0-1.5												
COC No / misc																
Containers	T	T	T	T												
Sample Date	<>	<>	<>	<>												
Sample Type	Soil	Soil	Soil	Soil												
Batch Number	1	1	1	1												
Date of Receipt	20/12/2013	20/12/2013	20/12/2013	20/12/2013												
Solid Waste Analysis																
Total Organic Carbon#	0.25	0.30	0.17	0.18							3	5	6	<0.02	%	TM21/PM24
Sum of BTEX	<0.025	<0.025	<0.025	<0.025							6	-	-	<0.025	mg/kg	TM31/PM12
Sum of 7 PCBs#	<0.035	<0.035	<0.035	<0.035							1	-	-	<0.035	mg/kg	TM17/PM8
PAH Sum of 6#	<0.22	<0.22	<0.22	<0.22							-	-	-	<0.22	mg/kg	TM4/PM8
PAH Sum of 17	<0.64	<0.64	<0.64	<0.64							100	-	-	<0.64	mg/kg	TM4/PM8
CEN 10:1 Leachate																
Arsenic#	<0.025	<0.025	<0.025	<0.025							0.5	2	25	<0.025	mg/kg	TM30/PM17
Barium#	<0.03	0.04	<0.03	<0.03							20	100	300	<0.03	mg/kg	TM30/PM17
Cadmium#	<0.005	<0.005	<0.005	<0.005							0.04	1	5	<0.005	mg/kg	TM30/PM17
Chromium#	<0.015	<0.015	<0.015	<0.015							0.5	10	70	<0.015	mg/kg	TM30/PM17
Copper#	<0.07	<0.07	<0.07	<0.07							2	50	100	<0.07	mg/kg	TM30/PM17
Mercury#	<0.0001	0.0020	<0.0001	0.0007							0.01	0.2	2	<0.0001	mg/kg	TM61/PM38
Molybdenum#	0.07	<0.02	0.02	<0.02							0.5	10	30	<0.02	mg/kg	TM30/PM17
Nickel#	<0.02	<0.02	<0.02	<0.02							0.4	10	40	<0.02	mg/kg	TM30/PM17
Lead#	<0.05	<0.05	<0.05	<0.05							0.5	10	50	<0.05	mg/kg	TM30/PM17
Antimony#	<0.02	<0.02	<0.02	<0.02							0.06	0.7	5	<0.02	mg/kg	TM30/PM17
Selenium#	<0.03	<0.03	<0.03	<0.03							0.1	0.5	7	<0.03	mg/kg	TM30/PM17
Zinc#	<0.03	0.04	<0.03	<0.03							4	50	200	<0.03	mg/kg	TM30/PM17
Chloride	<3	<3	<3	<3							800	15000	25000	<3	mg/kg	TM27/PM0
Fluoride	<3	<3	<3	<3							10	150	500	<3	mg/kg	TM27/PM0
Sulphate as SO4	1.0	3.9	2.8	3.7							1000	20000	50000	<0.5	mg/kg	TM27/PM0
Total Dissolved Solids#	150	290	300	270							4000	60000	100000	<100	mg/kg	TM20/PM0
Dissolved Organic Carbon	<20	30	<20	40							500	800	1000	<20	mg/kg	TM60/PM0
Mass of raw test portion	0.1038	0.1002	0.0999	0.1011							-	-	-		kg	NONE/PM17
Dry Matter Content Ratio	86.3	90.0	89.7	88.8							-	-	-	<0.1	%	NONE/PM4
Leachant Volume	0.886	0.89	0.89	0.889							-	-	-		l	NONE/PM17
Eluate Volume	0.48	0.3	0.48	0.5							-	-	-		l	NONE/PM17
Mineral Oil	<30	<30	<30	<30							-	-	-	<30	mg/kg	TM5/PM16
Phenol	<0.1	<0.1	<0.1	<0.1							-	-	-	<0.1	mg/kg	TM26/PM0

Client Name: Ground Investigations Ireland
Reference: 4040-11-13
Location: Saggart
Contact: Conor Finnerty

Matrix : Solid

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
13/11991	1	TP1 0.9	0.9	1	All analyses	No sampling date given
13/11991	1	TP2 0.5	0.5	2	All analyses	No sampling date given
13/11991	1	TP4 1.0	1.0	3	All analyses	No sampling date given
13/11991	1	TP8 1.0-1.1	1.0-1.1	4	All analyses	No sampling date given
13/11991	1	TP7 1.0-1.5	1.0-1.5	5	All analyses	No sampling date given
13/11991	1	TP6 1.5	1.5	6	All analyses	No sampling date given

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

Jones Environmental Laboratory — Notification of Deviating Samples

Client Name: Ground Investigations Ireland
Reference: 4040-11-13
Location: Saggart
Contact: Conor Finnerty

Matrix : CEN 10:1 1 Batch

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 13/11991

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

NOTE

Data is only accredited when all the requirements of our Quality System have been met. In certain circumstances where the requirements have not been met, the laboratory may issue the data in an interim report but will remove the accreditation, in this instance results should be considered indicative only. Where possible samples will be re-extracted and a final report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance.
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
CO	Suspected carry over
OC	Outside Calibration Range
NFD	No Fibres Detected

JE Job No: 13/11991

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Air Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
TM4	16 PAH by GC-MS, modified USEPA 8270	PM8	In-house method based on USEPA 3510. ISO 17025 accredited extraction method for organic extraction from solid samples using an end over end agitator.			AR	Yes
TM4	16 PAH by GC-MS, modified USEPA 8270	PM8	In-house method based on USEPA 3510. ISO 17025 accredited extraction method for organic extraction from solid samples using an end over end agitator.	Yes		AR	Yes
TM5	In-House method based on USEPA 8015D. Determination of Extractable Petroleum Hydrocarbons (EPH) in the carbon chain length range of C8-40 by GC-FID. Accredited to ISO 17025 on soil and water samples and MCERTS (carbon banding only) on soils. All accreditation is matrix specific.	PM16	Aliphatic/Aromatic fractionation			AR	Yes
TM17	PCB 7 Congeners and WHO 12 PCBs by GC-MS	PM8	In-house method based on USEPA 3510. ISO 17025 accredited extraction method for organic extraction from solid samples using an end over end agitator.	Yes		AR	Yes
TM20	TDS, TSS and TS - gravimetric	PM0	No preparation is required.	Yes		AR	Yes
TM21	TOC and TC by Combustion	PM24	Eltra preparation	Yes		AD	Yes
TM26	Phenols by HPLC	PM0	No preparation is required.			AR	Yes
TM27	In-House method based on USEPA 9056. Analysis of samples using a Dionex Ion-Chromatograph instrument.	PM0	No preparation is required.			AR	Yes
TM30	Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry) using Thermo iCAP 6000 series instrument. Accredited to ISO 17025 for soils and waters and MCERTS accredited for Soils. All accreditation is matrix specific.	PM17	CEN PR12457-2 10:1 1 batch leach	Yes		AR	Yes

JE Job No: 13/11991

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Air Dried (AD)	Reported on dry weight basis
TM31	In-house method based on USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID. Accredited to ISO 17025 for soils and waters and MCERTS accredited for soils. Accreditation is matrix specific.	PM12	In-house method based on USEPA 5021. Preparation of solid and liquid samples for headspace analysis. Samples are spiked with surrogates to facilitate quantification. ISO 17025 accredited extraction method. All accreditation is matrix specific			AR	Yes
TM31	In-house method based on USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID. Accredited to ISO 17025 for soils and waters and MCERTS accredited for soils. Accreditation is matrix specific.	PM12	In-house method based on USEPA 5021. Preparation of solid and liquid samples for headspace analysis. Samples are spiked with surrogates to facilitate quantification. ISO 17025 accredited extraction method. All accreditation is matrix specific	Yes		AR	Yes
TM38	Ionic analysis using the Thermo Aquakem Photometric Automatic Analyser. Accredited to ISO17025 and MCERTS for most analytes. All accreditation is matrix specific.	PM20	In-house method based on USEPA 1311 (TCLP). Solid samples are extracted with two parts de-ionised water to one part solid material for analysis of the extract for various parameters.	Yes		AD	Yes
TM60	TOC/DOC by NDIR	PM0	No preparation is required.			AR	Yes
TM61	PS Analytical's (instrument manufacturer) method based on USEPA 1631. Determination of Mercury by Cold Vapour Atomic Fluorescence. Accredited to ISO 17025. All accreditation is matrix specific.	PM38	In-house method based on USEPA 1631. Samples are brominated to reduce all mercury compounds to Mercury (II) which is analysed as per TM016. ISO 17025 accredited extraction method. All accreditation is matrix specific	Yes		AR	Yes
TM73	pH in by Metrohm	PM11	1:2.5 soil/water extraction	Yes		AR	No
NONE	No Method Code	PM17	CEN PR12457-2 10:1 1 batch leach				
NONE	No Method Code	PM17	CEN PR12457-2 10:1 1 batch leach			AR	
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.			AR	

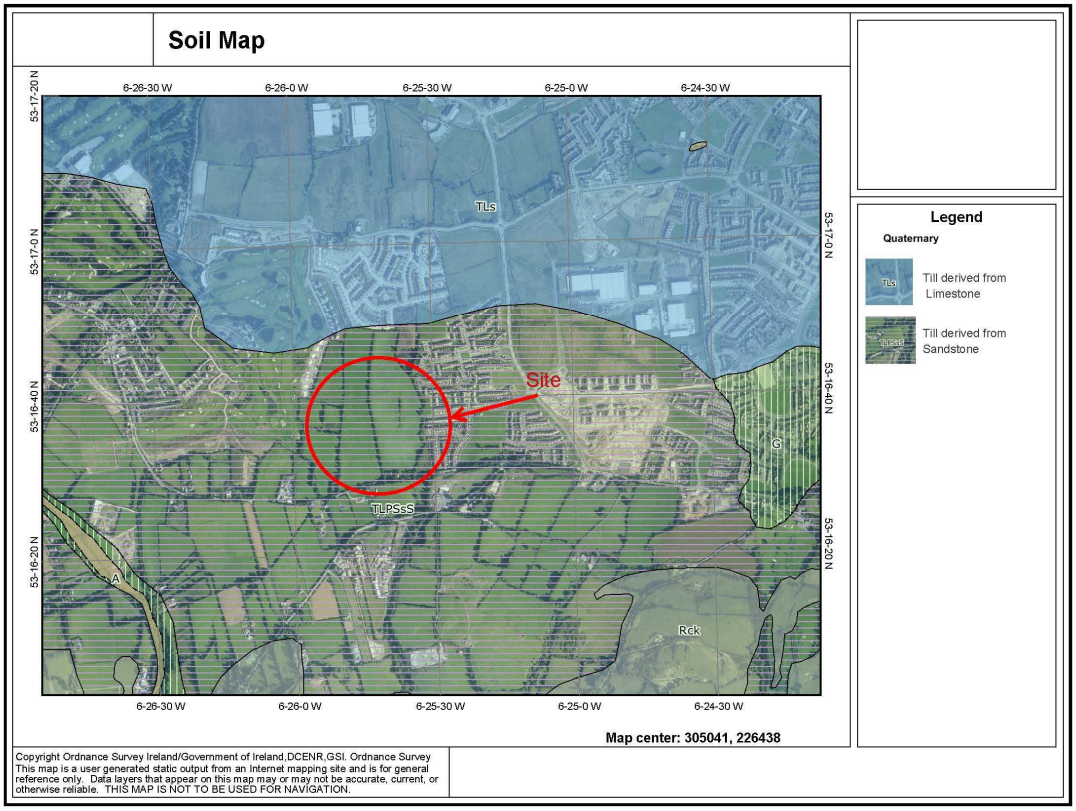
Appendix - Methods used for WAC (2003/33/EC)

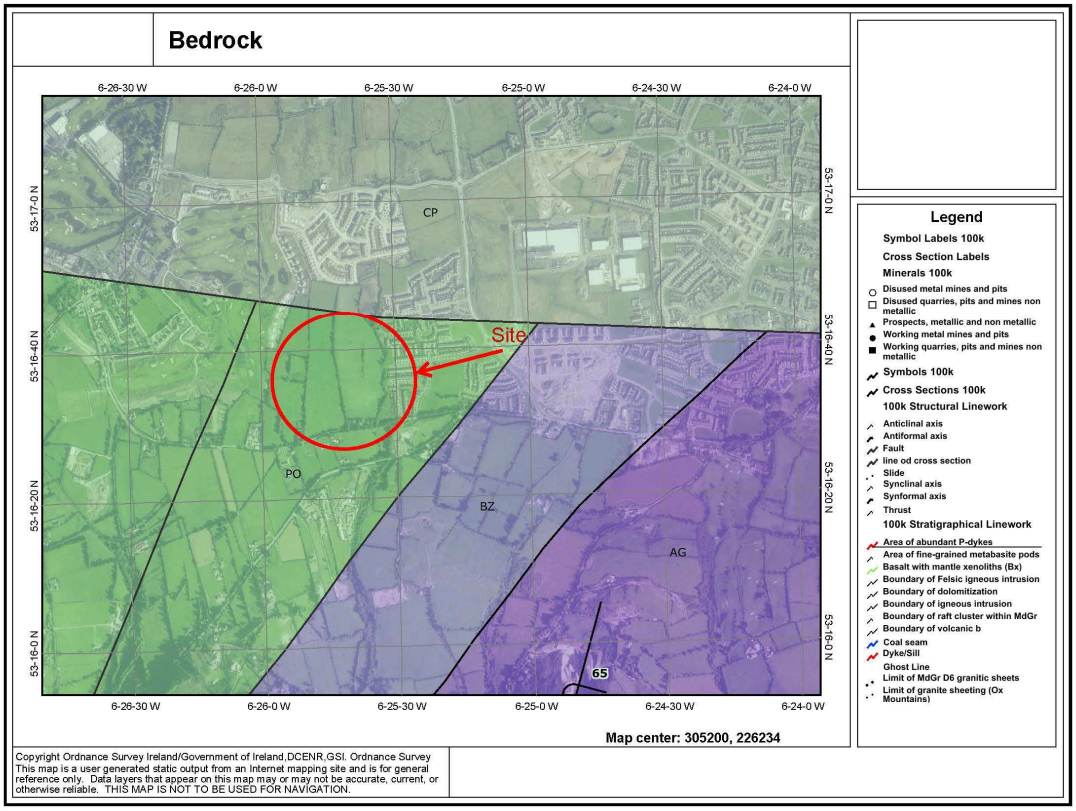
Leachate tests	
10l/kg; 4mm	I.S. EN 12457-2:2002 Specified particle size; water added to L/S ratio; capped; agitated for 24 ± 0.5 hours; eluate settled and filtered over 0.45 µm membrane filter.
Eluate analysis	
As	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Ba	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cd	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cr total	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cu	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Hg	I.S. EN 13370 rec. EN 1483 (CVAAS)
Mo	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Ni	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Pb	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Sb	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Se	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Zn	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Chloride	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Fluoride	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Sulphate	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Phenol index	I.S. EN 13370 rec. ISO 6439 (4-Aminoantipyrine spectrometic methods after distillation)* (BY HPLC - Jones Env)
DOC	I.S. EN 1484
TDS	I.S. EN 15216
Compositional analysis	
TOC	I.S. EN 13137 Method B: carbonates removed with acid; TOC by combustion.
BTEX	GC-FID
PCB7**	I.S. EN 15308 analysis by GC-ECD.
Mineral oil	I.S. EN 14039 C10 to C40 analysis by GC-FID.
PAH17***	I.S. EN 15527 PAH17 analysis by GC-MS
Metals	I.S. EN 13657 - Aqua regia digestion: EN ISO 11885 (ICP-OES)
Other	
Dry matter	I.S. EN 14346 sample is dried to a constant mass in an oven at 105 ± 3 °C; Method B Water content by direct Karl-Fischer-titration and either volumetric or coulometric detection.
LOI	I.S. EN 15169 Difference in mass after heating in a furnace up to 550 ± 25 °C.
ANC	CEN/TS 15364 Determined by amouns of acid or base needed to cover the pH range

Notes:
*If not suitable due to LOD, precision, etc., any other suitable method can be used, e.g. AFS, ICP-MS
**PCB-28, PCB-52, PCB-101, PCB-118, PCB-138, PCB-153 and PCB-180

***Naphthalene, Acenaphthylene, Acenaphthene, Anthracene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)perylene, Benzo(a)pyrene, Chrysene, Coronene, Dibenzo(a,h)anthracene, Fluorene, Fluoranthene, Indeno(1,2,3-c,d)pyrene, Phenanthrene and Pyrene.

Appendix 7: Desk Study – Geological Mapping Excerpts


Soil Map
6-26-30 W
6-26-0 W
6-25-30 W
6-25-0 W
6-24-30 W
53-17-20 N
53-17-0 N
53-16-40 N
53-16-20 N
TLs
Site
TLPSsS
G
A
Rck
Legend
Quaternary
TLs
Till derived from Limestone
TLPSsS
Till derived from Sandstone
Map center: 305041, 226438
Copyright Ordnance Survey Ireland/Government of Ireland,DCENR,GSI. Ordnance Survey
This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.


