

Appendix 18

Trial Pit Logs

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FTC
Trial Pit Log

Site	<u>Millennium Park</u>	Client	<u>Thornton's Waste</u>
Supervisor	<u>DF/DD</u>	Job Number	<u>DE07-046-02</u>
Trial Pit Number	<u>TP 1</u>	Date	<u>13/09/2007</u>
Trial Pit Location	<u>10342: 40796</u>		

Trial Pit Details

Depth (m)	Geology	Description	Comments
0.0 – 0.6	Topsoil	Uncompact brown Loam CLAY	
0.6 – 1.4	Silt	Firm sandy SILT with gravel	
1.4 – 3.0	Clay	Firm gravelly CLAY with some cobbles	
3.0 – 3.7	Clay	Stiff gravelly CLAY with cobbles and some weathered boulders (grey/ black limestone)	

Depth to Rock	<u>Not encountered</u>
Rock type	<u>Not encountered</u>
Water entry	<u>Not encountered</u>
Total depth	<u>3.7 m bgl</u>

Notes/
Comments No odour or visible contamination

FTC
Trial Pit Log

Site	<u>Millennium Park</u>	Client	<u>Thornton's Waste</u>
Supervisor	<u>DD</u>	Job Number	<u>DE07-046-02</u>
Trial Pit Number	<u>TP 2</u>	Date	<u>13/09/2007</u>
Trial Pit Location	<u>10401: 40683</u>		

Trial Pit Details

Depth (m)	Geology	Description	Comments
0.0 – 0.3	Topsoil	Uncompact brown loam CLAY	
0.3 – 0.8	Clay	Soft to firm sandy SILT/CLAY layer with gravel	Strong red colour/ staining
0.8 – 1.2	Clay	Firm CLAY with (rounded) gravel	
1.2 – 3.4	Clay	Firm gravelly CLAY (rounded gravel) and larger cobbles and boulders (increasing with depth) (grey/ black limestone)	Almost 50/50 gravel/ clay at depth

Depth to Rock	<u>Not encountered</u>
Rock type	<u>Not encountered</u>
Water entry	<u>Not encountered</u>
Total depth	<u>3.4 m bgl</u>

Notes/ Comments: No odour or visible contamination. Evidence of mottling down to 0.8 m. Trial pit left opened for one hour and no water entered.

FTC
Trial Pit Log

Site	<u>Millennium Park</u>	Client	<u>Thornton's Waste</u>
Supervisor	<u>DD</u>	Job Number	<u>DE07-046-02</u>
Trial Pit Number	<u>TP 3</u>	Date	<u>13/09/2007</u>
Trial Pit Location	<u>10376: 40745</u>		

Trial Pit
Details

Depth (m)	Geology	Description	Comments
0.0 – 0.45	Topsoil	Uncompact brown loam CLAY topsoil	
0.45 – 1.8	Clay	Firm CLAY/ gravely CLAY with cobbles (increasing from 1 m onwards)	
1.8 – 2.7	Clay	Stiff gravely CLAY with larger cobbles and boulders (increasing with depth) (grey/ black limestone)	

Depth to Rock	<u>Not encountered</u>
Rock type	<u>Not encountered</u>
Water entry	<u>Not encountered</u>
Total depth	<u>2.7 m bgl</u>

Notes/
Comments No odour or visible contamination. Evidence of mottling at 0.8 m.

Appendix 19

Soil Analysis Report

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CERTIFICATE OF ANALYSIS

Client: Fehily Timoney & Company (Dublin)
Floor 2
Mill House
Ashtowngate
Navan Road
Dublin 15

Attention: Declan Duff

Date: 9 October, 2007

Our Reference: 07-B06606/01

Your Reference: DE07 - 46

Location:

A total of 9 samples was received for analysis on Friday, 21 September 2007 and authorised on Tuesday, 9 October 2007. Accredited laboratory tests are defined in the log sheet, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation. We are pleased to enclose our final report, it was a pleasure to be of service to you, and we look forward to our continuing association.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Signed

Lorraine McNamara

Lorraine McNamara
Laboratory Technical Manager

Compiled By

Paul Barry
.....
Paul Barry



Printed at 12:41 on 22/10/2007

ALcontrol Geochem Ireland is a trading division of ALcontrol UK Limited.

Registered Office: Templeborough House, Mill Close, Rotherham, S60 1BZ. Registered in England and Wales No. 4057291

ALcontrol Laboratories Ireland

Test Schedule Summary

Ref Number: 07-B06606/01 **Sample Type: SOIL**
Client: Fehily Timoney & Company (Dublin) Location:
Date of Receipt: 21/09/2007 Client Contact: Declan Duff
Client Ref: DE07 - 46

* SUBCONTRACTED TO OTHER LABORATORY / ** SAMPLES ANALYSED AT THE CHESTER LABORATORY

SCHEDULE	METHOD	TEST NAME	TOTAL
X	GRAVIMETRIC	Natural Moisture Content	9
X	GRAVIMETRIC	Solvent Extractable Matter	9
X	HPLC	Total Phenols by HPLC	9
X	ICP	Total Sulphate (Acid Soluble)**	9
X	ICP	Metals (9)	9
X	ICP OES	Water Soluble Boron	9
X	KONE	Acid Soluble Sulphide	9
X	LECO	Total Sulphur**	9
X	METER	pH (Solid)	9
X	SPECTRO	Total Cyanide	9

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- Interim
- Validated

ALcontrol Laboratories Ireland

Table Of Results

Ref Number: 07-B06606/01

Sample Type: SOIL

Client: Fehily Timoney & Company (Dublin)

Location:

Date of Receipt: 21/09/2007

Client Contact: Declan Duff

(of first sample)

Client Ref: DE07 - 46

Detection Method				GRAVIMETRIC	GRAVIMETRIC	HPLC	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP OES	KONE	
Method Detection Limit				<0.1%	<10mg/kg	<0.01mg/kg	<100mg/kg	<1mg/kg	<1mg/kg	<1mg/kg	<1mg/kg	<1mg/kg	<1mg/kg	<1mg/kg	<1mg/kg	<1mg/kg	<5mg/kg	
UKAS Accredited [Testing Laboratory] No. 1291						✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		
Alcontrol Reference	Sample Identity Other ID			Natural Moisture Content	Solvent Extractable Matter	Total Phenols	Total Sulphate**	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Zinc	Water Soluble Boron	Acid Soluble Sulphide
				%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
07-B06606-S0006	TP 1	0.4M	UNKNOWN	17.3	<10	0.02	490	<1	2	18	31	48	<1	46	<1	139	<1	10
07-B06606-S0007	TP 1	0.6M	UNKNOWN	22.5	10	0.01	620	<1	2	27	64	120	<1	45	<1	160	1	<5
07-B06606-S0008	TP 1	3.5M	UNKNOWN	12.6	<10	0.07	270	<1	2	18	23	22	<1	52	<1	128	<1	36
07-B06606-S0009	TP 2	0.5M	UNKNOWN	21.5	10	0.06	350	<1	3	25	39	53	<1	55	<1	155	<1	<5
07-B06606-S0010	TP 2	0.6M	UNKNOWN	22.7	<10	0.09	280	<1	3	27	32	51	<1	53	<1	156	<1	<5
07-B06606-S0011	TP 2	0.8M	UNKNOWN	22.2	<10	0.09	220	<1	3	34	48	39	<1	69	<1	163	<1	<5
07-B06606-S0012	TP 2	3.4M	UNKNOWN	8.7	18	0.03	770	<1	2	14	22	53	<1	40	<1	159	<1	15
07-B06606-S0013	TP 3	1.0M	UNKNOWN	12.0	<10	0.06	310	<1	3	18	35	22	<1	47	<1	90	<1	<5
07-B06606-S0014	TP 3	2.5M	UNKNOWN	7.8	<10	0.03	510	<1	2	12	21	15	<1	34	<1	87	<1	20

Notes : METHOD DETECTION LIMITS ARE NOT ALWAYS ACHIEVABLE DUE TO VARIOUS CIRCUMSTANCES BEYOND OUR CONTROL.