Bedrock
6-26-30 W
6-26-0 W
6-25-30 W
6-25-0 W
6-24-30 W
6-24-0 W
53-17-0 N
53-16-40 N
53-16-20 N
53-16-0 N
CP
Site
PO
BZ
AG
65
Map center: 305200, 226234
Legend
Symbol Labels 100k
Cross Section Labels
Minerals 100k
Disused metal mines and pits
Disused quarries, pits and mines non metallic
Prospects, metallic and non metallic
Working metal mines and pits
Working quarries, pits and mines non metallic
Symbols 100k
Cross Sections 100k
100k Structural Linework
Anticlinal axis
Antiformal axis
Fault
line od cross section
Slide
Synclinal axis
Synformal axis
Thrust
100k Stratigraphical Linework
Area of abundant P-dykes
Area of fine-grained metabasite pods
Basalt with mantle xenoliths (Bx)
Boundary of Felsic igneous intrusion
Boundary of dolomitization
Boundary of igneous intrusion
Boundary of raft cluster within MdGr
Boundary of volcanic b
Coal seam
Dyke/Sill
Ghost Line
Limit of MdGr D6 granitic sheets
Limit of granite sheeting (Ox Mountains)
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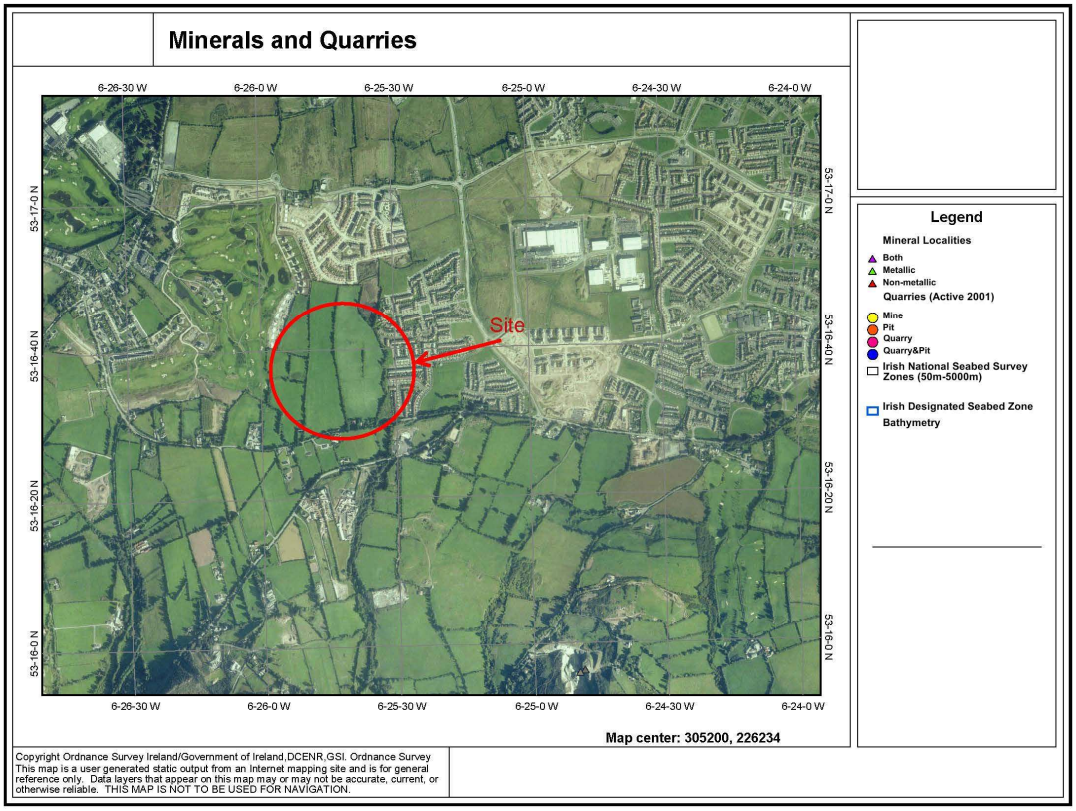
Minerals and Quarries
6-26-30 W
6-26-0 W
6-25-30 W
6-25-0 W
6-24-30 W
6-24-0 W
53-17-0 N
53-16-40 N
53-16-20 N
53-16-0 N
Site
Legend
Mineral Localities
Both
Metallic
Non-metallic
Quarries (Active 2001)
Mine
Pit
Quarry
Quarry&Pit
Irish National Seabed Survey Zones (50m-5000m)
Irish Designated Seabed Zone
Bathymetry
Map center: 305200, 226234
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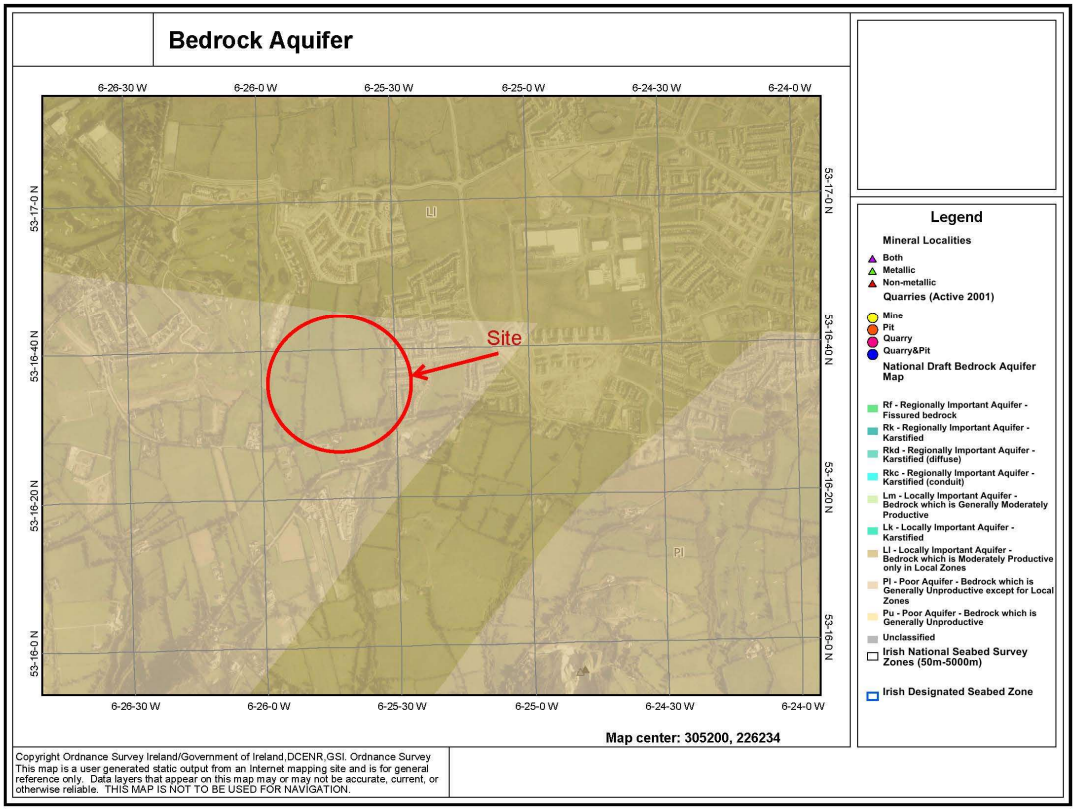
Appendix 8: Desk Study – Hydrogeological and Karst Mapping


Bedrock Aquifer
6-26-30 W
6-26-0 W
6-25-30 W
6-25-0 W
6-24-30 W
6-24-0 W
53-17-0 N
53-16-40 N
53-16-20 N
53-16-0 N
LI
PI
Site
Map center: 305200, 226234
Legend
Mineral Localities
Both
Metallic
Non-metallic
Quarries (Active 2001)
Mine
Pit
Quarry
Quarry&Pit
National Draft Bedrock Aquifer Map
Rf - Regionally Important Aquifer - Fissured bedrock
Rk - Regionally Important Aquifer - Karstified
Rkd - Regionally Important Aquifer - Karstified (diffuse)
Rkc - Regionally Important Aquifer - Karstified (conduit)
Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive
Lk - Locally Important Aquifer - Karstified
Ll - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
Pl - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
Pu - Poor Aquifer - Bedrock which is Generally Unproductive
Unclassified
Irish National Seabed Survey Zones (50m-5000m)
Irish Designated Seabed Zone
Copyright Ordnance Survey Ireland/Government of Ireland,DCENR,GSI. Ordnance Survey
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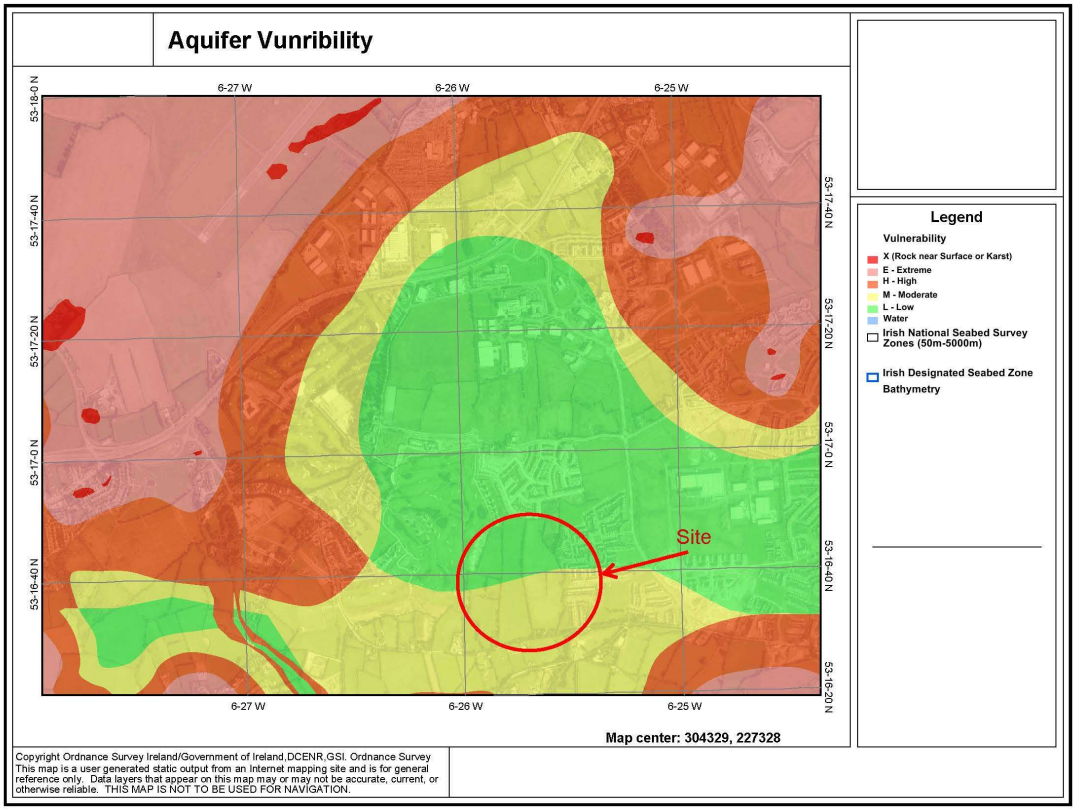
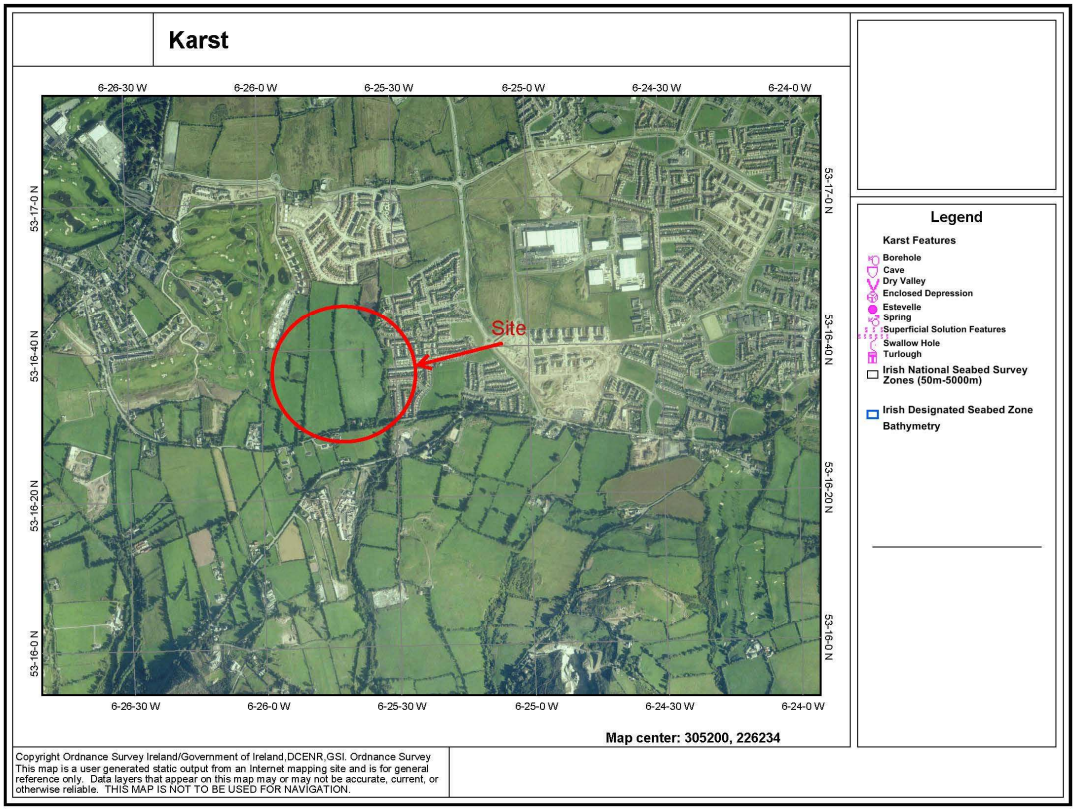

Aquifer Vunribility
6-27 W
6-26 W
6-25 W
53-18-0 N
53-17-40 N
53-17-20 N
53-17-0 N
53-16-40 N
53-16-20 N
Site
Map center: 304329, 227328
Legend
Vulnerability
X (Rock near Surface or Karst)
E - Extreme
H - High
M - Moderate
L - Low
Water
Irish National Seabed Survey Zones (50m-5000m)
Irish Designated Seabed Zone
Bathymetry
Copyright Ordnance Survey Ireland/Government of Ireland,DCENR,GSI. Ordnance Survey
This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.


Karst
6-26-30 W
6-26-0 W
6-25-30 W
6-25-0 W
6-24-30 W
6-24-0 W
53-17-0 N
53-16-40 N
53-16-20 N
53-16-0 N
Site
Legend
Karst Features
Borehole
Cave
Dry Valley
Enclosed Depression
Estevelle
Spring
Superficial Solution Features
Swallow Hole
Turlough
Irish National Seabed Survey Zones (50m-5000m)
Irish Designated Seabed Zone
Bathymetry
Map center: 305200, 226234
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This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.

APPENDIX 6 – WATER

Appendix 6A – Irish Water Confirmation of Feasibility and Statement of Acceptance

Phillip Assaf

1st Floor Maple House
Lower Kilmacud Road
Stillorgan
Co. Dublin
A94E3F2

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.

www.water.ie

25 August 2020

Re: CDS20004359 pre-connection enquiry - Subject to contract | Contract denied

Connection for Housing Development of 700 units at Boherboy Road,, Saggart, Co. Dublin

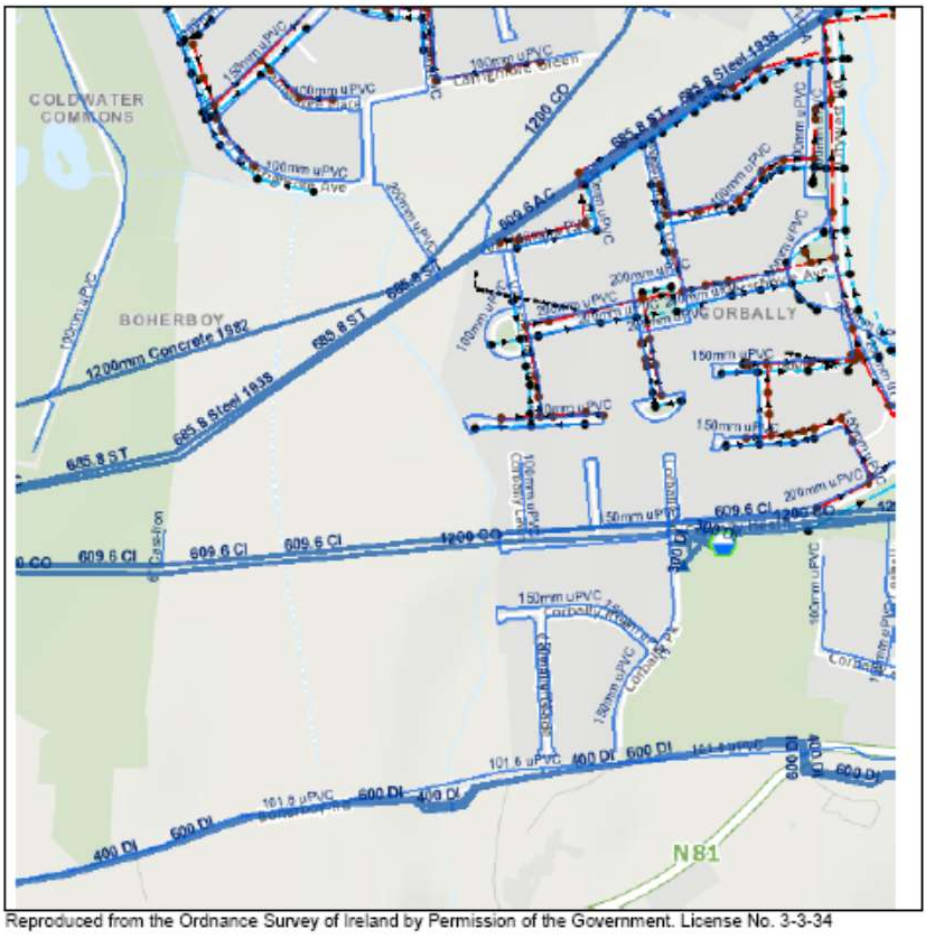
Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Boherboy Road,, Saggart, Co. Dublin (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish Water network(s) as assessed by Irish Water, we wish to advise you that your proposed connection to the Irish Water network(s) can be facilitated at this moment in time.

SERVICE	OUTCOME OF PRE-CONNECTION ENQUIRY THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible Subject to upgrades
SITE SPECIFIC COMMENTS	
Water Connection	Irish Water has several assets (strategic water trunk mains) running within the vicinity of the proposed works. Developer must demonstrate that proposed structures and works will not inhibit access for maintenance or endanger structural or functional integrity of the infrastructure during and after the works. Drawings (showing clearance distances, changing to ground levels) and method statements should be included in the detailed design of the Development. Appropriate wayleave in favour of Irish Water over the infrastructure will be required to ensure unrestricted access should future maintenance be required.
Wastewater Connection	In order to facilitate this connection, the network must be extended for approx.130m via private land/s. Any required consents will be agreed by the Customer.Also, approximately 510m of the 225 mm receiving sewer has to be upsized/twinned to accommodate the additional load as the sewer has no sufficient capacity to cater for the Development.

	Irish Water currently does not have any plans to commence extension or upgrade works to its network in this area. At connection application stage the network upgrade will be reviewed, and the works fee will be calculated in the connection offer fee or in a separate upgrade project agreement. A wayleave in favour of Irish Water will be required over the infrastructure that is not located within the Public Space.
The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this development shall comply with the Irish Water Connections and Developer Services Standard Details and Codes of Practice that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.	

The map included below outlines the current Irish Water infrastructure adjacent to your site:



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Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

General Notes:

1) The initial assessment referred to above is carried out taking into account water demand and wastewater discharge volumes and infrastructure details on the date of the assessment. **The availability of capacity may change at any date after this assessment.**
2) This feedback does not constitute a contract in whole or in part to provide a connection to any Irish Water infrastructure. All feasibility assessments are subject to the constraints of the Irish Water Capital Investment Plan.
3) The feedback provided is subject to a Connection Agreement/contract being signed at a later date.
4) A Connection Agreement will be required to commencing the connection works associated with the enquiry this can be applied for at https://www.water.ie/connections/get-connected/
5) A Connection Agreement cannot be issued until all statutory approvals are successfully in place.
6) Irish Water Connection Policy/ Charges can be found at https://www.water.ie/connections/information/connection-charges/
7) Please note the Confirmation of Feasibility does not extend to your fire flow requirements.
8) Irish Water is not responsible for the management or disposal of storm water or ground waters. You are advised to contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges
9) To access Irish Water Maps email datarequests@water.ie
10) All works to the Irish Water infrastructure, including works in the Public Space, shall have to be carried out by Irish Water.

If you have any further questions, please contact Marina Zivanovic Byrne from the design team via email mzbyrne@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,

Maria O'Dwyer

Connections and Developer Services

Phillip Assaf
1st Floor Maple House
Lower Kilmacud Road
Stillorgan,
Co. Dublin
A94E3F2

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City

www.water.ie

19 August 2021

Re: Design Submission for Boherboy Road,, Saggart, Co. Dublin (the "Development") (the "Design Submission") / Connection Reference No: CDS20004359

Dear Phillip Assaf,

Many thanks for your recent Design Submission.

We have reviewed your proposal for the connection(s) at the Development. Based on the information provided, which included the documents outlined in Appendix A to this letter, Irish Water has no objection to your proposals.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before you can connect to our network you must sign a connection agreement with Irish Water. This can be applied for by completing the connection application form at www.water.ie/connections. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities (CRU)(https://www.cru.ie/document_group/irish-waters-water-charges-plan-2018/).

You the Customer (including any designers/contractors or other related parties appointed by you) is entirely responsible for the design and construction of all water and/or wastewater infrastructure within the Development which is necessary to facilitate connection(s) from the boundary of the Development to Irish Water's network(s) (the "**Self-Lay Works**"), as reflected in your Design Submission. Acceptance of the Design Submission by Irish Water does not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

If you have any further questions, please contact your Irish Water representative:
Name: Dario Alvarez
Email: dalvarez@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix A

Document Title & Revision

- [1324B-307 – V2 - Foul drainage layout]
- [1324B-308 – V2 - Foul drainage layout]
- [1324B-309 – V2 - Foul drainage layout]
- [1324B-310 – V2 - Watermain layout]
- [1324B-311 – V2 - Watermain layout]
- [1324B-312 – V2 - Watermain layout]
- [1324B-316 –Sections At Existing Watermains]
- [1324B-321 to 328–Foul Water sections]

For further information, visit ***www.water.ie/connections***

Notwithstanding any matters listed above, the Customer (including any appointed designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay Works. Acceptance of the Design Submission by Irish Water will not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

APPENDIX 7 – AIR QUALITY & CLIMATE

APPENDIX 7.1

AMBIENT AIR QUALITY STANDARDS

National standards for ambient air pollutants in Ireland have generally ensued from Council Directives enacted in the EU (& previously the EC & EEC). The initial interest in ambient air pollution legislation in the EU dates from the early 1980s and was in response to the most serious pollutant problems at that time which was the issue of acid rain. As a result of this sulphur dioxide, and later nitrogen dioxide, were both the focus of EU legislation. Linked to the acid rain problem was urban smog associated with fuel burning for space heating purposes. Also apparent at this time were the problems caused by leaded petrol and EU legislation was introduced to deal with this problem in the early 1980s.

In recent years the EU has focused on defining a basis strategy across the EU in relation to ambient air quality. In 1996, a Framework Directive, Council Directive 96/62/EC, on ambient air quality assessment and management was enacted. The aims of the Directive are fourfold. Firstly, the Directive's aim is to establish objectives for ambient air quality designed to avoid harmful effects to health. Secondly, the Directive aims to assess ambient air quality on the basis of common methods and criteria throughout the EU. Additionally, it is aimed to make information on air quality available to the public via alert thresholds and fourthly, it aims to maintain air quality where it is good and improve it in other cases.

As part of these measures to improve air quality, the European Commission has adopted proposals for daughter legislation under Directive 96/62/EC. The first of these directives to be enacted, Council Directive 1999/30/EC, has been passed into Irish Law as S.I. No 271 of 2002 (Air Quality Standards Regulations 2002), and has set limit values which came into operation on 17th June 2002. The Air Quality Standards Regulations 2002 detail margins of tolerance, which are trigger levels for certain types of action in the period leading to the attainment date. The margin of tolerance varies from 60% for lead, to 30% for 24-hour limit value for PM_{10}, 40% for the hourly and annual limit value for NO_2 and 26% for hourly SO_2 limit values. The margin of tolerance commenced from June 2002, and started to reduce from 1 January 2003 and every 12 months thereafter by equal annual percentages to reach 0% by the attainment date. A second daughter directive, EU Council Directive 2000/69/EC, has published limit values for both carbon monoxide and benzene in ambient air. This has also been passed into Irish Law under the Air Quality Standards Regulations 2002.

The most recent EU Council Directive on ambient air quality was published on the 11/06/08 which has been transposed into Irish Law as S.I. 180 of 2011. Council Directive 2008/50/EC combines the previous Air Quality Framework Directive and its subsequent daughter directives. Provisions were also made for the inclusion of new ambient limit values relating to $PM_{2.5}$. The margins of tolerance specific to each pollutant were also slightly adjusted from previous directives. In regards to existing ambient air quality standards, it is not proposed to modify the standards but to strengthen existing provisions to ensure that non-compliances are removed. In addition, new ambient standards for $PM_{2.5}$ are included in Directive 2008/50/EC. The approach for $PM_{2.5}$ was to establish a target value of 25 $\mu g/m^3$, as an annual average (to be attained everywhere by 2010) and a limit value of 25 $\mu g/m^3$, as an annual average (to be attained everywhere by 2015), coupled with a target to reduce human exposure generally to $PM_{2.5}$ between 2010 and 2020. This exposure reduction target will range from 0% (for $PM_{2.5}$ concentrations of less than 8.5 $\mu g/m^3$ to 20% of the average exposure indicator (AEI) for concentrations of between 18 - 22 $\mu g/m^3$). Where the AEI is currently greater than 22 $\mu g/m^3$ all appropriate measures should be employed to reduce this level to 18 $\mu g/m^3$ by 2020. The AEI is based on measurements taken in urban background locations averaged over a three year period from 2008 - 2010 and again from 2018-2020. Additionally, an exposure concentration obligation of 20 $\mu g/m^3$ was set to be complied with by 2015 again based on the AEI.

Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by the EU Directives are used which are triggers for particular actions. The Alert Threshold is defined in Council Directive 96/62/EC as "a level beyond which there is a risk to human health from brief exposure and at which immediate steps shall be taken as laid down in Directive 96/62/EC". These steps include undertaking to ensure that the necessary steps are taken to inform the public (e.g. by means of radio, television and the press).

The Margin of Tolerance is defined in Council Directive 96/62/EC as a concentration which is higher than the limit value when legislation comes into force. It decreases to meet the limit value by the attainment date. The Upper Assessment Threshold is defined in Council Directive 96/62/EC as a concentration above which high quality measurement is mandatory. Data from measurement may be supplemented by information from other sources, including air quality modelling.

An annual average limit for both NO_X (NO and NO_2) is applicable for the protection of vegetation in highly rural areas away from major sources of NO_X such as large conurbations, factories and high road vehicle activity such as a dual carriageway or motorway. Annex VI of EU Directive 1999/30/EC identifies that monitoring to demonstrate compliance with the NO_X limit for the protection of vegetation should be carried out distances greater than:

- 5 km from the nearest motorway or dual carriageway
- 5 km from the nearest major industrial installation
- 20 km from a major urban conurbation

As a guideline, a monitoring station should be indicative of approximately 1000 km^2 of surrounding area.

Under the terms of EU Framework Directive on Ambient Air Quality (96/62/EC), geographical areas within member states have been classified in terms of zones. The zones have been defined in order to meet the criteria for air quality monitoring, assessment and management as described in the Framework Directive and Daughter Directives. Zone A is defined as Dublin and its environs, Zone B is defined as Cork City, Zone C is defined as 23 urban areas with a population greater than 15,000 and Zone D is defined as the remainder of the country. The Zones were defined based on among other things, population and existing ambient air quality.

EU Council Directive 96/62/EC on ambient air quality and assessment has been adopted into Irish Legislation (S.I. No. 33 of 1999). The act has designated the Environmental Protection Agency (EPA) as the competent authority responsible for the implementation of the Directive and for assessing ambient air quality in the State. Other commonly referenced ambient air quality standards include the World Health Organisation. The WHO guidelines differ from air quality standards in that they are primarily set to protect public health from the effects of air pollution. Air quality standards, however, are air quality guidelines recommended by governments, for which additional factors, such as socio-economic factors, may be considered.

APPENDIX 7.2

TRANSPORT INFRASTRUCTURE IRELAND SIGNIFICANCE CRITERIA

Magnitude of Change	Annual Mean NO_2 / PM_{10}	No. days with PM_{10} concentration > 50 µg/m^3	Annual Mean $PM_{2.5}$
Large	Increase / decrease ≥4 µg/m^3	Increase / decrease >4 days	Increase / decrease ≥2.5 µg/m^3
Medium	Increase / decrease 2 - <4 µg/m^3	Increase / decrease 3 or 4 days	Increase / decrease 1.25 - <2.5 µg/m^3
Small	Increase / decrease 0.4 - <2 µg/m^3	Increase / decrease 1 or 2 days	Increase / decrease 0.25 - <1.25 µg/m^3
Imperceptible	Increase / decrease <0.4 µg/m^3	Increase / decrease <1 day	Increase / decrease <0.25 µg/m^3

Table A7.2.1 - Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

Absolute Concentration in Relation to Objective/Limit Value	Change in Concentration [Note 1]		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m^3 of NO_2 or PM_{10}) (≥25 µg/m^3 of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m^3 of NO_2 or PM_{10}) (22.5 - <25 µg/m^3 of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (30 - <36 µg/m^3 of NO_2 or PM_{10}) (18.75 - <22.5 µg/m^3 of $PM_{2.5}$)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<30 µg/m^3 of NO_2 or PM_{10}) (<18.75 µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m^3 of NO_2 or PM_{10}) (≥25 µg/m^3 of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m^3 of NO_2 or PM_{10}) (22.5 - <25 µg/m^3 of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (30 - <36 µg/m^3 of NO_2 or PM_{10}) (18.75 - <22.5 µg/m^3 of $PM_{2.5}$)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<30 µg/m^3 of NO_2 or PM_{10}) (<18.75 µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight Beneficial

[Note 1] Well Below Standard = <75% of limit value.

Table A7.2.2 - Air Quality Impact Significance Criteria For Annual Mean NO_2 and PM_{10} and $PM_{2.5}$ Concentrations at a Receptor

APPENDIX 7.3

DUST MANAGEMENT PLAN

The objective of dust control at the site is to ensure that no significant nuisance occurs at nearby sensitive receptors. In order to develop a workable and transparent dust control strategy, the following management plan has been formulated by drawing on best practice guidance from Ireland, the UK (IAQM (2014), BRE (2003), The Scottish Office (1996), UK ODPM (2002)) and the USA (USEPA, 1997). The following measures will be incorporated into the Construction Management Plan (CMP) prepared for the site.

Site Management

The aim is to ensure good site management by avoiding dust becoming airborne at source. This will be done through good design and effective control strategies. At the construction planning stage, the siting of activities and storage piles will take note of the location of sensitive receptors and prevailing wind directions in order to minimise the potential for significant dust nuisance (see Figure 8.2 for the windrose for Casement Aerodrome Meteorological Station). As the prevailing wind is predominantly westerly to south-westerly, locating construction compounds and storage piles downwind of sensitive receptors will minimise the potential for dust nuisance to occur at sensitive receptors.

Good site management will include the ability to respond to adverse weather conditions by either restricting operations on-site or quickly implementing effective control measures before the potential for nuisance occurs. When rainfall is greater than 0.2mm/day, dust generation is generally suppressed (IAQM, 2014; UK ODPM, 2002). The potential for significant dust generation is also reliant on threshold wind speeds of greater than 10 m/s (19.4 knots) (at 7m above ground) to release loose material from storage piles and other exposed materials (USEPA, 1986). Particular care should be taken during periods of high winds (gales) as these are periods where the potential for significant dust emissions are highest. The prevailing meteorological conditions in the vicinity of the site are favourable in general for the suppression of dust for a significant period of the year. Nevertheless, there will be infrequent periods were care will be needed to ensure that dust nuisance does not occur. The following measures shall be taken in order to avoid dust nuisance occurring under unfavourable meteorological conditions:

- The Principal Contractor or equivalent must monitor the contractors' performance to ensure that the proposed mitigation measures are implemented and that dust impacts and nuisance are minimised;
- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions;
- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board should also include head/regional office contact details;
- It is recommended that community engagement be undertaken before works commence on site explaining the nature and duration of the works to local residents and businesses;
- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out;
- It is the responsibility of the contractor at all times to demonstrate full compliance with the dust control conditions herein;
- At all times, the procedures put in place will be strictly monitored and assessed.

The dust minimisation measures shall be reviewed at regular intervals during the works to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. In the event of dust nuisance occurring outside the site boundary, site activities will be reviewed and satisfactory procedures implemented to rectify the problem. Specific dust control measures to be employed are described below.

Preparing and Maintaining the Site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Fully enclose specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating Vehicles / Machinery and Sustainable Travel

- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Impose and signpost a maximum-speed-limit of 20 kph haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Avoid bonfires and burning of waste materials.

Measures Specific to Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Only remove the cover in small areas during work and not all at once.
- During dry and windy periods, and when there is a likelihood of dust nuisance, a bowser will operate to ensure moisture content is high enough to increase the stability of the soil and thus suppress dust.

Measures Specific to Construction

- Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

Measures Specific to Trackout

Site roads (particularly unpaved) can be a significant source of fugitive dust from construction sites if control measures are not in place. The most effective means of suppressing dust emissions from unpaved roads is to apply speed restrictions. Studies show that these measures can have a control efficiency ranging from 25 to 80% (UK ODPM, 2002).

- A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles.
- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use. If sweeping using a road sweeper is not possible due to the nature of the surrounding area then a suitable smaller scale street cleaning vacuum will be used.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10 m from receptors where possible.

Summary of Dust Mitigation Measures

The pro-active control of fugitive dust will ensure that the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released, will contribute towards the satisfactory performance of the contractor. The key features with respect to control of dust will be:

- The specification of a site policy on dust and the identification of the site management responsibilities for dust issues;
- The development of a documented system for managing site practices with regard to dust control;
- The development of a means by which the performance of the dust minimisation plan can be regularly monitored and assessed; and
- The specification of effective measures to deal with any complaints received.