NDP = NO DETERMINATION POSSIBLE

Checked By : Paul Barry

- Interim
- Validated

ALcontrol Laboratories Ireland

Table Of Results

Ref Number: 07-B06606/01

Client: Fehily Timoney & Company (Dublin)

Date of Receipt: 21/09/2007

(of first sample)

Sample Type: SOIL

Location:

Client Contact: Declan Duff

Client Ref: DE07 - 46

Detection Method				LECO	METER	SPECTRO										
Method Detection Limit				<0.01%	napH Units	<2.5mg/kg										
UKAS Accredited [Testing Laboratory] No. 1291																
ALcontrol Reference	Sample Identity			Other ID	Total Sulphur**	pH	Total Cyanide									
					%	pH Units	mg/kg									
07-B06606-S0006	TP 1	0.4M	UNKNOWN	0.05	8.21	<2.5										
07-B06606-S0007	TP 1	0.6M	UNKNOWN	0.03	8.15	<2.5										
07-B06606-S0008	TP 1	3.5M	UNKNOWN	0.03	8.41	<2.5										
07-B06606-S0009	TP 2	0.5M	UNKNOWN	0.02	8.28	<2.5										
07-B06606-S0010	TP 2	0.6M	UNKNOWN	0.01	8.10	<2.5										
07-B06606-S0011	TP 2	0.8M	UNKNOWN	0.01	8.37	<2.5										
07-B06606-S0012	TP 2	3.4M	UNKNOWN	0.06	8.42	<2.5										
07-B06606-S0013	TP 3	1.0M	UNKNOWN	0.03	8.40	<2.5										
07-B06606-S0014	TP 3	2.5M	UNKNOWN	0.07	8.45	<2.5										

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Notes : METHOD DETECTION LIMITS ARE NOT ALWAYS ACHIEVABLE DUE TO VARIOUS CIRCUMSTANCES BEYOND OUR CONTROL.

NDP = NO DETERMINATION POSSIBLE

Checked By : Paul Barry

APPENDIX

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APPENDIX

1. Results are expressed as mg/kg dry weight (dried at 30°C) on all soil analyses except for the following: NRA Leach tests, flash point, and ammoniacal N₂ by the BRE method, VOC, PRO, Cyanide, Acid Soluble Sulphide, SVOC, DRO, PAH, PCB, TPH CWG ,TPH by IR, OFGs and SEM.
2. Samples will be run in duplicate upon request, but an additional charge may be incurred.
3. A sub sample of all samples received will be retained free of charge for one month for soils and one month for waters (sample size permitting), but may then be discarded unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage.
4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.
5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.
6. When requested, an asbestos screen is done in-house on soils and if no fibres are found will be reported as NFD – no fibres detected. If fibres are detected, then identification and quantification is carried out by ALcontrol Technichem or Alcontrol Shutlers in the UK. If a sample is suspected of containing asbestos, then drying and crushing will be suspended on that sample until the asbestos results are known. If asbestos is present, then no analysis requiring dry sample are undertaken.
7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample – similarly, if a headspace is present in the volatile sample.
8. NDP – No Determination Possible due to insufficient/unsuitable sample.
9. Metals in water are performed on a filtered sample, and therefore represent dissolved metals – total metals must be requested separately.
10. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.

Last updated February 2005

Chain of Custody No: 52890

GEOTRACE - ANALYSIS REQUEST FORM AND SAMPLE CUSTODY SHEET



ALcontrol Laboratories

Unit 18a, Rosemount Business Park,
Ballycoolin, Dublin 11
e-mail: Ireland.schedulers@alcontrol.ie
Tel: 01 8829893 Fax: 01 8829895

Client: <u>FTC</u>	Date of Despatched:	Sheet of
Address: <u>FLOOR 2 MILL HOUSE BUSHYDOWN GATE, NAUHAN RD, DG</u>	Sampler:	
Tel: _____ Fax: _____	Email schedule to:	Report Format Standard
Project/Site Name: <u>DECT-1407</u>	Email results to: <u>dedan.duff@alcontrol.ie</u>	
Email: <u>dedan.duff@alcontrol.ie</u>	Contact Name: <u>DECIAN DUFF</u>	Job Continuation - yes / no
Project Code:	ALcontrol Quote Number:	

13/09/07

Date of Sampling:	Sample Ref. ID	Depth in metres	Sample Preservation Y/N	(S)oil or (W)ater (specify if other)	Sample Concentration Low, Medium or High (L, M, H)	SUITE NAME/ANALYSIS REQUIRED	Turnaround - please tick				Time Dependant Please Tick Box	Sampler Signature	
							10 day t/a	5 day t/a	3 day t/a	1 day t/a			BOD
0.4m	TP1	0.4	N	S		MINI SOIL SUITE	<input checked="" type="checkbox"/>						
0.6m	TP1	0.6	N	S									
3.5m	TP1	3.5	N	S									
13/9/07	TP2	0.5	N	B									
"	TP2	0.6	N	B									
"	TP2	0.8	N	B									
"	TP2	3.4	N	B		PLASTIC + GLASS JAR							
"	TP3	1.0	N	S									
"	TP3	2.5	N	S									

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Please hold samples
→ possible analysis
(GRO, PRO, TPH) after
mini suite.

Special Instructions: (Please include any know or suspected hazardous in the samples for analysis)	P.O. Number <u>to follow</u>	Invoice address if different from above:
	Date Received: <u>21/09/07 15:55</u>	Signature: <u>Sophie Fullen</u> ALcontrol Job No.

Appendix 20

Groundwater Analysis Report

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Fehily Timoney
3rd Floor
North Park Offices
North Park Business Park
North Road
Dublin
Dublin 11

Attention: Barry Donovan

CERTIFICATE OF ANALYSIS

Date: 13 June 2016
Customer: D_FTIM_DUB
Sample Delivery Group (SDG): 160603-119
Your Reference: LW15-046-02 Thorntons
Location: Thorntons Millenium Park
Report No: 364675

We received 2 samples on Friday June 03, 2016 and 2 of these samples were scheduled for analysis which was completed on Monday June 13, 2016. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Approved By:

Sonia McWhan

Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG: 160603-119
Job: D_FTIM_DUB-253
Client Reference: LW15-046-02 Thorntons

Location: Thorntons Millenium Park
Customer: Fehily Timoney
Attention: Barry Donovan

Order Number: Z0275
Report Number: 364675
Superseded Report:

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
13536878	GW05		0.00 - 0.00	02/06/2016
13536890	GW06		0.00 - 0.00	02/06/2016

Only received samples which have had analysis scheduled will be shown on the following pages.