APPENDIX 11 - MATERIAL ASSETS: RESOURCE and WASTE MANAGEMENT

Appendix 11.1: Construction & Demolition Resource Waste Management Plan

CONSTRUCTION & DEMOLITION RESOURCE WASTE MANAGEMENT PLAN FOR A PROPOSED RESIDENTIAL DEVELOPMENT

BOHERBOY, SAGGART SHD

Report Prepared For

Kelland Homes Ltd and Durkan Estates Ireland Ltd

Report Prepared By

Chonaill Bradley, Principal Environmental Consultant

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Title	Principal Environmental Consultant	Director
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1.0 INTRODUCTION

AWN Consulting Ltd. (AWN) has prepared this Construction & Demolition Resource Waste Management Plan (C&D RWMP) on behalf of Kelland Homes Ltd and Durkan Estates Ireland Ltd. The development will principally consist of the demolition of the existing agricultural buildings onsite and the construction of a residential development consisting of houses, duplex units and apartments to accommodate residential dwellings and including a crèche, and residential tenant amenities.

This plan will provide information necessary to ensure that the management of C&D waste at the site is undertaken in accordance with the current legal and industry standards including the *Waste Management Acts 1996 - 2011* and associated Regulations [1], *Protection of the Environment Act 2003* as amended [2], *Litter Pollution Act 1997* as amended [3] and the *Eastern-Midlands Region Waste Management Plan 2015 – 2021* [4]. 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 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. The C&D WMP should be viewed as a live document that will be update by the site construction contractor as and when changing site conditions require it to do so.

2.0 CONSTRUCTION & DEMOLITION WASTE MANAGEMENT IN IRELAND

2.1 National Level

The Irish Government issued a policy statement in September 1998*, Changing Our Ways*[5], 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'* [6] 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 government of Ireland released a national policy document outlining a new action plan for Ireland and its waste to cover the period of 2020-2025. This plan, 'A Waste Action Plan for a Circular Economy' [7], was prepared in response to the 'European Green Deal' which sets a roadmap for a transition to a new economy, where climate and environmental challenges are turned into opportunities, replacing the previous national waste management plan 'A Resource Opportunity (2012)'

It aims to fulfil the commitment in the Programme for Government to publish and start implementing a new National Waste Action Plan. It is intended that this new national waste policy will inform and give direction to waste planning and management in Ireland over the coming years. It will be followed later this year by an All of Government Circular Economy Strategy. The policy document shifts focus away from waste disposal and moves it back up the production chain. To support the policy, regulation is already in place (Circular Economy Legislative Package) or in the pipeline. 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 is the development of a high-level, whole of Government Circular Economy Strategy to set a course for Ireland to transition across all sectors and at all levels of Government toward circularity. This strategy was issued for public consultation in April 2021.

The Environmental Protection Agency (EPA) of Ireland issued guildines the '*Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects' in November 2021.* These guidelines replace the previous 2006 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 and informed 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 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, South Dublin County Council, etc.

Section 3 of the Guidelines identifies thresholds above which there is a requirement for the preparation of a C&D Waste Management Plan for developments. The new guidance Classifies developments on a two Tiers based system. Below the following thresholds may be classed as Tier 1 development and above a Tier 2:

- 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.

Developments above these thresholds are classed as Tier-2 projects

This development requires a C&D WMP as a Tier 2 development as they are above following criterion:

- New residential development of less than 10 dwellings.

Other guidelines followed in the preparation of this report include *'Construction and Demolition Waste Management – a handbook for Contractors and Site Managers'* [9] , published by FÁS and the Construction Industry Federation in 2002 and the previous guildines 'Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects'[10] (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 South Dublin County Council (SDCC).

The *EMR Waste Management Plan 2015 – 2021* is the regional waste management plan for the SDCC area published in May 2015. Currently the EMR and other regional waste management plans are under review.

The regional plan sets out the following strategic targets for waste management in the region:

- A 1% reduction per annum in the quantity of household waste generated per capita over the period of the plan;
- Achieve a recycling rate of 50% of managed municipal waste by 2020; and
- Reduce to 0% the direct disposal of unprocessed residual municipal waste to landfill (from 2016 onwards) in favour of higher value pre-treatment processes and indigenous recovery practices.

Municipal landfill charges in Ireland are based on the weight of waste disposed. In the Leinster Region, charges are approximately €130 - €150 per tonne of waste which includes a €75 per tonne landfill levy specified in the *Waste Management (Landfill Levy) Regulations 2015.*

The *South Dublin County Council Development Plan 2016 – 2022* [11] sets out a number of objectives and actions for the South Dublin area in line with the objectives of the waste management plan.

Waste objectives and actions with a particular relevance to the proposed development are as follows:

Objectives:

- **IE5 Objective 1:** To support the implementation of the Eastern–Midlands Region Waste Management Plan 2015-2021 by adhering to overarching performance targets, policies and policy actions.
- **IE5 Objective 2:** To support waste prevention through behavioural change activities to de-couple economic growth and resource use.
- **IE5 Objective 3:** To encourage the transition from a waste management economy to a green circular economy to enhance employment and increase the value recovery and recirculation of resources.
- **IE5 Objective 8:** To secure appropriate provision for the sustainable management of waste within developments, including the provision of facilities for the storage, separation and collection of such waste.

Actions:

- Support and facilitate the separation of waste at source into organic and non-organic streams or other waste management systems that divert waste from landfill and maximise the potential for each waste type to be re-used and recycled or composted and divert organic waste from landfill, in accordance with the National Strategy on Biodegradable Waste (2006).
- Implement the objectives of the National Waste Prevention Programme at a local level with businesses, schools, householders, community groups and within the Council's own activities.
- Promote an increase in the amount of waste re-used and recycled consistent with the Regional Waste Management Plan and Waste Hierarchy and facilitate recycling of waste through adequate provision of facilities and good design in new developments.
- Implement the South Dublin Litter Management Plan 2015 - 2019.

The *Draft South Dublin County Development Plan 2022 – 2028* [13] will supersede the current development plan and is due to be complete and come into effect in August 2022. The following policy and objectives have

thus far been incorporated into the draft plan:

Policy and Objectives

Policy IE6: Waste Management
Implement European Union, National and Regional waste and related environmental policy, legislation, guidance and codes of practice to improve management of material resources and wastes.

- **IE6 Objective 1**

To encourage a just transition from a waste management economy to a green circular economy to enhance employment and increase the value, recovery and recirculation of resources through compliance with the provisions of the Waste Action Plan for a Circular Economy 2020 – 2025 and to promote the use of, but not limited to, reverse vending machines and deposit return schemes or similar to ensure a wider and varying ways of recycling.

- **IE6 Objective 2**

To support the implementation of the Eastern Midlands Region Waste Management Plan 2015-2021 or as amended by adhering to overarching performance targets, policies and policy actions.

- **IE6 Objective 4**

To provide for and maintain the network of bring infrastructure (e.g. civic amenity facilities, bring banks) in the County to facilitate the recycling and recovery of hazardous and non-hazardous municipal wastes.

- **IE6 Objective 7**

To require the appropriate provision for the sustainable management of waste within all developments, ensuring it is suitably designed into the development, including the provision of facilities for the storage, separation and collection of such waste.

- **IE6 Objective 8**

To adhere to the recommendations of the National Hazardous Waste Management Plan 2014-2020 and any subsequent plan, and to co-operate with other agencies including the EPA in the planning, organisation and supervision of the disposal of hazardous waste streams, including hazardous waste identified during construction and demolition projects.

2.3 Legislative Requirements

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

- Waste Management Act 1996 (No. 10 of 1996) as amended. Sub-ordinate legislation includes:
  - European Communities (Waste Directive) Regulations 2011 (SI 126 of 2011) as amended
  - Waste Management (Collection Permit) Regulations (S.I No. 820 of 2007) as amended
  - Waste Management (Facility Permit and Registration) Regulations 2007, (S.I No. 821 of 2007) as amended
  - Waste Management (Licensing) Regulations 2004 (S.I. No. 395 of 2004) as amended
  - Waste Management (Packaging) Regulations 2014 (S.I. 282 of 2014) as amended
  - Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997)
  - Waste Management (Landfill Levy) Regulations 2015 (S.I. No. 189 of 2015)
  - European Union (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014)
  - European Union (Batteries and Accumulators) Regulations 2014 (S.I. No. 283 of 2014) as amended
  - Waste Management (Food Waste) Regulations 2009 (S.I. 508 of 2009), as amended
  - European Union (Household Food Waste and Bio-waste) Regulation 2015 (S.I. No. 191 of 2015)
  - Waste Management (Hazardous Waste) Regulations, 1998 (S.I. No. 163 of 1998) as amended
  - Waste Management (Shipments of Waste) Regulations, 2007 (S.I. No. 419 of 2007) as amended
  - European Communities (Transfrontier Shipment of Waste) Regulations 1994 (SI 121 of 1994)
  - European Union (Properties of Waste which Render it Hazardous) Regulations 2015 (S.I. No. 233 of 2015) as amended

- Environmental Protection Act 1992 (No. 7 of 1992) as amended.
- Litter Pollution Act 1997 (No. 12 of 1997) as amended.
- Planning and Development Act 2000 (No. 30 of 2000) as amended [14].

One of the guiding principles of European waste legislation, which has in turn been incorporated into the *Waste Management Act 1996 - 2001* 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 Developer ensures that the waste contractors engaged by demolition and 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 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 DEVELOPMENT

3.1 Location, Size and Scale of the Development

Kelland Homes Ltd and Durkan Estates Ireland Ltd intend are applying to An Bord Pleanála for permission for a strategic housing development at a site at Boherboy, Saggart, County Dublin. To the immediate north of the site is the Carrigmore residential estate, to the west are agricultural lands and a single dwelling, to the east is the Corbally residential estate while to the south is the Boherboy Road. The proposed application represents the development of the entire Boherboy Neighbourhood as identified within the Fortunestown Local Area Plan (2012).

The development will consist of 655 no. dwellings, comprised of 257 no. 2, 3 & 4 bed, 2 & 3 storey detached, semi-detached & terraced houses, 152 no. 1, 2 & 3 bed duplex units in 12 no. 2 & 3 storey blocks, and 246 no. 1, 2 & 3 bed apartments in 9 no. buildings ranging in height from 2, 3-5, 4-5 and 5 storeys, and a 2 storey crèche (693m²). Access to the development will by via one no. vehicular access point from the Boherboy Road, along with proposed upgrade works to Boherboy Road to include the provision of a roadside footpath along the front of the site at the Boherboy Road, continuing eastwards to the junction with the N81 Blessington Road (for an overall distance of c.370m). The proposed development also provides for pedestrian and cyclist connectivity to the adjoining District Park to the north-east, and vehicular connections to adjoining developments at Corbally Heath to the east and Carrigmore Green to the north.

The proposed development includes for all associated site development works, public open spaces, including alongside the Corbally Stream, which will accommodate the provision of pedestrian / cyclist links to the

District Park to the north-east, hard and soft landscaping, undercroft & surface car parking, bicycle parking, bin storage, public lighting, ESB sub-stations. Surface water will be attenuated within the site, with outfall to existing watercourses, with foul sewer connected to a proposed new pumping station located at the northern end of the site, on an overall application site area of 18.3ha. In accordance with the Fortunestown Local Area Plan (2012) an area of approx. 1.44ha is reserved for a school site.

3.2 Details of the Non-Hazardous Wastes to be Produced

There will be waste materials generated from the demolition of some of the existing buildings and hardstanding areas on site, as well as from the further excavation of the building foundations. The volume of waste generated from demolition 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. plasterboard on timber ceiling joists, steel embedded in concrete, etc.

There will be soil, stones, clay and made ground excavated to facilitate construction of new foundations, underground services, and the installation of the proposed basements. The development quantity surveyors have estimated that 101,000m^3 of material will need to be excavated to do so. It is currently envisaged that 41,000m^3 will be able to be retained and reused onsite for landscaping and fill, the remaining material, will need to be removed offsite due to the limited opportunities for reuse on site. This will be taken for appropriate offsite reuse, recovery, recycling and / or disposal.

During the construction phase there may be a surplus of building materials, such as timber off-cuts, broken concrete blocks, cladding, 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 supply of materials will also be generated. The contractor will be required to ensure that oversupply of materials is kept to a minimum and opportunities for reuse of suitable materials is maximised.

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 on site 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.

3.3 Potential Hazardous Wastes Arising

3.3.1 Contaminated Soil

Site investigations and environmental soil testing were undertaken by Ground Investigation Ireland Ltd in December 2013. Environmental soil testing was undertaken on four samples collected from trial pits and boreholes and sent Jones Environmental Laboratories (Now known as Element Deeside) in the UK for a range of contamination testing.

The results were assessed in accordance with European Council Directive 1999 131/EC Article 16 Annex II 'Criteria and procedures for the acceptance of waste at landfills which lays down guidelines for the classification of waste as "Inert' 'Non Hazardous' and 'Hazardous'. The results classify the material tested as below the limits for inert waste at Murphy Environmental Landfill in Co. Dublin. All results provided inert readings

If any potentially contaminated material is encountered, 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'* [12] 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* [13], which establishes the criteria for the acceptance of waste at landfills.

In the event that Asbestos Containing Materials (ACMs) are found within the excavated material, the removal will only be carried out 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.

In the event that hazardous soil, or historically deposited waste is encountered during the construction phase, the contractor will notify SDCC and provide a Hazardous / Contaminated Soil Management Plan, to include estimated tonnages, description of location, any relevant mitigation, destination for disposal / treatment, in addition to information on the authorised waste collector(s).

3.3.2 Fuel/Oils

Fuels and oils are classed as hazardous materials; any on-site storage of fuel / oil, and 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 waste generated at the site.

3.3.3 Invasive Plant Species

Site surveys were undertaken by Scott Cawley Ecology in June 2020 and March 2021. This included a site walkover survey of the entire site, and around part of the outside perimeter to search for any invasive species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011. Evidence of Japanese Knotweed (*Fallopia japonica*) was not recorded on site and no other invasive species were detected.

3.3.4 Asbestos

If any of asbestos or ACMs are detected in the farm buildings to be demolished the removal of ACMs will be carried out by a suitably qualified contractor and ACMs will only be removed from site by a suitably permitted / licenced waste contractor, in accordance with *S.I. No. 589 of 2010 Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006-2010.* All material will be taken to a suitably licensed or permitted facility.

3.3.5 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 generated, will be stored in appropriate receptacles in designated areas of the site pending collection by an authorised waste contractor.

3.4 Main Construction and Demolition 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 3.1. The List of Waste (LoW) code (applicable as of 1 June 2015) (also referred to as the European Waste Code (EWC)) for each waste stream is also shown.

Table 3.1 *Typical waste types generated and LoW codes (individual waste types may contain hazardous substances)*

Waste Material	LoW/EWC Code
Concrete, bricks, tiles, ceramics	17 01 01-03 & 07
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 & 03*
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, 27-30
Insulation materials	17 06 04
Organic (food) waste	20 01 08
Mixed Municipal Waste	20 03 01

** Individual waste type may contain hazardous substances*

4.0 RESOURCE AND WASTE MANAGEMENT

4.1 Demolition Waste Generation

The demolition stage will involve the demolition and renovation of multiple dilapidated farm out buildings on-site. The demolition areas are identified in the planning drawings provided with this application. The anticipated demolition waste and rates of reuse, recycling / recovery and disposal are shown in Table 4.1, below.

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

Waste Type	Tonnes	Reuse		Recycle / Recovery		Disposal	
		%	Tonnes	%	Tonnes	%	Tonnes
Concrete, Bricks, Tiles, Ceramics	84.2	30	25.2	65	54.7	5	4.2
Asphalts	1.7	0	0.0	25	0.4	75	1.2
Metals	24.8	5	1.2	80	19.8	15	3.7
Timber	19.8	10	2.0	60	11.9	30	5.9
Total	**130.5**		**28.4**		**86.8**		**15.0**

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 [14] and the joint EPA & GMIT study [15].*

Table 4.2: *Waste materials generated on a typical Irish construction site*

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

Table 4.3, below, shows the estimated construction waste generation for the proposed Project based on the gross floor area of construction and other information available to date, along with indicative targets for management of the waste streams. The estimated amounts for the main waste types (with the exception of soils and stones) are based on an average large-scale development waste generation rate per m^2, using the waste breakdown rates shown in Table 4.2. These have been calculated from the schedule of development areas provided by the architect.

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

Waste Type	Tonnes	Reuse		Recycle / Recovery		Disposal	
		%	Tonnes	%	Tonnes	%	Tonnes
Mixed C&D	1300.9	10	130.1	80	1040.7	10	130.1
Timber	1103.8	40	441.5	55	607.1	5	55.2
Plasterboard	394.2	30	118.3	60	236.5	10	39.4
Metals	315.4	5	15.8	90	283.8	5	15.8
Concrete	236.5	30	71.0	65	153.7	5	11.8
Other	591.3	20	118.3	60	354.8	20	118.3
Hazardous	0.1	0	0.0	0	0.0	100	0.1
Total	**3942.2**		**894.9**		**2676.8**		**370.7**

In addition to the waste streams in Table 4.3, there will be c. 101,000 m^3 of soil, stones, clay and made ground excavated to facilitate construction of new foundations, underground services, and the installation of the proposed basements. Any suitable excavated material will be temporarily stockpiled for reuse as fill, where possible, but reuse on site is expected to be limited and all of the excavated material except for 41,000 m^3 is expected to be removed off- site for appropriate reuse, recovery and / or disposal.