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SDG: 160603-119
Job: D_FTIM_DUB-253
Client Reference: LW15-046-02 Thorntons

Location: Thorntons Millenium Park
Customer: Fehily Timoney
Attention: Barry Donovan

Order Number: Z0275
Report Number: 364675
Superseded Report:

LIQUID Results Legend X Test N No Determination Possible	Lab Sample No(s)		13536878	13536890
	Customer Sample Reference		GW05	GW06
	AGS Reference			
	Depth (m)		0.00 - 0.00	0.00 - 0.00
	Container		1000ml glass bottle	Vial (ALE297)
Alkalinity as CaCO3	All	NDPs: 0 Tests: 2	X	X
Ammonium Low	All	NDPs: 0 Tests: 2		X
Anions by Kone (w)	All	NDPs: 0 Tests: 2	X	X
Conductivity (at 20 deg.C)	All	NDPs: 0 Tests: 2	X	X
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 2	X	X
Dissolved Oxygen by Probe	All	NDPs: 0 Tests: 2	X	X
EPH (DRO) (C10-C40) Aqueous (W)	All	NDPs: 0 Tests: 2	X	X
Fluoride	All	NDPs: 0 Tests: 2	X	X
GRO by GC-FID (W)	All	NDPs: 0 Tests: 2		X
Mercury Dissolved	All	NDPs: 0 Tests: 2	X	X
Metals by iCap-OES Dissolved (W)	All	NDPs: 0 Tests: 2	X	X
Metals by iCap-OES Unfiltered (W)	All	NDPs: 0 Tests: 2	X	X
Nitrite by Kone (w)	All	NDPs: 0 Tests: 2		X
pH Value	All	NDPs: 0 Tests: 2	X	X
Total EPH (aq)	All	NDPs: 0 Tests: 2	X	X

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SDG: 160603-119
Job: D_FTIM_DUB-253
Client Reference: LW15-046-02 Thorntons

Location: Thorntons Millenium Park
Customer: Fehily Timoney
Attention: Barry Donovan

Order Number: Z0275
Report Number: 364675
Superseded Report:

Results Legend		Customer Sample R	GW05	GW06				
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00	0.00 - 0.00				
M	mCERTS accredited.		Water(GW/SW)	Water(GW/SW)				
aq	Aqueous / settled sample.		02/06/2016	02/06/2016				
diss.filt	Dissolved / filtered sample.							
tot.unfilt	Total / unfiltered sample.							
*	Subcontracted test.							
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery							
(F)	Trigger breach confirmed							
1-5&*\$@	Sample deviation (see appendix)							
Component	LOD/Units	Method						
Alkalinity, Total as CaCO3	<2 mg/l	TM043	245	335				
			#	#				
Oxygen, dissolved	<0.3 mg/l	TM046	7.62	5.64				
			#	#				
Organic Carbon, Total	<3 mg/l	TM090	<3	<3				
			#	#				
Ammoniacal Nitrogen as N (low level)	<0.01 mg/l	TM099	0.0208	0.0618				
			#	#				
Fluoride	<0.5 mg/l	TM104	<0.5	0.59				
			#	#				
Conductivity @ 20 deg.C	<0.005 mS/cm	TM120	0.445	0.768				
			#	#				
Arsenic (diss.filt)	<0.12 µg/l	TM152	0.639	5.38				
			#	#				
Boron (diss.filt)	<9.4 µg/l	TM152	10.7	25.5				
			#	#				
Cadmium (diss.filt)	<0.1 µg/l	TM152	0.195	<0.1				
			#	#				
Chromium (diss.filt)	<0.22 µg/l	TM152	3.06	3.91				
			#	#				
Copper (diss.filt)	<0.85 µg/l	TM152	2.09	1.27				
			#	#				
Lead (diss.filt)	<0.02 µg/l	TM152	0.279	0.076				
			#	#				
Manganese (diss.filt)	<0.04 µg/l	TM152	210	165				
			#	#				
Nickel (diss.filt)	<0.15 µg/l	TM152	2.55	4.99				
			#	#				
Zinc (diss.filt)	<0.41 µg/l	TM152	179	8.93				
			#	#				
EPH Range >C10 - C40 (aq)	<46 µg/l	TM172	<46	<46				
			#	#				
Total EPH (C6-C40) (aq)	<100 µg/l	TM172	<100	<100				
			#	#				
Mercury (diss.filt)	<0.01 µg/l	TM183	<0.01	<0.01				
			#	#				
Nitrite as NO2	<0.05 mg/l	TM184	<0.05	<0.05				
			#	#				
Sulphate	<2 mg/l	TM184	64.9	151				
			#	#				
Chloride	<2 mg/l	TM184	8.9	40.8				
			#	#				
Phosphate (ortho) as PO4	<0.05 mg/l	TM184	<0.05	<0.05				
			#	#				
Nitrate as NO3	<0.3 mg/l	TM184	<0.3	<0.3				
			#	#				
Calcium (diss.filt)	<0.012 mg/l	TM228	97.2	139				
			#	#				
Sodium (diss.filt)	<0.076 mg/l	TM228	6.05	20.9				
			#	#				
Magnesium (diss.filt)	<0.036 mg/l	TM228	7.78	21				
			#	#				
Potassium (diss.filt)	<1 mg/l	TM228	1.41	1.89				
			#	#				
Iron (diss.filt)	<0.019 mg/l	TM228	<0.019	<0.019				
			#	#				
Hardness, Total as CaCO3 unfiltered	<0.35 mg/l	TM228	413	663				
			#	#				
pH	<1 pH Units	TM256	7.69	7.56				
			#	#				

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CERTIFICATE OF ANALYSIS

Validated

SDG: 160603-119
Job: D_FTIM_DUB-253
Client Reference: LW15-046-02 Thorntons

Location: Thorntons Millenium Park
Customer: Fehily Timoney
Attention: Barry Donovan

Order Number: Z0275
Report Number: 364675
Superseded Report:

GRO by GC-FID (W)

Table with columns: Results Legend, Customer Sample R, GW05, GW06, Component, LOD/Units, Method. Rows include Methyl tertiary butyl ether (MTBE), Benzene, Toluene, Ethylbenzene, m,p-Xylene, o-Xylene, Sum of detected BTEX, GRO >C5-C10, EPH (C6-C10).

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SDG: 160603-119
Job: D_FT1M_DUB-253
Client Reference: LW15-046-02 Thorntons

Location: Thorntons Millenium Park
Customer: Fehily Timoney
Attention: Barry Donovan

Order Number: Z0275
Report Number: 364675
Superseded Report:

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample ¹	Surrogate Corrected
TM043	Method 2320B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part109 1984	Determination of alkalinity in aqueous samples		
TM046	Method 4500G, AWWA/APHA, 20th Ed., 1999	Measurement of Dissolved Oxygen by Oxygen Meter		
TM061	Method for the Determination of EPH, Massachusetts Dept. of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water		
TM099	BS 2690: Part 7:1968 / BS 6068: Part2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser		
TM104	Method 4500F, AWWA/APHA, 20th Ed., 1999	Determination of Fluoride using the Kone Analyser		
TM120	Method 2510B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part 9:1970	Determination of Electrical Conductivity using a Conductivity Meter		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM172	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	EPH in Waters		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM191	Standard Methods for the examination of waters and wastewaters 16th Edition, ALPHA, Washington DC, USA. ISBN 0-87553-131-8.	Determination of Unfiltered Metals in Water Matrices by ICP-MS		
TM228	US EPA Method 6010B	Determination of Major Cations in Water by iCap 6500 Duo ICP-OES		
TM245	By GC-FID	Determination of GRO by Headspace in waters		
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter		

¹ Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = Not applicable.