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.

4.3 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. 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 reused, recycled, recovered or disposed of at a facility holding the appropriate registration, permit or licence, as required.

During construction, 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 (per 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 off- site in their work vehicles (which are not designed 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 / 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, if required.

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

Soil, Stone, Gravel & Clay
The waste hierarchy states that the preferred option for waste management is prevention and minimisation of waste, followed by preparing for reuse and recycling / recovery, energy recovery (i.e. incineration) and, least favoured of all, disposal. The excavations are required to facilitate construction works so the preferred option (prevention and minimisation) cannot be accommodated for the excavation phase.

When 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 Article 27 of the *European Communities (Waste Directive) Regulations 2011*, 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 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.

If the material is deemed to be a waste, then 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).

Bedrock
While it is not envisaged that bedrock will be encountered, if bedrock is encountered, it is anticipated that it will not be crushed on site. Any excavated rock is expected to be removed off- site for appropriate reuse, recovery and / or disposal. If bedrock is to be crushed on- site, the appropriate waste facility permit will be obtained from SDCC.

Silt & Sludge
During the construction phase, silt and petrochemical interception will be carried out on run-off and pumped water from site works, where required. Sludge and silt will then be collected by a suitably licensed contractor and removed off- site.

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. If concrete is to be crushed on- site, the appropriate waste facility permit will be obtained from SDCC.

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, 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. Plasterboard from the construction phases 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.

Glass
Glass materials will be segregated for recycling, where possible.

Waste Electrical & Electronic Equipment (WEEE)
Any 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 off- site.

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 (see Section 7.0) 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.

Asbestos Containing Materials
Any asbestos or ACM found on- site should be removed by a suitably competent contractor and disposed of as asbestos waste before the demolition works begin. All asbestos removal work or encapsulation work must be carried out in accordance with *S.I. No. 589 of 2010 Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006-2010.*

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.

On-Site Crushing

It is currently not envisaged that the crushing of waste materials will occur on- site. However, if the crushing of material is to be undertaken, a waste facility permit will first be obtained from SDCC and the destination of the accepting waste facility will be supplied to the SDCC waste unit.

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 a weighing mechanism on the truck or at the receiving facility. These waste records will be maintained on site by the nominated project Waste Manager (see Section 7.0).

All movement of waste and the use of waste contractors will be undertaken in accordance with the *Waste Management Acts 1996 - 2011*, *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 Waste Manager (see Section 7.0) 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 / Industrial Emissions Licence for that site will be provided to the nominated project Waste Manager (see Section 7.0). 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.

5.0 ESTIMATED COST OF WASTE MANAGEMENT

An outline of the costs associated with different aspects of waste management is outlined 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 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 at a reduced fee 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.

5.3 Disposal

Landfill charges are currently at around €130 - €150 per tonne which includes a €75 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.

6.0 DEMOLITION PROCEDURES

The demolition stage will involve the demolition multiple dilapidated farm out buildings on-site. The demolition areas are identified in the planning drawings submitted as part of this application. A formal demolition plan including safety procedures will be prepared by the demolition contractor. However, in general, the following sequence of works should be followed during the demolition stage:

Check for Hazards
Prior to commencing works, buildings and structures to be demolished will be checked for any likely hazards including asbestos, ACMs, electrical power lines or cables, gas reticulation systems, telecommunications, unsafe structures and fire / explosion hazards, e.g. combustible dust, chemical hazards, oil, fuels and contamination.

Removal of Components
All hazardous materials will be removed first. All components from within the buildings that can be salvaged will be removed next. This will primarily be comprised of metal; however, may also include timbers, doors, windows, wiring and metal ducting, etc.

Removal of Roofing
Steel roof supports, beams, etc., will be dismantled and taken away for recycling / salvage.

Excavation of Services, Demolition of Walls and Concrete
Services will be removed from the ground and the breakdown of walls will be carried out once all salvageable or reusable materials have been taken from the buildings. Finally, any existing foundations and hard standing areas will be excavated.

7.0 TRAINING PROVISIONS

A member of the construction team will be appointed as the Waste Manager to ensure commitment, operational efficiency and accountability in relation to waste management during the C&D phases of the development.

7.1 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 them 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.

7.2 Site Crew Training

Training of site crew in relation to waste 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.

8.0 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 arisings 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 Waste Manager with a waste docket (or Waste Transfer Form (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 name
- Collection Permit No.
- Vehicle Reg.
- Driver Name
- Docket No.
- Waste Type
- EWC / LoW

The waste vehicle will be checked by security personal or the Waste Manager 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 Waste Manager on a weekly basis and can be placed in the Waste Tracking Log file. This information will be forwarded onto the SDCC Waste Regulation Unit when requested.

Alternatively, 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.

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. 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.

9.0 OUTLINE WASTE AUDIT PROCEDURE

9.1 Responsibility for Waste Audit

The appointed Waste Manager will be responsible for conducting a waste audit at the site during the C&D phase of the proposed Project. Contact details for the nominated Waste Manager will be provided to the SDCC Waste Regulation Unit after the main contractor is appointed and prior to any material being removed from site.

9.2 Review of Records and Identification of Corrective Actions

A review of all waste management costs and the records for the waste generated and transported off-site should be undertaken mid-way through the demolition and construction phase of the proposed 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.

Upon completion of the C&D 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.

10.0 CONSULTATION WITH RELEVANT BODIES

10.1 Local Authority

Once construction contractors have been appointed and have appointed waste contractors, and prior to removal of any C&D waste materials off-site, details of the proposed destination of each waste stream will be provided to the SDCC Waste Regulation Unit.

SDCC 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.

10.2 Recycling / Salvage Companies

The appointed waste contractor for the main waste streams managed by the demolition and construction contractors will be audited in order to ensure that relevant and up-to-date waste collection permits and facility registrations / permits / licences are held. In addition, information will be obtained regarding the feasibility of recycling each material, the costs of recycling / reclamation, the means by which the wastes

will be collected and transported off- site, and the recycling / reclamation process each material will undergo off- site.

11.0 REFERENCES

1. Waste Management Act 1996 (No. 10 of 1996) as amended. Sub-ordinate and associated legislation includes:
    - European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011) as amended.
    - Waste Management (Collection Permit) Regulations 2007 (S.I. No. 820 of 2007) as amended.
    - Waste Management (Facility Permit and Registration) Regulations 2007 (S.I No. 821 of 2007) as amended.
    - Waste Management (Licensing) Regulations 2000 (S.I No. 185 of 2000) as amended.
    - European Union (Packaging) Regulations 2014 (S.I. No. 282 of 2014) as amended.
    - Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997) as amended.
    - Waste Management (Landfill Levy) Regulations 2015 (S.I. No. 189 of 2015)
    - European Union (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014)
    - European Union (Batteries and Accumulators) Regulations 2014 (S.I. No. 283 of 2014) as amended.
    - Waste Management (Food Waste) Regulations 2009 (S.I. No. 508 of 2009) as amended.
    - European Union (Household Food Waste and Bio-waste) Regulations 2015 (S.I. No. 430 of 2015)
    - Waste Management (Hazardous Waste) Regulations 1998 (S.I. No. 163 of 1998) as amended.
    - Waste Management (Shipments of Waste) Regulations 2007 (S.I. No. 419 of 2007) as amended.
    - European Communities (Shipments of Hazardous Waste exclusively within Ireland) Regulations 2011 (S.I. No. 324 of 2011)
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Appendix 11.2: Operational Waste Management Plan

OPERATIONAL WASTE MANAGEMENT PLAN FOR A PROPOSED RESIDENTIAL DEVELOPMENT

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CONTENTS

1.0 INTRODUCTION

AWN Consulting Ltd. (AWN) has prepared this Operational Waste Management Plan (OWMP) on behalf of Kelland Homes Ltd and Durkan Estates Ireland Ltd. The development will principally consist of the demolition of the existing agricultural buildings onsite and the construction of a residential development consisting of houses, duplex units and apartments to accommodate residential dwellings and including a crèche, and residential tenant amenities.

This OWMP has been prepared to ensure that the management of waste during the operational phase of the proposed residential development is undertaken in accordance with the current legal and industry standards including, the *Waste Management Act 1996 – 2011* as amended and associated Regulations [1], Environmental Protection Agency Act 2003 as amended [2], *Litter Pollution Act 2003* as amended [3], the *'Eastern-Midlands Region (EMR) Waste Management Plan 2015 – 2021*' [4], The South Dublin County Council *(SDCC) South Dublin County Council Household & Commercial Waste Bye-Laws (2018)* [5]. In particular, this OWMP aims to provide a robust strategy for storing, handling, collection and transport of the wastes generated at site.

This OWMP aims to ensure maximum recycling, reuse and recovery of waste with diversion from landfill, wherever possible. The OWMP also seeks to provide guidance on the appropriate collection and transport of waste to prevent issues associated with litter or more serious environmental pollution (e.g. contamination of soil or water resources). The plan estimates the type and quantity of waste to be generated from the proposed Development during the operational phase and provides a strategy for managing the different waste streams. At present, there are no specific guidelines in Ireland for the preparation of OWMPs. Therefore, in preparing this document, consideration has been given to the requirements of national and regional waste policy, legislation and other guidelines.

2.0 OVERVIEW OF WASTE MANAGEMENT IN IRELAND

2.1 National Level

The Irish Government issued a policy statement in September 1998 entitled *'Changing Our Ways'* [6], which identified objectives for the prevention, minimisation, reuse, recycling, recovery and disposal of waste in Ireland. A heavy emphasis was placed on reducing reliance on landfill and finding alternative methods for managing waste. Amongst other things, *Changing Our Ways* stated a target of at least 35% recycling of municipal (i.e. household, commercial and non-process industrial) waste.

A further policy document, *'Preventing and Recycling Waste – Delivering Change'* was published in 2002 [7]. This document proposed a number of programmes to increase recycling of waste and allow diversion from landfill. The need for waste minimisation at source was considered a priority.

This view was also supported by a review of sustainable development policy in Ireland and achievements to date, which was conducted in 2002, entitled *'Making Irelands Development Sustainable – Review, Assessment and Future Action'* [8]. This document also stressed the need to decouple economic growth and waste generation, again through waste minimisation and reuse of discarded material.

In order to establish the progress of the Government policy document *Changing Our Ways*, a review document was published in April 2004 entitled *'Taking Stock and Moving Forward'* [9]. Covering the period 1998 – 2003, the aim of this document was to assess progress to date with regard to waste management in Ireland, to consider developments since the policy framework and the local authority waste management plans were put in place, and to identify measures that could be undertaken to further support progress towards the objectives outlined in *Changing Our Ways*.

In particular, *Taking Stock and Moving Forward* noted a significant increase in the amount of waste being brought to local authority landfills. The report noted that one of the significant challenges in the coming years was the extension of the dry recyclable collection services.

In September 2020, the Irish Government published a new 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'* [10], was prepared in response to the 'European Green Deal' which sets a roadmap for a transition to a new economy, where climate and environmental challenges are turned into opportunities, replacing the previous national waste management plan *"A Resource Opportunity"* (2012).

It aims to fulfil the commitment in the Programme for Government to publish and start implementing a new National Waste Action Plan. It is intended that this new national waste policy will inform and give direction to waste planning and management in Ireland over the coming years. It will be followed later this year by an All of Government Circular Economy Strategy. The policy document shifts focus away from waste disposal and back up the production chain. To support the policy, regulation is already in place (Circular Economy Legislative Package) or in the pipeline. 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 is the development of a high-level, whole of Government Circular Economy Strategy to set a course for Ireland to transition across all sectors and at all levels of Government toward circularity. This strategy was issued for public consultation in April 2021.

Since 1998, the Environmental Protection Agency (EPA) has produced periodic *'National Waste (Database) Reports'* [11] detailing, among other things, estimates for household and commercial (municipal) waste generation in Ireland and the level of recycling, recovery and disposal of these materials. The *2019 National Waste Statistics*, which is the most recent study published, along with the national waste statistics web resource (November 2021) reported the following key statistics for 2019:

- **Generated –** Ireland produced 3,085,652 t of municipal waste in 2019. This is almost a 6% increase since 2018. This means that the average person living in Ireland generated 628 kg of municipal waste in 2019.
- **Managed –** Waste collected and treated by the waste industry. In 2019, a total of 3,036,991 t of municipal waste was managed and treated.
- **Unmanaged –**Waste that is not collected or brought to a waste facility and is, therefore, likely to cause pollution in the environment because it is burned, buried or dumped. The EPA estimates that 48,660 t was unmanaged in 2019.
- **Recovered –** The amount of waste recycled, used as a fuel in incinerators, or used to cover landfilled waste. In 2019, around 83% of municipal waste was recovered – a decrease from 84% in 2018.
- **Recycled –** The waste broken down and used to make new items. Recycling also includes the breakdown of food and garden waste to make compost. The recycling rate in 2019 was 37%, which is down from 38% in 2018.
- **Disposed –** Less than a sixth (15%) of municipal waste was landfilled in 2019. This is an increase from 14% in 2018.

2.2 Regional Level

The proposed development is located in the Local Authority area of South Dublin County Council (SDCC).

The *EMR Waste Management Plan 2015 – 2021* is the regional waste management plan for the SDCC area published in May 2015.

The regional plan sets out the following strategic targets for waste management in the region:

- A 1% reduction per annum in the quantity of household waste generated per capita over the period of the plan;
- Achieve a recycling rate of 50% of managed municipal waste by 2020; and
- Reduce to 0% the direct disposal of unprocessed residual municipal waste to landfill (from 2016 onwards) in favour of higher value pre-treatment processes and indigenous recovery practices.

Municipal landfill charges in Ireland are based on the weight of waste disposed. In the Leinster Region, charges are approximately €130 - €150 per tonne of waste which includes a €75 per tonne landfill levy specified in the *Waste Management (Landfill Levy) Regulations 2015.*

The *South Dublin County Council Development Plan 2016 – 2022* [12] sets out a number of objectives and actions for the South Dublin area in line with the objectives of the waste management plan.

Waste objectives and actions with a particular relevance to the proposed development are as follows:

Objectives:

- **IE5 Objective 1:** To support the implementation of the Eastern–Midlands Region Waste Management Plan 2015-2021 by adhering to overarching performance targets, policies and policy actions.
- **IE5 Objective 2:** To support waste prevention through behavioural change activities to de-couple economic growth and resource use.
- **IE5 Objective 3:** To encourage the transition from a waste management economy to a green circular economy to enhance employment and increase the value recovery and recirculation of resources.
- **IE5 Objective 8:** To secure appropriate provision for the sustainable management of waste within developments, including the provision of facilities for the storage, separation and collection of such waste.

Actions:

- Support and facilitate the separation of waste at source into organic and non-organic streams or other waste management systems that divert waste from landfill and maximise the potential for each waste type to be re-used and recycled or composted and divert organic waste from landfill, in accordance with the National Strategy on Biodegradable Waste (2006).
- Implement the objectives of the National Waste Prevention Programme at a local level with businesses, schools, householders, community groups and within the Council's own activities.
- Promote an increase in the amount of waste re-used and recycled consistent with the Regional Waste Management Plan and Waste Hierarchy and facilitate recycling of waste through adequate provision of facilities and good design in new developments.
- Implement the South Dublin Litter Management Plan 2015 - 2019.

The *Draft South Dublin County Development Plan 2022 – 2028* [13] will supersede the current development plan and is due to be complete and come into effect in August 2022. The following policy and objectives have thus far been incorporated into the draft plan:

Policy and Objectives

- **Policy IE6: Waste Management**

Implement European Union, National and Regional waste and related environmental policy, legislation, guidance and codes of practice to improve management of material resources and wastes.

- **IE6 Objective 1**

To encourage a just transition from a waste management economy to a green circular economy to enhance employment and increase the value, recovery and recirculation of resources through compliance with the provisions of the Waste Action Plan for a Circular Economy 2020 – 2025 and to promote the use of, but not limited to, reverse vending machines and deposit return schemes or similar to ensure a wider and varying ways of recycling.

- **IE6 Objective 2**

To support the implementation of the Eastern Midlands Region Waste Management Plan 2015-2021 or as amended by adhering to overarching performance targets, policies and policy actions.

- **IE6 Objective 4**

To provide for and maintain the network of bring infrastructure (e.g. civic amenity facilities, bring banks) in the County to facilitate the recycling and recovery of hazardous and non-hazardous municipal wastes.

- **IE6 Objective 7**

To require the appropriate provision for the sustainable management of waste within all developments, ensuring it is suitably designed into the development, including the provision of facilities for the storage, separation and collection of such waste.

- **IE6 Objective 8**

To adhere to the recommendations of the National Hazardous Waste Management Plan 2014-2020 and any subsequent plan, and to co-operate with other agencies including the EPA in the planning, organisation and supervision of the disposal of hazardous waste streams, including hazardous waste identified during construction and demolition projects.