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SDG: 160603-119
Job: D_FTIM_DUB-253
Client Reference: LW15-046-02 Thorntons

Location: Thorntons Millenium Park
Customer: Fehily Timoney
Attention: Barry Donovan

Order Number: Z0275
Report Number: 364675
Superseded Report:

Test Completion Dates

Lab Sample No(s) Customer Sample Ref.	13536878	13536890
	GW05	GW06
AGS Ref.		
Depth	0.00 - 0.00	0.00 - 0.00
Type	LIQUID	LIQUID
Alkalinity as CaCO3	07-Jun-2016	07-Jun-2016
Ammonium Low	06-Jun-2016	07-Jun-2016
Anions by Kone (w)	06-Jun-2016	06-Jun-2016
Conductivity (at 20 deg.C)	06-Jun-2016	07-Jun-2016
Dissolved Metals by ICP-MS	09-Jun-2016	09-Jun-2016
Dissolved Oxygen by Probe	05-Jun-2016	05-Jun-2016
EPH (DRO) (C10-C40) Aqueous (W)	10-Jun-2016	10-Jun-2016
Fluoride	06-Jun-2016	06-Jun-2016
GRO by GC-FID (W)	09-Jun-2016	09-Jun-2016
Mercury Dissolved	06-Jun-2016	06-Jun-2016
Metals by iCap-OES Dissolved (W)	07-Jun-2016	07-Jun-2016
Metals by iCap-OES Unfiltered (W)	06-Jun-2016	06-Jun-2016
Nitrite by Kone (w)	06-Jun-2016	06-Jun-2016
pH Value	07-Jun-2016	07-Jun-2016
Total EPH (aq)	13-Jun-2016	13-Jun-2016
Total Organic and Inorganic Carbon	06-Jun-2016	06-Jun-2016

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SDG: 160603-119
Job: D_FTIM_DUB-253
Client Reference: LW15-046-02 Thorntons

Location: Thorntons Millenium Park
Customer: Fehily Timoney
Attention: Barry Donovan

Order Number: Z0275
Report Number: 364675
Superseded Report:

Appendix

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH₄ by the BRE method, VOC TICs and SVOC TICs.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP - No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals - total metals must be requested separately.

11. Results relate only to the items tested.

12. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%, they are generally wider for volatiles analysis, 50-150%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

14. **Product analyses** - Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethylphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

General

20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

21. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

24. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

Sample Deviations

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Holding time exceeded before sample received
5	Samples exceeded holding time before preservation was performed
\$	Sampled on date not provided
+	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to sampled on date
&	Sample Holding Time exceeded - Late arrival of instructions.

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Crystalline	White Asbestos
Amphibole	Brown Asbestos
Crystalline	Blue Asbestos
Fibrous Asbestos	-
Fibrous Amphibole	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

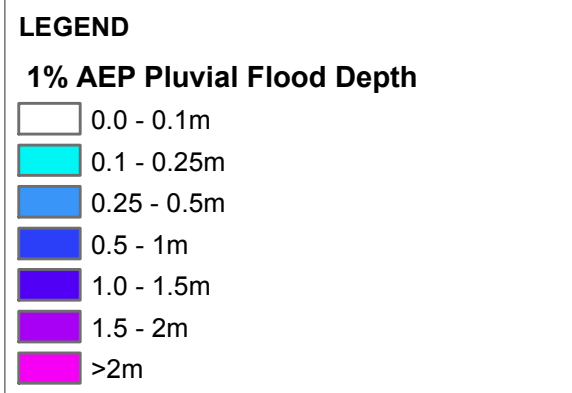
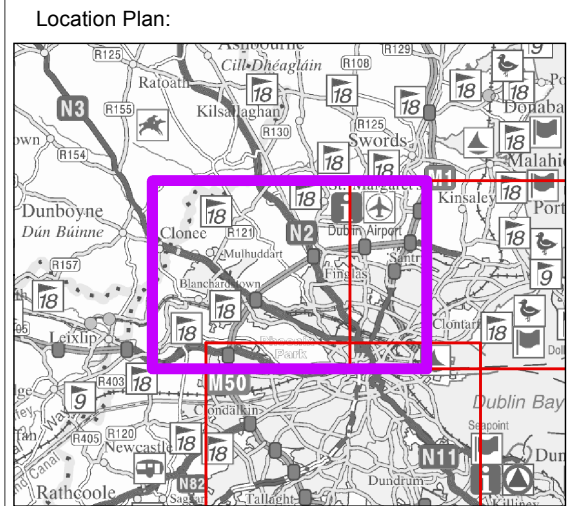
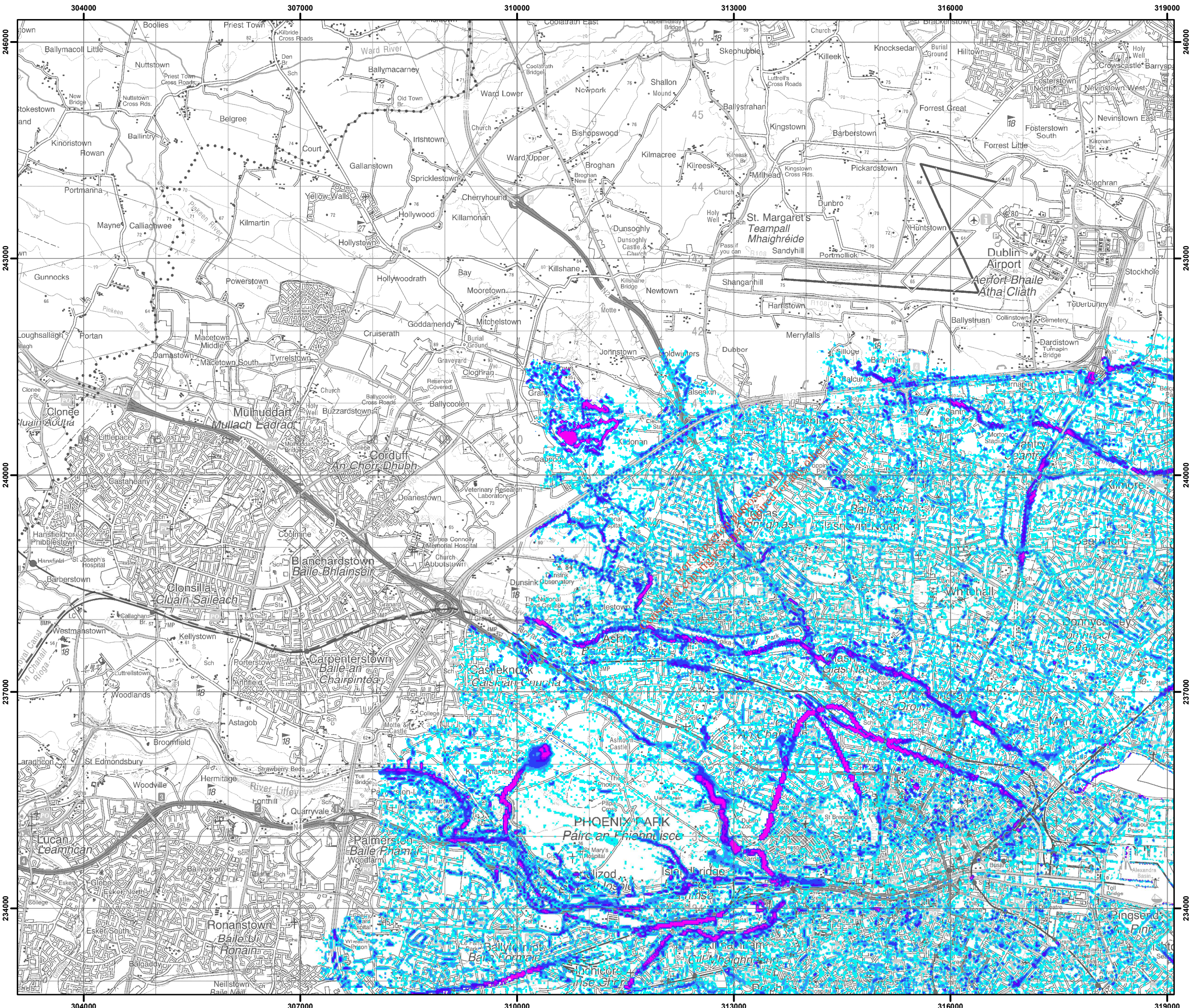
The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Appendix 21