2.3 Legislative Requirements

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

- Waste Management Act 1996 (No. 10 of 1996) as amended 2001 (No. 36 of 2001), 2003 (No. 27 of 2003) and 2011 (No 20 of 2011). Sub-ordinate and associated legislation includes:
  - European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011) as amended
  - Waste Management (Collection Permit) Regulations 2007 (S.I. No. 820 of 2007) as amended
  - Waste Management (Facility Permit and Registration) Regulation 2007 (S.I No. 821 of 2007) as amended
  - Waste Management (Licensing) Regulations 2000 (S.I No. 185 of 2000) as amended
  - European Union (Packaging) Regulations 2014 (S.I. No. 282 of 2014) as amended.
  - Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997) as amended
  - Waste Management (Landfill Levy) Regulations 2015 (S.I. No. 189 of 2015)
  - European Communities (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014)
  - Waste Management (Batteries and Accumulators) Regulations 2014 (S.I. No. 283 of 2014) as amended
  - Waste Management (Food Waste) Regulations 2009 (S.I. No. 508 of 2009) as amended
  - European Union (Household Food Waste and Bio-waste) Regulations 2015 (S.I. No. 191 of 2015)

- Waste Management (Hazardous Waste) Regulations 1998 (S.I. No. 163 of 1998) as amended
- Waste Management (Shipments of Waste) Regulations 2007 (S.I. No. 419 of 2007) as amended
- *European Communities (Transfrontier Shipment of Waste) Regulations 1994 (SI 121 of 1994)*
- European Union (Properties of Waste Which Render it Hazardous) Regulations 2015 (S.I. No. 233 of 2015) as amended
- Environmental Protection Act 1992 (S.I. No. 7 of 1992) as amended;
- Litter Pollution Act 1997 (Act No. 12 of 1997) as amended and
- Planning and Development Act 2000 (S.I. No. 30 of 2000) as amended [14]

These Acts and subordinate Regulations transpose the 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 - 2011 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 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 disposal area, waste contractors will be employed to physically transport waste to the final waste disposal site.

It is, therefore, imperative that the residents and the proposed building management company undertake on-Site management of waste in accordance with all legal requirements and that the facilities management company employ suitably permitted / licenced contractors to undertake off-Site management of their waste in accordance with all legal requirements. This includes the requirement that a waste contactor handle, transport and reuse / recover / recycle / 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, as amended, or a Waste or Industrial Emissions (IE) 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.

2.3.1 South Dublin County Council Waste Bye-Laws

The SDCC *"County of South Dublin (Storage, Presentation and Segregation of Household and Commercial Waste) Bye-Laws (2018)"* came into effect in December 2018. These Bye-laws repeal the previous SDCC bye-laws*; South Dublin County Council Household Waste Bye-Laws 2012* and *South Dublin County Council (Storage, Separation at Source, Presentation and Collection of Commercial Waste) Bye-Laws 2007*. The Bye-Laws set a number of enforceable requirements on waste holders and collectors with regard to storage, separation, presentation and collection of waste within the SDCC functional area. Key requirements under these Bye-laws are:

- Kerbside waste presented for collection shall not be presented for collection earlier than 8.00pm on the day immediately preceding the designated waste collection day;
- All containers used for the presentation of kerbside waste and any uncollected waste shall be removed from any roadway, footway, footpath or any other public place no later than 8:00am on the day following the designated waste collection day;
- Neither recyclable household kerbside waste nor food waste arising from households shall be contaminated with any other type of waste before or after it has been segregated; and

- A management company, or another person if there is no such company, who exercises control and supervision of residential and/or commercial activities in multi-unit developments, mixed-use developments, flats or apartment blocks, combined living/working spaces or other similar complexes shall ensure that:
  - separate receptacles of adequate size and number are provided for the proper segregation, storage and collection of recyclable household kerbside waste and residual household kerbside waste;
  - additional receptacles are provided for the segregation, storage and collection of food waste where this practice is a requirement of the national legislation on food waste;
  - the receptacles referred to in paragraphs (a) and (b) are located both within any individual apartment and at the place where waste is stored prior to its collection;
  - any place where waste is to be stored prior to collection is secure, accessible at all times by tenants and other occupiers and is not accessible by any other person other than an authorised waste collector,
  - written information is provided to each tenant or other occupier about the arrangements for waste separation, segregation, storage and presentation prior to collection; and
  - an authorised waste collector is engaged to service the receptacles referred to in this section of these bye-laws, with documentary evidence, such as receipts, statements or other proof of payment, demonstrating the existence of this engagement being retained for a period of no less than two years. Such evidence shall be presented to an authorised person within a time specified in a written request from either that person or from another authorised person employed by South Dublin County Council.

The full text of the Waste Bye-Laws is available from the SDCC website.

2.4 Regional Waste Management Service Providers and Facilities

Various contractors offer waste collection services for the residential sector in the SDCC region. Details of waste collection permits (granted, pending and withdrawn) for the region are available from the NWCPO.

As outlined in the regional waste management plan, there is a decreasing number of landfills available in the region. Only three municipal solid waste landfills remain operational and all are operated by the private sector. There are a number of other licensed and permitted facilities in operation in the region including waste transfer stations, hazardous waste facilities and integrated waste management facilities. There are two existing thermal treatment facilities, one in Duleek, Co. Meath and a second in Poolbeg in Dublin.

There is a civic amenity Centre at Ballymount Avenue, located c.6.4 km to the north-west of the Development Site, which can be utilised by the residents of the proposed Development for other household waste streams while a bottle bank can be found c. 1.78 m to the north west at the Jobstown Community Centre.

A copy of all CORs and waste permits issued by the Local Authorities are available from the NWCPO website and all Waste / Industrial Emissions Licenses issued are available from the EPA.

3.0 DESCRIPTION OF THE Development

3.1 Location, Size and Scale of the Development

Kelland Homes Ltd and Durkan Estates Ireland Ltd intend are applying to An Bord Pleanála for permission for a strategic housing development at a site at Boherboy, Saggart, County Dublin. To the immediate north of the site is the Carrigmore residential estate, to the west are agricultural lands and a single dwelling, to the east is the Corbally residential estate while to the south is the Boherboy Road. The proposed application represents the development of the entire Boherboy Neighbourhood as identified within the Fortunestown Local Area Plan (2012).

The development will consist of 655 no. dwellings, comprised of 257 no. 2, 3 & 4 bed, 2 & 3 storey detached, semi-detached & terraced houses, 152 no. 1, 2 & 3 bed duplex units in 12 no. 2 & 3 storey blocks, and 246 no. 1, 2 & 3 bed apartments in 9 no. buildings ranging in height from 2, 3-5, 4-5 and 5 storeys, and a 2 storey crèche (693m²). Access to the development will by via one no. vehicular access point from the Boherboy Road, along with proposed upgrade works to Boherboy Road to include the provision of a roadside footpath along the front of the site at the Boherboy Road, continuing eastwards to the junction with the N81 Blessington Road (for an overall distance of c.370m). The proposed development also provides for pedestrian and cyclist connectivity to the adjoining District Park to the north-east, and vehicular connections to adjoining developments at Corbally Heath to the east and Carrigmore Green to the north.

The proposed development includes for all associated site development works, public open spaces, including alongside the Corbally Stream, which will accommodate the provision of pedestrian / cyclist links to the District Park to the north-east, hard and soft landscaping, undercroft & surface car parking, bicycle parking, bin storage, public lighting, ESB sub-stations. Surface water will be attenuated within the site, with outfall to existing watercourses, with foul sewer connected to a proposed new pumping station located at the northern end of the site, on an overall application site area of 18.3ha. In accordance with the Fortunestown Local Area Plan (2012) an area of approx. 1.44ha is reserved for a school site.

3.2 Typical Waste Categories

The typical non-hazardous and hazardous wastes that will be generated at the proposed Development will include the following:

- Dry Mixed Recyclables (DMR) - includes waste paper (including newspapers, magazines, brochures, catalogues, leaflets), cardboard and plastic packaging, metal cans, plastic bottles, aluminium cans, tins and Tetra Pak cartons;
- Organic waste – food waste and green waste generated from internal plants / flowers;
- Glass; and
- Mixed Non-Recyclable (MNR)/General Waste.

In addition to the typical waste materials that will be generated at the development on a daily basis, there will be some additional waste types generated less frequently / in smaller quantities which will need to be managed separately including:

- Green / garden waste may be generated from external landscaping;
- Batteries (both hazardous and non-hazardous);
- Waste electrical and electronic equipment (WEEE) (both hazardous and non-hazardous);
- Printer cartridges / toners;
- Chemicals (paints, adhesives, resins, detergents, etc.);
- Light bulbs;
- Textiles;
- Waste cooking oil (if any generated by the residents);
- Furniture (and, from time to time, other bulky wastes); and
- Abandoned bicycles.

Wastes should be segregated into the above waste types to ensure compliance with waste legislation and guidance while maximising the re-use, recycling and recovery of waste with diversion from landfill wherever possible.

3.3 European Waste Codes

In 1994, the *European Waste Catalogue* [15] and *Hazardous Waste List* [16] were published by the European Commission. In 2002, the EPA published a document titled the *European Waste Catalogue and Hazardous Waste List* [17], which was a condensed version of the original two documents and their subsequent amendments. This document has recently been replaced by the EPA '*Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous'* [18], applicable since the 1st June 2015. This waste classification system applies across the EU and is the basis for all national and international waste reporting, such as those associated with waste collection permits, CORs, permits and licences and the EPA National Waste Database.

Under the classification system, different types of wastes are fully defined by a code. The List of Waste (LoW) code (also referred to as European Waste Code (EWC)) for typical waste materials expected to be generated during the operation of the proposed development are provided in Table 3.1, below.

Table 3.1 Typical Waste Types Generated and LoW Codes

Waste Material	LoW/EWC Code
Paper and Cardboard	20 01 01
Plastics	20 01 39
Metals	20 01 40
Mixed Non-Recyclable Waste	20 03 01
Glass	20 01 02
Biodegradable Kitchen Waste	20 01 08
Oils and Fats	20 01 25
Textiles	20 01 11
Batteries and Accumulators*	20 01 33* - 34
Printer Toner/Cartridges*	20 01 27* - 28
Green Waste	20 02 01
WEEE*	20 01 35*-36
Chemicals (solvents, pesticides, paints & adhesives, detergents, etc.) *	20 01 13*/19*/27*/28/29*30
Fluorescent tubes and other mercury containing waste*	20 01 21*
Bulky Wastes	20 03 07

** Individual waste type may contain hazardous materials*

4.0 ESTIMATED WASTE ARISINGS

A waste generation model (WGM) developed by AWN has been used to predict waste types, weights and volumes expected to arise from operations within the proposed Development. The WGM incorporates building area and use and combines these with other data, including Irish and US EPA waste generation rates.

The estimated quantum / volume of waste that will be generated from the residential units has been determined based on the predicted occupancy of the units. While the floor area usage (m^2) has been used to estimate the waste arising from the crèche unit.

The estimated waste generation for the proposed Development for the main waste types is presented in Tables 4.1 – 4.6.

Table 4.1 Estimated Waste Generation for Residential Apartment Blocks A B C & Y

Waste Type	Waste Volume (m^3 / week)			
	Apartment Block A (Combined)	Apartment Block B (Combined)	Apartment Block C (Combined)	Apartment Block Y (Per Block)
Organic Waste	1.72	0.32	1.45	0.06
Dry Mixed Recyclables	12.16	2.30	10.28	0.41
Glass	0.33	0.06	0.28	0.01
Mixed Non-Recyclables	6.39	1.21	5.41	0.21
Total	**20.60**	**3.90**	**17.42**	**0.69**

Table 4.2 Estimated Waste Generation for Residential Apartment Block X and Individual Houses

Waste Type	Waste Volume (m^3 / week)			
	Apartment Block X (Per Block)	House 2 bed (Individual)	House 3 bed (Individual)	House 4 bed (Individual)
Organic Waste	0.07	0.02	0.02	0.02
Dry Mixed Recyclables	0.47	0.11	0.13	0.18
Glass	0.01	>0.01	>0.01	>0.01
Mixed Non-Recyclables	0.25	0.07	0.08	0.09
Total	**0.80**	**0.20**	**0.23**	**0.29**

Table 4.3 Estimated Waste Generation for Residential Duplex Blocks A-D

Waste Type	Waste Volume (m^3 / week)			
	Duplex Block A (Combined)	Duplex Block B (Combined)	Duplex Block C (Combined)	Duplex Block D (Combined)
Organic Waste	0.35	0.29	0.29	0.18
Dry Mixed Recyclables	2.45	2.03	2.03	1.27
Glass	0.07	0.06	0.06	0.03
Mixed Non-Recyclables	1.29	1.07	1.07	0.67
Total	**4.16**	**3.44**	**3.44**	**2.15**

Table 4.4 Estimated Waste Generation for Residential Duplex Blocks E-H

Waste Type	Waste Volume (m³ / week)			
	Duplex Block E (Combined)	Duplex Block F (Combined)	Duplex Block G (Combined)	Duplex Block H (Combined)
Organic Waste	0.22	0.11	0.22	0.22
Dry Mixed Recyclables	1.52	0.75	1.52	1.52
Glass	0.04	0.02	0.04	0.04
Mixed Non-Recyclables	0.80	0.39	0.80	0.80
Total	**2.58**	**1.26**	**2.58**	**2.58**

Table 4.5 Estimated Waste Generation for Residential Duplex Blocks I-L

Waste Type	Waste Volume (m³ / week)			
	Duplex Block I (Combined)	Duplex Block J (Combined)	Duplex Block K (Combined)	Duplex Block L (Combined)
Organic Waste	0.21	0.15	0.21	0.07
Dry Mixed Recyclables	1.49	1.08	1.49	0.51
Glass	0.04	0.03	0.04	0.01
Mixed Non-Recyclables	0.78	0.57	0.78	0.27
Total	**2.53**	**1.83**	**2.53**	**0.86**

Table 4.6 Estimated Waste Generation for the Creche (Commercial) Unit

Waste Type	Waste Volume (m³ / week)
	Crèche Unit (Individual)
Organic Waste	0.07
Dry Mixed Recyclables	2.73
Glass	0.01
Mixed Non-Recyclables	1.21
Total	**4.02**

BS5906:2005 Waste Management in Buildings – Code of Practice [19] has been considered in the calculations of waste estimates. AWN's modelling methodology is based on recently published data and data from numerous other similar developments in Ireland and is based on AWN's experience, it provides a more representative estimate of the likely waste arisings from the proposed Development.

5.0 WASTE STORAGE AND COLLECTION

This section provides information on how waste generated within the Site will be stored and collected. This has been prepared with due consideration of the proposed Site layout as well as best practice standards, local and national waste management requirements, including those of DCC. In particular, consideration has been given to the following documents:

- *BS 5906:2005 Waste Management in Buildings – Code of Practice,*
- *EMR Waste Management Plan 2015 – 2021;*
- SDCC 'County of South Dublin (Storage, Presentation and Segregation of Household and Commercial Waste) Bye-Laws' (2018); and
- *DoHLGH, Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities* (2020) [20].

Waste Storage Areas
Locations of all Waste Storage Areas (WSAs) can be viewed on the drawings submitted with the planning application under separate cover.

Apartment Block A, B & C
Three (3 no.) shared communal WSAs have been allocated within the development design for the residential apartment blocks. Each block has 1 no. WSA strategically located on the ground / under croft level.

Apartment Blocks X & Y
Four (4 no.) individual WSAs have been allocated per block. These have been strategically located on the ground floor level, in the rear shared yard.

Houses
One (1 no.) individual WSA has been allocated per house. The WSAs have been strategically located on the ground floor level, in the rear yard of the unit, where the unit has external access to their rear yard or at the front of the unit in a shielded bin store where there is no external access to the rear yard.

Duplex Blocks (A -K)
Shared shared communal WSAs have been allocated within the development design for the residential Duplex blocks. Each block has 1 no. WSA strategically located on the ground / under croft level. Blocks D & E will share a WSA, located between the two duplex blocks.

Duplex Block L
Individual WSAs have been allocated for each unit in a shielded bin store. The WSA have been strategically located on the ground floor level, at the front of the units.

Crèche
One (1 no.) WSA has been allocated within the development design for the creche unit in this block to share. This has been strategically located at ground floor level, in close proximity to the building.
Using the estimated waste generation volumes in Tables 4.1 – 4.6, above, the waste receptacle requirements for MNR, DMR, organic waste and glass have been established for the WSA. It is envisaged that organic waste and glass will be collected on a weekly basis while MNR and DMR will be collected on a twice weekly basis.

Waste Storage Requirements

Estimated waste storage requirements for the operational phase of the proposed Development are detailed in Table 5.1, below.