Dublin Pluvial Study (FloodResilienCity)

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IMPORTANT USER NOTE:

THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

THIS DRAFT MAP IS FOR CONSULTATION PURPOSES ONLY AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.



OPW
The Office of Public Works
Oifis na n-Obrechtaí Poblaithe

The Office of Public Works
Jonathan Swift Street
Trim
Co. Meath



**Comhairle Cathrach
Bhaile Átha Cliath
Dublin City Council**

Dublin City Council
Civic Offices
Wood Quay
Dublin 8

Project: **DUBLIN PLUVIAL STUDY (FloodResilienCity)**

Map: **DUBLIN CITY PLUVIAL FLOOD DEPTH MAP**

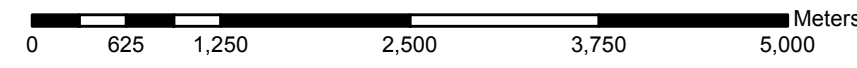
Map Type:	DEPTH - 180min Rainfall		
Source:	1% AEP PLUVIAL		
Map Area:	URBAN		
Scenario:	CURRENT		
Drawn by:	NC	Date:	September 2015
Checked by:	DD	Date:	September 2015
Approved by:	JM	Date:	September 2015

Map No.: **E09DCC_DPPCD010_C1**

Sheet 1 of 3

Map Scale: 1:50,000

Plot Scale: 1:1 @ A3



Appendix 22

Justification Test

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Ref.: The Planning System and Flood Risk Management Guidelines for Planning Authorities, OPW & DoEHLG, November 2009

Box 5.1 Justification Test for development management

When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2 (in the case of the Proposed development identified as a 'Less Vulnerable Development in Flood Zone A (Pluvial), the following criteria must be satisfied:

1	<i>The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines.</i>
Response	The site for the proposed development for the materials processing & transfer facility at Millennium Business Park, in the townland of Grange, in north County Dublin is zoned to Provide Heavy Industry in the Fingal Development Plan 2011 – 2017, in the Zoning Objectives for Blanchardstown North.
2	<i>The proposal has been subject to an appropriate flood risk assessment that demonstrates:</i>
	(i) <i>The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;</i>
Response	A flood risk identification and assessment was undertaken. It is proposed to raise the ground where appropriate at the proposed development, above the predicted pluvial flood levels. It is proposed to collect the surface water run-off from the development via roof rainwater pipes, road gullies and surface water channels into a collection system leading to an attenuation facility that incorporates permeable paving. All surface water flows from hard surfaces (car parking areas, yards and access roads) will drain via an attenuation tank, hydrobrake and petrol interceptor before entering the existing drainage system that serves the Millenium Business Park. A rainwater harvesting system will be provided to collect and reuse the rainwater from the roofs of significant buildings in the proposed development. The flows discharging from the attenuation tank into the existing drainage system will be limited to Greenfield Rates. Therefore it is expected that the development will not increase flood risk elsewhere. In addition, the proposed drainage for the site will in effect increase the Time of Concentration of surface water flows from the site into the catchment, thus introducing an overall improvement in the risk of flooding contributing to Batchelors Stream, downstream of the site.
	(ii) <i>The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;</i>
Response	A topographical survey was available for the site and a flood risk assessment has been undertaken to ascertain the extent of the site within flood zones A and B where this applies (See Appendix XX for copies of Pluvial Flood Maps produced for the OPW as part of the Dublin Pluvial Study (FloodResilienCity) Project). The Finished Floor Level (FFL) of any buildings will be greater than 0.5 m above existing ground levels within the site, where buildings are coincident with the pluvial flood depths identified in the detailed Dublin Pluvial Study (Proposed FFL for buildings is set at 82.5 – 82.7 m OD which is greater than XX m above existing levels). Car and truck parking areas will avoid the areas with predicted pluvial depths greater than 0.25 m in the identified pluvial Flood Zone A areas. The electricity substation will be located outside the identified pluvial Flood Zone A or Flood Zone B (predicted pluvial flooding with a return period of 1 in 1000 years) areas. All other open areas will be allowed to flood in an extreme pluvial event. Any foul sewers running through such areas will have sealed manhole covers. This will minimise the flood risk to people, property, the economy and the environment.

	(iii)	<i>The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and</i>
Response		The development will avoid flood risk areas or be raised above them and therefore will not impede the full access for emergency services onto the site. Future flood protection measures in this area are dependent on Pluvial Flood Warning systems and the proposed development will not impede these measures.
	(iv)	<i>The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes. The acceptability or otherwise of levels of residual risk should be made with consideration of the type and foreseen use of the development and the local development context.</i>
Response		It is not expected that the proposed development will impact negatively on any wider planning objectives. It is proposed to use SuDS systems in the Surface Water Management at the site. The efficient operation of the proposed SuDS systems will be dependent on the effective maintenance of the existing drainage system which will receive flows from the proposed development and this will be in accordance with the wider management of the Millennium Business Park. The proposed development will be in accordance with proper planning and sustainable development of the area.

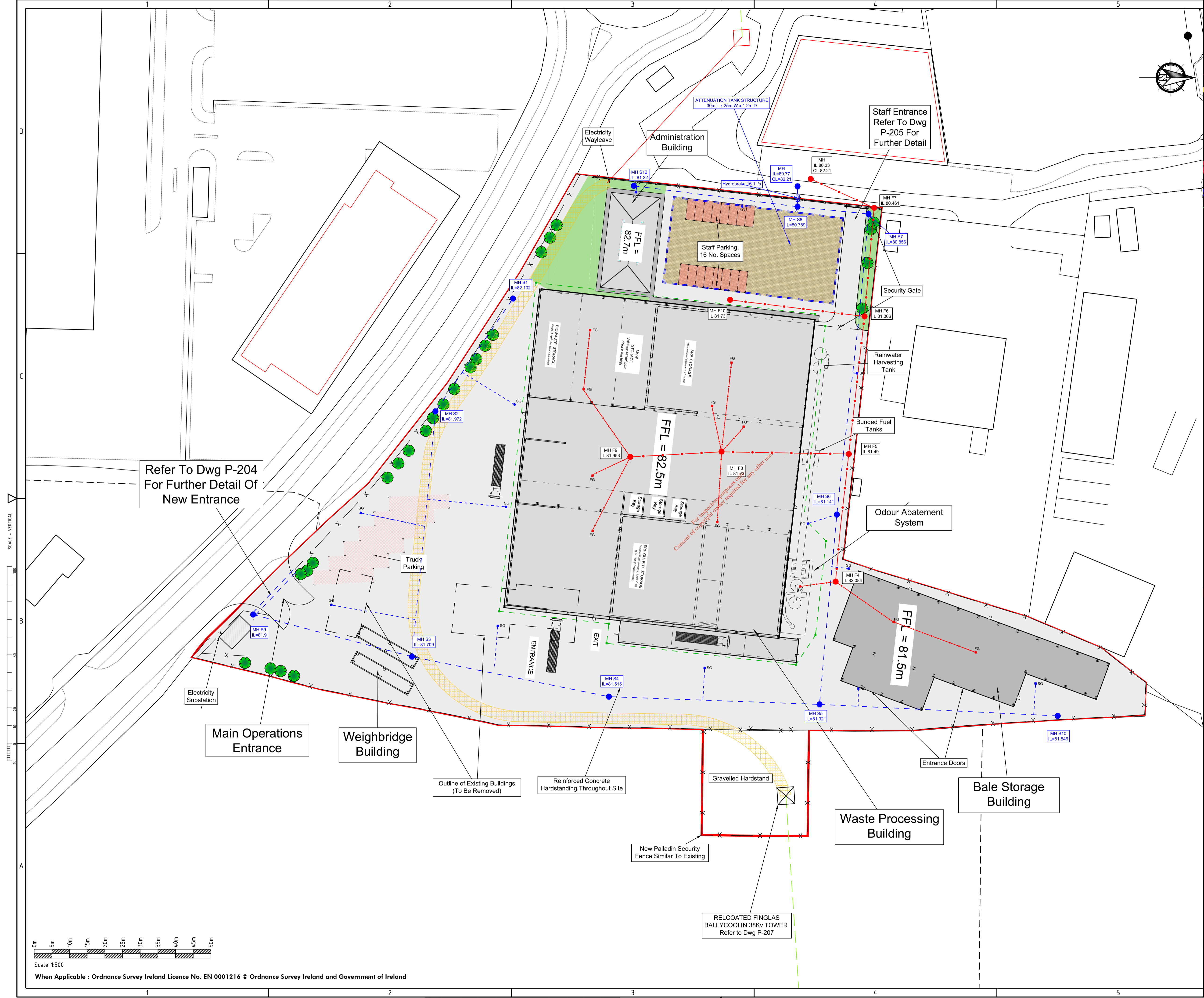
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Appendix 23

Drainage Layout & Storage Tank Sizing Calculations

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Refer To Dwg P-204 For Further Detail Of New Entrance

Main Operations Entrance

Weighbridge Building

Outline of Existing Buildings (To Be Removed)

Reinforced Concrete Hardstanding Throughout Site

New Palladin Security Fence Similar To Existing

RELCOATED FINGLAS BALLYCOOLIN 38kv TOWER. Refer to Dwg P-207

Waste Processing Building

Bale Storage Building

FFL = 81.5m

FFL = 82.5m

FFL = 82.7m

ATTENUATION TANK STRUCTURE
30m L x 25m W x 1.2m D

Staff Entrance
Refer To Dwg P-205 For Further Detail

Hydrobrake 16.1 l/s

Staff Parking, 16 No. Spaces

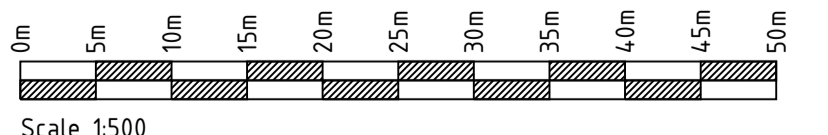
Security Gate

Rainwater Harvesting Tank

Bunded Fuel Tanks

Odour Abatement System

Entrance Doors



SCALE - VERTICAL

SCALE HORIZ.

Rainwater Harvesting Calculations

Ref. drawing Plans Elevations Sections

SRF Processing Building - Pitched Roof - Plan Area - 78m long x 89.9m wide

Description	Plan Area (One Side of pitched roof only) A_h	Half Maximum Area in Elevation $A_v/2$	Effective Area $A_e = A_h + A_v/2$	Annual Rainfall (Source: FSU Website OPW.Hydronet.com)	Annual Rainfall Yield for this roof	5% of Annual Yield for Underground Tank sizing
	m ²	m ²	m ²	mm	m ³	m ³
Roof	3506	140.9	3646.9	740	2698.68	134.93

Expected Demand for Potable Water

Building	Facilities and Estimated Water Demand*												Grand Total daily demand (Litres)	Annual demand (m ³)	5% of Annual water demand (m ³)
	W.C.s			Lavatory Basins			Kitchen Sink (Canteen)		Building Washdown**						
	No.	Estimated demand per day (Litres)	Total daily demand (Litres)	No.	Estimated demand per day (Litres)	Total daily demand (Litres)	No.	Estimated demand per day (Litres)	Total daily demand (Litres)	No.	Estimated demand per day (Litres)	Total daily demand (Litres)			
Wash down activities	0	181.8	0.0	0	272.76	0.0	0	181.80	0.0	1	8000.00	8000.0	8000.00	2920.00	146.00

*Public Health Engineering Practice: Water Supply and Building Sanitation v. 1 – March 1972, Leonard Bushby Escrib

**Assuming a 4 hour cleaning event, with two people operating 2 No. standard industrial power washers, each with a flow rate of 1,000l/hour (Karcher High Pressure HD10 or similar), results in 8 cu.m of water demand.

The capacity of the storage tank shall be calculated in accordance with the 'Intermediate Approach' advocated in BS 8515 to provide the lesser of 5% of the annual rainwater yield or 5% of the annual water demand.

Therefore the capacity of the storage tank =

134.93 m³

= 3 No. 8000 Gallon tanks and 1 No. 6000 Gallon tank

Appendix 24


Attenuation Facility Design

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<u>Stormwater Attenuation Unit</u>						
<u>Combined Permeable Paving and Aqua Cell type unit</u>						
<u>Volume of Storage Required</u>						
Total Volume required (As determined from MicroDrainage)=						830.00 m3
Available Area of Permeable Paving=						1008.00 m2
Recommended depth of permeable paving for a 1 in 100 year return period storm plus a 20% allowance for Climate Change*=						210 mm
Volume of storage from permeable paving assuming 30% voids ratio=						64 m3
						64 m3
Volume of storage required in Aquacell Units=						766 m3
Dimensions of AquaCell Units =						1m (long) x 0.5m (wide) x 0.4m (high)
Volume of each unit =						0.2 m3
Actual Storage volume per unit (95%) =						0.19 m3
Units High	Layout of units	length	width	area	Volume	Storage
(0.4m)	(each unit 1.0m long x 0.5m wide)	m	m	m2	(x 0.4) m3	95%
2	42 units long x 48 units wide	42	24	1008	806.4	766.08
						766.08 m3
Total Storage Provided=						830 m3