Table 5.1 Waste storage requirements for the proposed development

Area/Use	Bins Required			
	MNR[1]	DMR[2]	Glass	Organic
Apartment Block A	6 no. 1100 L	12 no. 1100 L	2 no. 240 L	8 no. 240 L
Apartment Block B	2 no. 1100 L	3 no. 1100 L	1 no. 240 L	2 no. 240 L
Apartment Block C	5 no. 1100 L	10 no. 1100 L	2 no. 240 L	6 no. 240 L
Apartment Block X (4 no. blocks)	4 no. 240 L	4 no. 240 L	Bottle Bank	4 no. 120 L
Apartment Block Y (6 no. blocks)	4 no. 240 L	4 no. 240 L	Bottle Bank	4 no. 120 L
Duplex Block A	2 no. 1100 L	3 no. 1100 L	1 no. 240 L	2 no. 240 L
Duplex Block B	1 no. 1100 L	2 no. 1100 L	1 no. 240 L	2 no. 240 L
Duplex Block C	1 no. 1100 L	2 no. 1100 L	1 no. 240 L	2 no. 240 L
Duplex Block D	1 no. 1100 L	2 no. 1100 L	1 no. 240 L	1 no. 240 L
Duplex Block E	1 no. 1100 L	2 no. 1100 L	1 no. 240 L	1 no. 240 L
Duplex Block F	1 no. 1100 L	1 no. 1100 L	1 no. 240 L	1 no. 240 L
Duplex Block G	1 no. 1100 L	2 no. 1100 L	1 no. 240 L	1 no. 240 L
Duplex Block H	1 no. 1100 L	2 no. 1100 L	1 no. 240 L	1 no. 240 L
Duplex Block I	1 no. 1100 L	2 no. 1100 L	1 no. 240 L	1 no. 240 L
Duplex Block J	1 no. 1100 L	2 no. 1100 L	1 no. 240 L	1 no. 240 L
Duplex Block K	1 no. 1100 L	2 no. 1100 L	1 no. 240 L	1 no. 240 L
Duplex Block L	4 no. 240 L	4 no. 240 L	Bottle Bank	4 no. 120 L
Crèche	1 no. 1100 L 1 no. 240L	3 no. 1100 L	1 no. 120 L	1 no. 120 L

Note: 1 = Mixed Non-Recyclables
2 = Dry Mixed Recyclables

The waste receptacle requirements have been established from distribution of the total weekly waste generation estimate into the holding capacity of each receptacle type. Waste storage receptacles as per Table 5.1, above, (or similar appropriate approved containers) will be provided by the building management company in the residential WSA.

The types of bins used will vary in size, design and colour dependent on the appointed waste contractor. However, examples of typical receptacles to be provided in the WSAs are shown in Figure 5.1. All waste receptacles used will comply with the IS EN 840 2012 standard for performance requirements of mobile waste containers, where appropriate.

Figure 5.1 Typical waste receptacles of varying size (240 L and 1100 L)

5.1 Waste Storage – Residential Units

Residents will be required to segregate waste into the following main waste streams:

- DMR;
- MNR;
- Glass; and
- Organic waste.

Residents will be required to take their segregated waste materials to their designated WSA and deposit their segregated waste into the appropriate bins. The location of the WSAs are illustrated in the drawings submitted with the planning application under separate cover.

Space will be provided in the residential units to accommodate 3 no. bin types to facilitate waste segregation at source.

Each bin / container in the WSAs will be clearly labelled and colour coded to avoid cross contamination of the different waste streams. Signage will be posted above or on the bins to show exactly which waste types can be placed in each bin.

Access to the shared WSAs will be restricted to authorised residents, facilities management and waste contractors by means of a key or electronic fob access.

Other waste materials such as textiles, batteries, printer toner / cartridges, light bulbs and WEEE may be generated infrequently by the residents. Residents will be required to identify suitable temporary storage areas for these waste items within their own units and dispose of them appropriately. Further details on additional waste types can be found in Section 5.4.

5.2 Waste Storage – Crèche

Staff at the crèche will be required to segregate their waste into the following waste categories within their own units:

- DMR;
- MNR;
- Organic waste; and
- Glass.

As required, the staff will need to take segregated DMR, MNR, glass and organic waste to their allocated WSA.

Each bin / container in the WSA will be clearly labelled and colour coded to avoid cross contamination of the different waste streams. Signage will be posted above or on the bins to show exactly which waste types can be placed in each bin.

Other waste materials such as textiles, batteries, WEEE, lightbulbs, cooking oil and printer toner / cartridges may be generated infrequently by the tenants. Tenants will be required to identify suitable temporary storage areas for these waste items within the crèche and dispose of them appropriately. Further details on additional waste types can be found in Section 5.4.

5.3 Waste Collection

There are numerous private contractors that provide waste collection services in the South Dublin County Council area. All waste contractors servicing the proposed development must hold a valid waste collection permit for the specific waste types collected. All waste collected must be transported to registered / permitted / licensed facilities only.

Bins from the shared WSAs at the development will be brought to collection points by the waste contractor or facilities management, immediately prior to collection or be collected directly from the WSAs (depending on the agreement with the waste contractor).

A trolley / tug or suitable vehicle may be required to convey the bins to and from the collection area. The building management or waste contractor will ensure that empty bins are promptly returned to the WSAs after collection / emptying.

Residents with their own individual WSAs will be required to take their own bins to the curtilage for collection and promptly return them to their own WSAs.

Suitable access and egress has been provided to enable the bins to be moved easily from the WSAs to the waste collection vehicles on the appropriate days. Waste will be collected at agreed days and times by the nominated waste contractors.

All waste receptacles should be clearly identified as required by waste legislation and the requirements of the SDCC *Waste Bye-Laws*. Waste will be presented for collection in a manner that will not endanger health, create a risk to traffic, harm the environment or create a nuisance through odours or litter.

It is recommended that bin collection times are staggered to reduce the number of bins required to be emptied at once and the time the waste vehicle is on-Site. This will be determined during the process of appointment of a waste contractor.

5.4 Additional Waste Materials

In addition to the typical waste materials that are generated on a daily basis, there will be some additional waste types generated from time to time that will need to be managed separately. A non-exhaustive list is presented below.

Green Waste

Green waste may be generated from gardens, external landscaping and internal plants / flowers. Green waste generated from landscaping of external areas will be removed by external landscape contractors. Green waste generated from gardens internal plants / flowers can be placed in the organic waste bins.

Batteries

A take-back service for waste batteries and accumulators (e.g. rechargeable batteries) is in place in order to comply with the S.I. No. 283/2014 - European Union (Batteries and Accumulators) Regulations 2014, as amended. In accordance with these regulations, consumers are able to bring their waste batteries to their local civic amenity centre or can return them free of charge to retailers which supply the equivalent type of battery, regardless of whether or not the batteries were purchased at the retail outlet and regardless of whether or not the person depositing the waste battery purchases any product or products from the retail outlet.

The crèche tenants cannot use the civic amenity centre. They must segregate their waste batteries and either avail of the take-back service provided by retailers or arrange for recycling / recovery of their waste batteries by a suitably permited / licenced contractor. Facilties management may arrange collection, depending on the agreement.

Waste Electrical and Electronic Equipment (WEEE)

The WEEE Directive (Directive 2002/96/EC) and associated Waste Management (WEEE) Regulations have been enacted to ensure a high level of recycling of electronic and electrical equipment. In accordance with the regulations, consumers can bring their waste electrical and electronic equipment to their local recycling centre. In addition, consumers can bring back WEEE within 15 days to retailers when they purchase new equipment on a like for like basis. Retailers are also obliged to collect WEEE within 15 days of delivery of a new item, provided the item is disconnected from all mains, does not pose a health and safety risk and is readily available for collection.

As noted above, the crèche tenants cannot use the civic amenity centre. They must segregate their WEEE and either avail of the take-back / collection service provided by retailers or arrange for recycling / recovery of their WEEE by a suitably permited / licenced contractor. Facilties management may arrange collection, depending on the agreement.

Printer Cartridge / Toners

It is recommended that a printer cartridge / toner bin is provided in the crèche unit, where appropriate. The crèche tenant will be required to store this waste within their unit and arrange for return to retailers or collection by an authorised waste contractor, as required.

Waste printer cartridge / toners generated by residents can usually be returned to the supplier free of charge or can be brought to a civic amenity centre.

Chemicals

Chemicals (such as solvents, paints, adhesives, resins, detergents, etc) are largely generated from building maintenance works. Such works are usually completed by external contractors who are responsible for the off-site removal and appropriate recovery / recycling / disposal of any waste materials generated.

Any waste cleaning products or waste packaging from cleaning products generated in the crèche unit that is classed as hazardous (if they arise) will be appropriately stored within the tenants' own space. Facilties management may arrange collection, depending on the agreement.

Any waste cleaning products or waste packaging from cleaning products that are classed as hazardous (if they arise) generated by the residents should be brought to a civic amenity centre.

Light Bulbs

Waste light bulbs (fluorescent, incandescent and LED) may be generated by lighting at the crèche units. It is anticipated that crèche tenant will be responsible for the off-site removal and appropriate recovery / disposal of these wastes. Facilties management may arrange collection, depending on the agreement.

Light bulbs generated by residents should be taken to the nearest civic amenity centre for appropriate storage and recovery / disposal.

Textiles

Where possible, waste textiles should be recycled or donated to a charity organisation for reuse. Crèche and residential tenants will be responsible for disposing of waste textiles appropriately.

Waste Cooking Oil

If the commerial tenants use cooking oil, waste cooking oil will need to be stored within the unit on a bunded area or spill pallet and regular collections by a dedicated waste contractor will need to be organised as required. Under sink grease traps will be installed in any cooking space.

If the residents generate waste cooking oil, this can be brought to a civic amenity centre.

Furniture & Other Bulky Waste Items

Furniture and other bulky waste items (such as carpet, etc.) may occasionally be generated by the crèche tenant. The collection of bulky waste will be arranged, as required by the tenant. If residents wish to dispose of furniture, this can be brought a civic amenity centre.

Abandoned Bicycles

Bicycle parking areas are planned for the development. As happens in other developments, residents sometimes abandon faulty or unused bicycles, and it can be difficult to determine their ownership. Abandoned bicycles should be donated to charity if they arise or Facilties management willmay arrange collection by a licensed waste contractor.

Covid-19 Waste

Any waste generated by residential and crèche tenant that have tested positive for Covid-19 should be manged in accordance with the current Covid-19 HSE Guidelines at the time that that waste arises. At the time this report was prepared, the HSE Guidelines require the following procedure for any waste from a person that tests positive for Covid-19:

- Put all waste (gloves, tissues, wipes, masks) from that person in a bin bag and tie when almost full;
- Put this bin bag into a second bin bag and tie a knot;
- Store this bag safely for 3 days, then put the bag into the non-recyclable waste / general waste wheelie bin for collection / emptying.

Please note that this guidance is likely to be updated by the time the proposed Development is open and occupied and the relevant guidance at the time will need to be reviewed.

5.5 Waste Storage Area Design

The WSAs should be designed and fitted-out to meet the requirements of relevant design Standards, including:

- Be fitted with a non-slip floor surface;
- Provide ventilation to reduce the potential for generation of odours with a recommended 6-10 air changes per hour for a mechanical system for internal WSAs;
- Provide suitable lighting – a minimum Lux rating of 220 is recommended;
- Be easily accessible for people with limited mobility;
- Be restricted to access by nominated personnel only;
- Be supplied with hot or cold water for disinfection and washing of bins;
- Be fitted with suitable power supply for power washers;
- Have a sloped floor to a central foul drain for bins washing run-off;
- Have appropriate signage placed above and on bins indicating correct use;
- Have access for potential control of vermin, if required; and
- Be fitted with CCTV for monitoring.

The building management company, tenants and residents will be required to maintain the resident bins and storage areas in good condition as required by the SDCC Waste Bye-Laws.

6.0 CONCLUSIONS

In summary, this OWMP presents a waste strategy that addresses all legal requirements, waste policies and best practice guidelines and demonstrates that the required storage areas have been incorporated into the design of the proposed Development.

Implementation of this OWMP will ensure a high level of recycling, reuse and recovery at the development. All recyclable materials will be segregated at source to reduce waste contractor costs and ensure maximum diversion of materials from landfill, thus contributing to the targets set out in the *EMR Waste Management Plan 2015 – 2021*.

Adherence to this plan will also ensure that waste management at the development is carried out in accordance with the requirements of the S*DCC Waste Bye-Laws.*

The waste strategy presented in this document will provide sufficient storage capacity for the estimated quantity of segregated waste. The designated areas for waste storage will provide sufficient room for the required receptacles in accordance with the details of this strategy.

7.0 REFERENCES

1. Waste Management Act 1996 (S.I. No. 10 of 1996) as amended 2001 (S.I. No. 36 of 2001), 2003 (S.I. No. 27 of 2003) and 2011 (S.I. No. 20 of 2011). Sub-ordinate and associated legislation includes:
    - European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011) as amended
    - Waste Management (Collection Permit) Regulations 2007 (S.I. No. 820 of 2007) as amended
    - Waste Management (Facility Permit and Registration) Regulations 2007 (S.I No. 821 of 2007) as amended
    - Waste Management (Licensing) Regulations 2000 (S.I No. 185 of 2000) as amended
    - European Union (Packaging) Regulations 2014 (S.I. No. 282 of 2014)
    - Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997)
    - Waste Management (Landfill Levy) Regulations 2015 (S.I. No. 189 of 2015)

- European Communities (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014)
- Waste Management (Batteries and Accumulators) Regulations 2014 (S.I. No. 283 of 2014) as amended
- Waste Management (Food Waste) Regulations 2009 (S.I. No. 508 of 2009) as amended 2015 (S.I. No. 190 of 2015)
- European Union (Household Food Waste and Bio-waste) Regulations 2015 (S.I. No. 191 of 2015)
- Waste Management (Hazardous Waste) Regulations 1998 (S.I. No. 163 of 1998) as amended 2000 (S.I. No. 73 of 2000)
- Waste Management (Shipments of Waste) Regulations 2007 (S.I. No. 419 of 2007) as amended
- *European Communities (Transfrontier Shipment of Waste) Regulations 1994 (SI 121 of 1994)*
- European Union (Properties of Waste which Render it Hazardous) Regulations 2015 (S.I. No. 233 of 2015) as amended

2. Environmental Protection Act 1992 (Act No. 7 of 1992) as amended;
3. Litter Pollution Act 1997 (Act No. 12 of 1997) as amended;
4. Eastern-Midlands Waste Region, *Eastern-Midlands Region (EMR) Waste Management Plan 2015 – 2021* (2015)
5. The South Dublin County (SDCC) *'South Dublin County Council Household & Commercial Waste Bye-Laws'(2018).*
6. Department of Environment and Local Government (DoELG) *Waste Management – Changing Our Ways, A Policy Statement* (1998)
7. Department of Environment, Heritage and Local Government (DoEHLG) *Preventing and Recycling Waste - Delivering Change* (2002)
8. DoELG, *Making Ireland's Development Sustainable – Review, Assessment and Future Action (World Summit on Sustainable Development)* (2002)
9. DoEHLG, *Taking Stock and Moving Forward* (2004)
10. Department of Communications, Climate Action and Environment (DCCAE), *Waste Action Plan for the Circular Economy - Ireland's National Waste Policy 2020-2025* (2020).
11. Environmental Protection Agency (EPA), *National Waste Database Reports 1998 – 2012*.
12. SDCC*, South Dublin County Development Plan 2016 – 2022* (2016)
13. SDCC*, Draft South Dublin County Development Plan 2022 – 2028* (2021)
14. Planning and Development Act 2000 (S.I. No. 30 of 2000) as amended 2010 (S.I. No. 30 of 2010) and 2015 (S.I. No. 310 of 2015).
15. European Waste Catalogue - Council Decision 94/3/EC (as per Council Directive 75/442/EC).
16. Hazardous Waste List - Council Decision 94/904/EC (as per Council Directive 91/689/EEC).
17. EPA, *European Waste Catalogue and Hazardous Waste List* (2002)
18. EPA, *Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous* (2015)
19. BS 5906:2005 Waste Management in Buildings – Code of Practice.
20. DoHLGH, Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities (2020).