*Guide to the Design, Construction and Maintenance of Concrete Block Permeable Pavements, by Interpave, The Precast Concrete Paving and Kerb Association, January 2010, Edition 6

				DESIGNED:	MC	CHECKED:	
				DATE:	25-May-16	REVISION:	-
				JOB NUMBER:	LW15-046-02		
Fehily Timoney and Company Engineering and Environmental Consultants				CALC NUMBER:	C1		
Cork : Tel 021-4964133 Fax 021-4964464				FILE	https://uss.ftco.ie/___files/renditiondirect/138890/LW15-046-02_Attenuation Pond Volume for Whole Site.xls		
				SHEET	Pond 30 yr-GSDSDS		
PROJECT:	Planning and licence application for Millennium Park						
DESCRIPTION:	Attenuation Pond Design Calculations for whole site						
Catchment Characteristics							
Site Area				16.1874	ha		
SAAR				715	mm	Met Eireann	
Soil Category		2	SOIL =	0.3		(change the category, 1, 2,...5)	
M5-60				15	mm		
M5-2D				50	mm		
r = M5-60 / M5-2d =				0.30			
QBAR = 0.00108 (Area ^{0.89})(SAAR ^{1.17})(Soil ^{2.17}) for CA > 50 ha							
If CA < 50 ha, apply it for 50 ha and get value for smaller catchment by linear interpolation (refer page 70, Vol. 2 of GSDSDS, RDP).							
			Let the Area be	50	ha		
			Qbar for 50 ha area =	0.0934	m ³ /s		
			Qbar for the given area =	0.0302	m ³ /s		
For Irish Region,			1 year factor	0.85	(Refer to page 71, Vol 2 of GSDSDS, RDP)		
			30 year factor	1.63			
			100 year factor	1.96			
Therefore, the greenfield limiting discharge rates are							
			1 year throttle	25.71	l/s	1.59	l/s/ha
			30 year throttle	49.41	l/s	3.05	l/s/ha
			100 year throttle	59.27	l/s	3.66	l/s/ha

Return Period =		1 yr								I/s
Development Area =		16.1874 ha	Permissible flow =		25.71			=		25.71
Impervious Area =		16.1874 ha								
Rainfall duration hrs	Rainfall depth (R1) mm	Rainfall depth*1.1 mm	Total volume of runoff m3	Average flow m3/s	Permsble Flow m3/s	Flow to be stored m3/s	Storage Volume m3	Retention Time hrs		
0.25	5.6	6.1	990.45	1.101	0.025705	1.075	967	10.45		
0.5	7.3	8.1	1305.20	0.725	0.025705	0.699	1259	13.60		
1	9.6	10.6	1717.40	0.477	0.025705	0.451	1625	17.56		
2	12.6	13.8	2237.96	0.311	0.025705	0.285	2053	22.18		
4	16.7	18.4	2979.59	0.207	0.025705	0.181	2609	28.20		
6	20.1	22.1	3578.50	0.166	0.025705	0.140	3023	32.67		
12	26	28.3	4586.84	0.106	0.025705	0.080	3476	37.57		
24	31	34.4	5574.39	0.065	0.025705	0.039	3353	36.24		
48	38	42.2	6823.13	0.039	0.025705	0.014	2381	25.73		
Required Volume = Maximum of storage volume, V =							3476	m3		
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Return Period =		30 yr								I/s
Development Area =		16.1874 ha	Permissible flow =		49.41			25.71 =		23.71
Impervious Area =		16.1874 ha								
Rainfall duration hrs	Rainfall depth (R30) mm	(R30-R1)*1.1 mm	Total volume of runoff m3	Average flow m3/s	Permsble Flow m3/s	Flow to be stored m3/s	Storage Volume m3	Retention Time hrs		
0.25	15.6	11.0	1782.95	1.981	0.023709	1.957	1762	20.64		
0.5	20.1	14.1	2276.92	1.265	0.023709	1.241	2234	26.18		
1	25	17.1	2763.57	0.768	0.023709	0.744	2678	31.38		
2	31	19.9	3225.77	0.448	0.023709	0.424	3055	35.79		
4	38	23.1	3743.96	0.260	0.023709	0.236	3403	39.86		
6	44	26.4	4271.56	0.198	0.023709	0.174	3759	44.05		
12	54	31.2	5055.50	0.117	0.023709	0.093	4031	47.23		
24	64	36.4	5900.03	0.068	0.023709	0.045	3852	45.12		
48	76	42.0	6791.53	0.039	0.023709	0.016	2695	31.57		
Required Volume = Maximum of storage volume, V =							4031	m3		

Return Period =		100 yr							l/s
Development Area =		16.1874 ha	Permissible flow =		59.27	-	49.41 =	9.86	
Impervious Area =		16.1874 ha							
Rainfall duration hrs	Rainfall depth (R100) mm	(R100-R30)*1.1 mm	Total volume of runoff m3	Average flow m3/s	Permsble Flow m3/s	Flow to be stored m3/s	Storage Volume m3	Retention Time hrs	
0.25	21	6.0	969.52	1.077	0.009859	1.067	961	27.07	
0.5	27	7.7	1251.61	0.695	0.009859	0.685	1234	34.77	
1	34	9.4	1526.06	0.424	0.009859	0.414	1491	42.00	
2	41	11.0	1780.34	0.247	0.009859	0.237	1709	48.16	
4	49	12.3	1986.88	0.138	0.009859	0.128	1845	51.98	
6	57	13.9	2248.90	0.104	0.009859	0.094	2036	57.36	
12	69	16.0	2589.61	0.060	0.009859	0.050	2164	60.96	
24	81	18.3	2966.69	0.034	0.009859	0.024	2115	59.59	
48	96	21.1	3420.15	0.020	0.009859	0.010	1717	48.37	
Required Volume = Maximum of storage volume, V =							2164	m3	
Total storage requirement =			1yr 3476	30 yr 4031	100 yr 2164	=	7508	m3	
							9671	m3	
								(30 year)	
								(100 year)	
Allowance to account for the simplifying assumption of head-discharge relationship of 1.25 is not required on this site due to the fact that the attenuation facility will be regularly maintained and hydrobrakes will be used on the outlet.									

				DESIGNED: MC		CHECKED:	
				DATE: 26-Jul-16		REVISION: -	
				JOB NUMBER:		LW15-046-02	
Fehily Timoney and Company Engineering and Environmental Consultants				CALC NUMBER:		C1	
Cork : Tel 021-4964133 Fax 021-4964464				FILE		https://uss.ftco.ie/___files/renditiondirect/139769/LW15-046-02_Attenuation Pond Volume for MMTF only.xls	
				SHEET		Pond 30 yr-GSDSDS	
PROJECT:		Planning and licence application for Millennium Park					
DESCRIPTION:		Attenuation Pond Design Calculations for waste transfer facility					
Catchment Characteristics							
Site Area				2.2634 ha			
SAAR				715 mm		Met Eireann	
Soil Category		2		SOIL =		0.3	
(change the category, 1, 2,...5)							
M5-60				15 mm			
M5-2D				50 mm			
r = M5-60 / M5-2d =				0.30			
QBAR = 0.00108 (Area ^{0.89})(SAAR ^{1.17})(Soil ^{2.17}) for CA > 50 ha							
If CA < 50 ha, apply it for 50 ha and get value for smaller catchment by linear interpolation (refer page 70, Vol. 2 of GSDSDS, RDP).							
Let the Area be				50 ha			
Qbar for 50 ha area =				0.0934 m3/s			
Qbar for the given area =				0.0042 m3/s			
For Irish Region,		1 year factor		0.85		(Refer to page 71, Vol 2 of GSDSDS, RDP)	
		30 year factor		1.63			
		100 year factor		1.96			
Therefore, the greenfield limiting discharge rates are							
1 year throttle				3.59 l/s		1.59 l/s/ha	
30 year throttle				6.91 l/s		3.05 l/s/ha	
100 year throttle				8.29 l/s		3.66 l/s/ha	