APPENDIX 12 - ARCHAEOLOGY & CULTURAL HERITAGE

Appendix 12.1: Figures

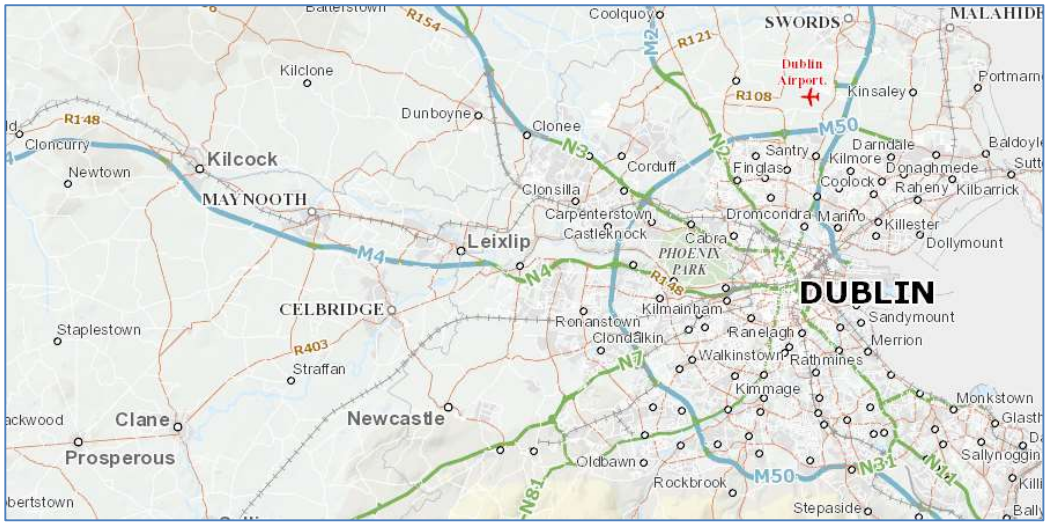

Figure 1: Location of development in Saggart, Co. Dublin

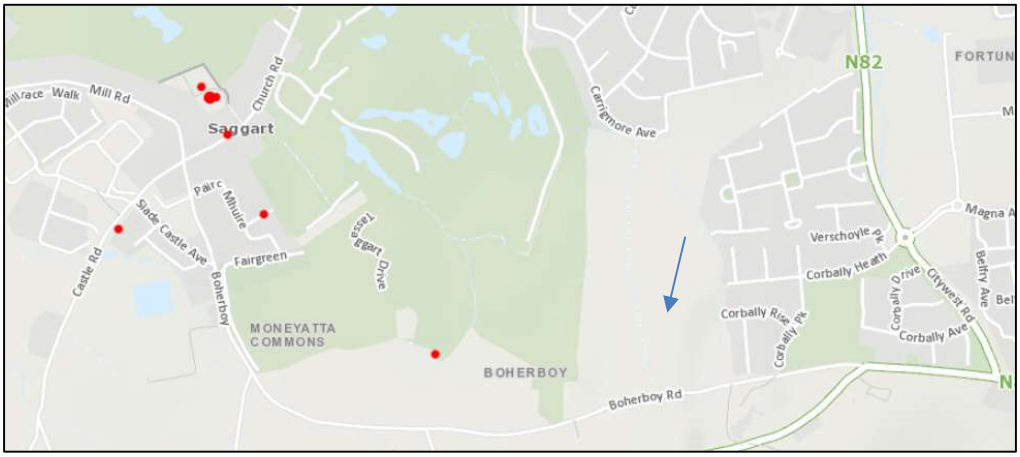

Figure 2: Extract from the RMP for the development with the proposed marked

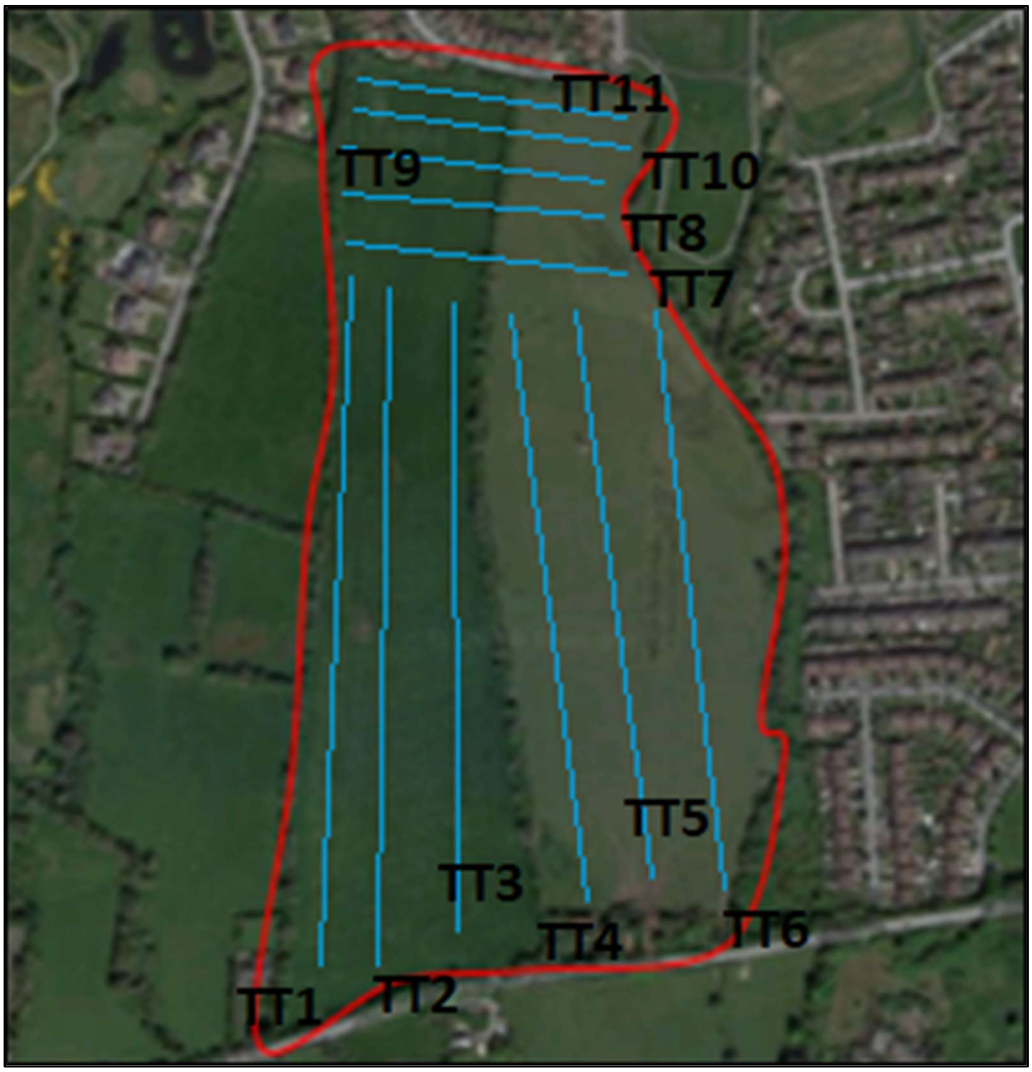

Figure 3: Site layout with the test trenches marked

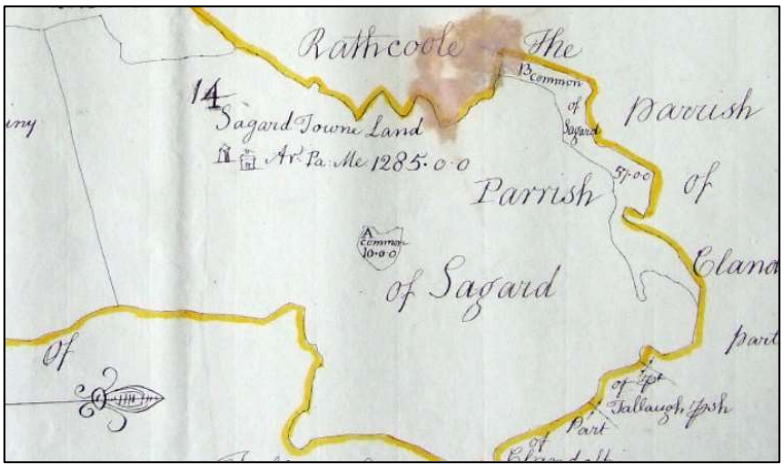

Figure 4: 17th century Down Survey for the area

Figure 5: Site in the Roque map of 1760

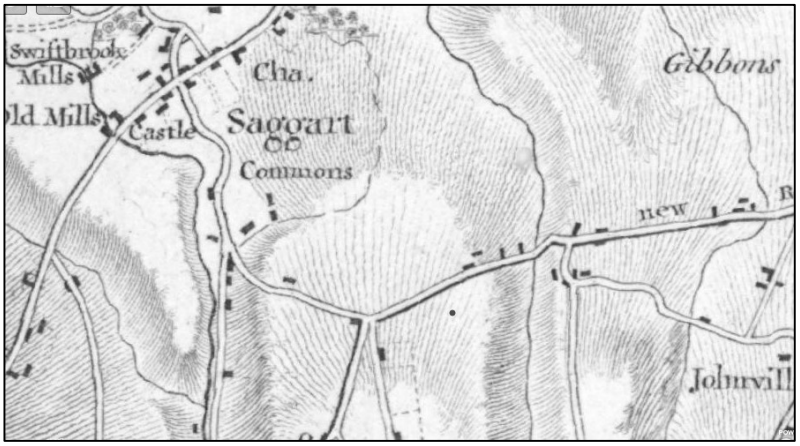

Figure 6: Taylors Survey of 1817

Figure 7: First edition OS map with the development marked and structures visible at the south of the study

area

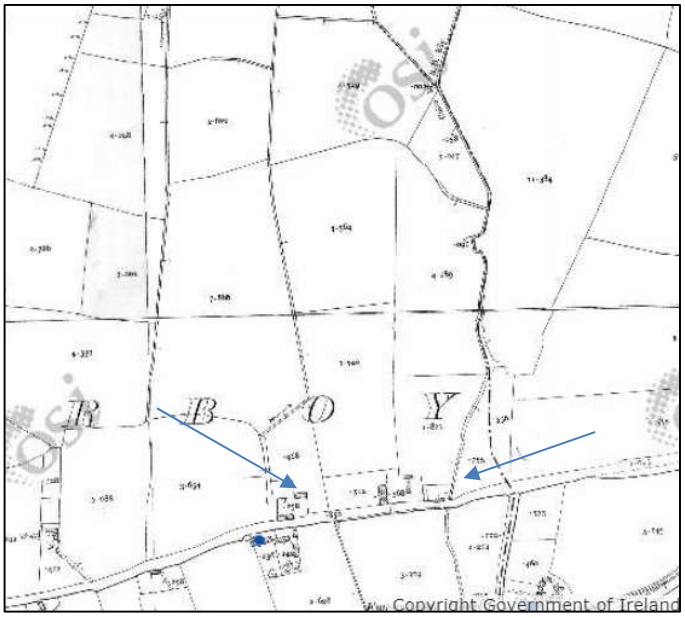

Figure 8: 25" map (1897-1913) with the farmyards at the south marked

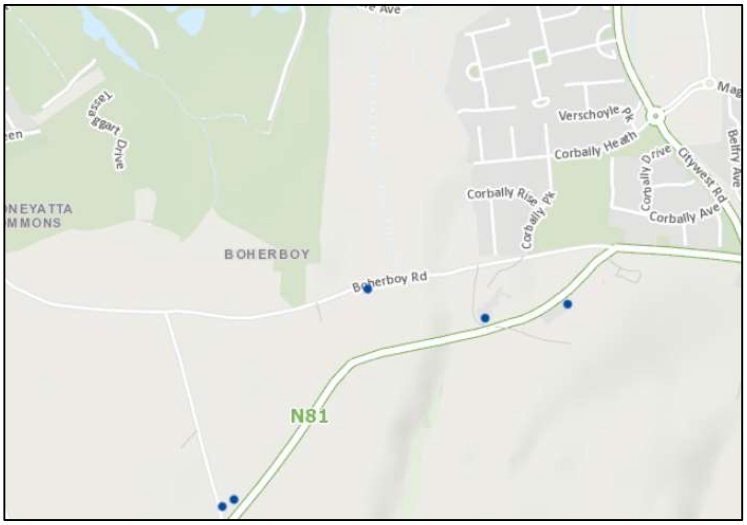

Figure 9: Location of structures adjacent to the study area, listed in the Inventory of Architecture of Ireland

Appendix 12.2: Photographic record

Plate 1: Modern farmhouses at the north of the study area

Plate 2: Looking northwest over the site

Plate 3: Looking south over the study area

Plate 4: Recently cleaned drainage channels at the east of the site

Plate 5: Protected structure (Reg No. 11214010) visible from the current entrance to the study area

Plate 6: Structure at the southwest of the study area

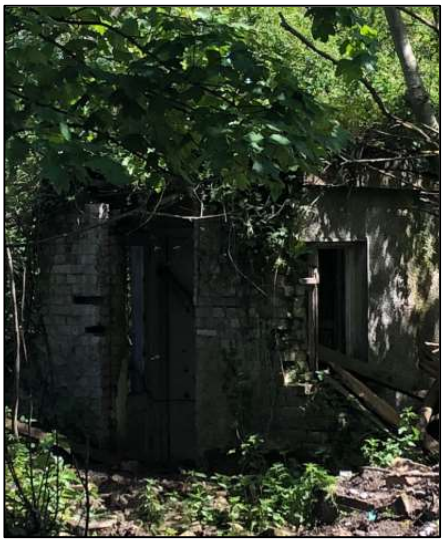

Plate 7: The remains of dwelling at the southeast of the study area

Plate 8: Modern shed at the south east of the study area

Plate 9: Looking west from the study area to Saggarts Historical Centre

Plate 10: Trench 1 during excavation looking north

Plate 11: Test trench three, looking north

Plate 12: Test trench 4, looking south during excavation, plough marks visible

Plate 13: Test trench 5, looking south, on the left with gap for the water mains visible, looking north at the right

Plate 14: Test trench 6, looking south

Plate 15: Test trench 7 during excavation

Plate 16: Test trench 8 during excavation, looking west

Plate 17: Test trench 9, looking north

Plate 18: Test trench 10, looking west

Appendix 12.3: Archaeological Testing

A series of test trenches were excavated by a mechanical excavator on a dry overcast day (Figure 3). These were placed to assess the impact on any possible archaeological deposits below the ground surface. These traversed the proposed development and the associated works (Figure 1-3).

Test Trench 1-2

These were excavated at the west of the site. The trench was 2m in width and between 3-350m in length and was excavated north to south, the field slopes steeply to the northeast. The upper layer of the trench was dark brown humic topsoil and overlay boulder clay. The topsoil was shallow in nature measuring between 0.2-0.25m in depth. Areas of gravel were visible on occasion along the trench. At the centre of the trench a large water mains traverses the site running east to west from Poulaphouca Reservoir to Dublin City. No archaeological features, finds or architectural fragments were visible in the trench.

Test Trench 3

This was located in the centre of the site running from north to south in the field at the west. The site of the trench slopes to the north. The top of the trench has commanding views of the surrounding countryside. The trench was excavated by mechanical excavator. The trench was 2m in width and 300m in length. The topsoil was shallow in the trench averaging at 0.2m, this overlay the natural boulder clay. Areas of gravel was visible at intervals along the trench reflecting the unlaying stratigraphy of the site which is composed of gravel, sand and boulders.

Test Trench 4

This was located at the centre of the site in the field at the east. The trench was 2m in width and 250m in length and was excavated north to south. The upper layer of the trench was dark brown humic topsoil and overlay boulder clay. The topsoil was shallow in nature measuring between 0.2-0.25m in depth. Areas of gravel were visible on occasion along the trench. At the centre of the site evidence of a land boundary crossing the site east to west. This was also visible in trenches 5 and 6. At the north of the trench a large water mains traverses the site running east to west from Poulaphouca Reservoir to Dublin City. No archaeological features, finds or architectural fragments were visible in the trench.

Test Trench 5

This was located at the centre of the site. The trench was 2m in width and 260m in length and was excavated north to south. The upper layer of the trench was dark brown humic topsoil and overlay boulder clay. The topsoil was shallow in nature measuring between 0.2-0.25m in depth. Areas of gravel were visible on occasion along the trench. At the centre of the site evidence of a land boundary crossing the site east to west. This was also visible in trenches 4 and 6. At the north of the trench a large water mains traverses the site running east to west from Poulaphouca Reservoir to Dublin City. No archaeological features, finds or architectural fragments were visible in the trench.

Test Trench 6

This was excavated along the northern half of the development from north to south. The trench was 2m in width and 95m in length. The trench was excavated through topsoil that measured on average 0.25m which overlay boulder clay. A modern drain was visible at the northern end of the trench running north to south.

Test Trench 7

This was excavated at the northeast of the development. The trench was excavated along a northeast sloping section of the field. The trench was 2m in width and 125m in length. The trench was excavated through topsoil that measured on average 0.2m which overlay an orange boulder clay. The trench was bisected by a hedgerow and drain. The drain had recently been cleaned and was assessed for features. No archaeological finds or features were encountered in the test trench or in the drain that bisected the trench.

Test Trench 8

This was excavated at the north of the development. The trench was excavated in the lowest part of the field. The trench was excavated through marshy ground at the east. The trench slopes gently to the northeast. The west of the trench was drier. Water loving plants such as rushes were visible at the west. The trench was 2m in width and 75m in length. The trench was excavated through topsoil that measured on average 0.2m which overlay a grey clay at the west and orange boulder clay at the west. The trench was bisected by a hedgerow and drain. The drain had recently been cleaned and was assessed for features. At the west the trench was curtailed to avoid the water mains. No archaeological finds or features were encountered in the test trench or in the drain that bisected the trench.

Test Trench 9

This was excavated at the north of the development. The trench was excavated in the lowest part of the field. The trench was excavated through marshy ground at the east. The trench slopes gently to the northeast. The west of the trench was drier. Water loving plants such as rushes were visible at the west. The trench was 2m in width and 140m in length. The trench was excavated through topsoil that measured on average 0.2m which overlay a grey clay at the west and orange boulder clay at the west. The trench was bisected by a hedgerow and drain. The drain had recently been cleaned and was assessed for features. At the east the trench was curtailed to avoid the water mains. No archaeological finds or features were encountered in the test trench or in the drain that bisected the trench.

Test Trench 10-11

These trenches were excavated at the north of the development. The trenches were similar in stratigraphy. The trench in located in level ground. The type of ground was similar across the two fields. The trenches were excavated through marshy ground. Water loving plants such as rushes were visible at the west. The trenches were 2m in width and approximately 75m in length. They were excavated through topsoil that measured on average 0.2m which overlay a grey clay at the west with peaty soil visible in places. The trenches were bisected by a hedgerow and drain. The drain had recently been cleaned and was assessed for features. No archaeological finds or features were encountered in the test trench or in the drain that bisected the trench.

A series of text trenches were excavated across the site. The fill of the trenches was relatively uniform across the entire site. The trenches were 2m in width and between 55m and 350m in length, they were excavated to a maximum depth of 0.75m. The trenches did not contain any archaeological finds or features.