Return Period =		1 yr							I/s
Development Area =		2.2634 ha	Permissible flow =		3.59			=	3.59
Impervious Area =		2.2634 ha							
Rainfall duration hrs	Rainfall depth (R1) mm	Rainfall depth*1.1 mm	Total volume of runoff m3	Average flow m3/s	Permsble Flow m3/s	Flow to be stored m3/s	Storage Volume m3	Retention Time hrs	
0.25	5.6	6.1	138.49	0.154	0.003594	0.150	135	10.45	
0.5	7.3	8.1	182.50	0.101	0.003594	0.098	176	13.60	
1	9.6	10.6	240.14	0.067	0.003594	0.063	227	17.56	
2	12.6	13.8	312.92	0.043	0.003594	0.040	287	22.18	
4	16.7	18.4	416.62	0.029	0.003594	0.025	365	28.20	
6	20.1	22.1	500.36	0.023	0.003594	0.020	423	32.67	
12	26	28.3	641.35	0.015	0.003594	0.011	486	37.57	
24	31	34.4	779.44	0.009	0.003594	0.005	469	36.24	
48	38	42.2	954.04	0.006	0.003594	0.002	333	25.73	
Required Volume = Maximum of storage volume, V =							486	m3	
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Return Period =		30 yr							I/s
Development Area =		2.2634 ha	Permissible flow =		6.91	-	3.59	=	3.32
Impervious Area =		2.2634 ha							
Rainfall duration hrs	Rainfall depth (R30) mm	(R30-R1)*1.1 mm	Total volume of runoff m3	Average flow m3/s	Permsble Flow m3/s	Flow to be stored m3/s	Storage Volume m3	Retention Time hrs	
0.25	15.6	11.0	249.30	0.277	0.003315	0.274	246	20.64	
0.5	20.1	14.1	318.37	0.177	0.003315	0.174	312	26.18	
1	25	17.1	386.42	0.107	0.003315	0.104	374	31.38	
2	31	19.9	451.04	0.063	0.003315	0.059	427	35.79	
4	38	23.1	523.50	0.036	0.003315	0.033	476	39.86	
6	44	26.4	597.27	0.028	0.003315	0.024	526	44.05	
12	54	31.2	706.88	0.016	0.003315	0.013	564	47.23	
24	64	36.4	824.97	0.010	0.003315	0.006	539	45.12	
48	76	42.0	949.62	0.005	0.003315	0.002	377	31.57	
Required Volume = Maximum of storage volume, V =							564	m3	

Return Period =		100	yr								l/s
Development Area =		2.2634	ha	Permissible flow =	8.29	-	6.91	=		1.38	
Imperious Area =		2.2634	ha								
Rainfall duration	Rainfall depth (R100)	(R100-R30)*1.1	Total volume of runoff	Average flow	Permissible Flow	Flow to be stored	Storage Volume	Retention Time			
hrs	mm	mm	m3	m3/s	m3/s	m3/s	m3	hrs			
0.25	21	6.0	135.56	0.151	0.001379	0.149	134	27.07			
0.5	27	7.7	175.01	0.097	0.001379	0.096	173	34.77			
1	34	9.4	213.38	0.059	0.001379	0.058	208	42.00			
2	41	11.0	248.94	0.035	0.001379	0.033	239	48.16			
4	49	12.3	277.82	0.019	0.001379	0.018	258	51.98			
6	57	13.9	314.45	0.015	0.001379	0.013	285	57.36			
12	69	16.0	362.09	0.008	0.001379	0.007	303	60.96			
24	81	18.3	414.82	0.005	0.001379	0.003	296	59.59			
48	96	21.1	478.22	0.003	0.001379	0.001	240	48.37			
Required Volume = Maximum of storage volume, V =							303	m3			
			1yr	30 yr	100 yr						
Total storage requirement =			486	564	303	=	1050	m3	(30 year)		
							1352	m3	(100 year)		
Allowance to account for the simplifying assumption of head-discharge relationship of 1.25 is not required on this site due to the fact that the attenuation facility will be regularly maintained and hydrobrakes will be used on the outlet.											

Sizing of the Surface Water Attenuation Tank					
Site:	Planning and licence application for Millennium Park				
Design Volume based on =	30-year return period storm, outflow Q Greenfield or on spillage containment if required*				
Required live volume *=			7508	m3	
Length of the tank, L =			70	m	input
Width of the tank, W=			7.55	m	input (average)
Side slope = 1V:ZH		Z =	0.001		input
Free board =			0.01	m	input
Live depth =			5.059	m	input from invert of orifice outfall
Permanent depth =			0	m	input
Total depth =			5.069	m	
Live and dead storage (total water) depth =			5.059	m	3m is Max. allowable
Surface Area of the tank =			528.5	m2	
Top water level length =			69.99998	m	
Top water level width =			7.54998	m	
Area at top water level, A =			528	m2	<--- Use to assess SS Removal
Bottom Length, l =			69.98986	m	
Bottom width, b =			7.539862	m	
Bottom area =			527.7139	m2	
Calculated live volume = $H/3*(A+a+sqrt(Aa)) =$			2672	m3	
Permanent volume =			0	m3	
Freeboard volume =			5	m3	
Total volume =			2677	m3	
<u>Check:</u>					
1st Flush =	0.015	x	161874	=	2428.11 m ³

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Appendix 25

Outline Invasive Species Management Plan

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ENVIRONMENTAL BALANCE IN DESIGN AND CONSTRUCTION

THORNTONS RECYCLING

OUTLINE INVASIVE SPECIES MANAGEMENT PLAN FOR PROPOSED DEVELOPMENT AT MILLENNIUM BUSINESS PARK

NOVEMBER 2016



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1 INTRODUCTION

This chapter of the EIS details the ecological appraisal for the project carried out by Fehily Timoney & Company (FT) including a site walkover survey and bat survey on the 7th of July 2016 and the 30th of September 2016. A series of ecological surveys were carried out at the site, including habitat and botanical surveys, bird surveys, and mammal (including bats) surveys. Based on the results of these various studies, FT considered potential direct, indirect and cumulative impacts of the proposed development on the existing ecological receptors and proposed appropriate mitigation measures to minimise these potential impacts.

1.1 Consultation

The following bodies were consulted on the proposed project, as described in Chapter 5 of this EIS:

- National Parks and Wildlife Services (NPWS)
- The Development Application Unit
- Inland Fisheries Ireland (IFI)
- The Environmental Protection Agency (EPA)
- An Taisce.

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2 EXISTING ENVIRONMENT

The development site is located at the Millennium Business Park, Cappagh Road, Dublin 11 at an elevation of 82 mOD and is c. 2.4 ha in area. It is located in the townlands of Grange & Cappoge, approximately 4 km north-west of Finglas village and 3 km north-east of Blanchardstown village. The site is located approximately 700 m directly north of the M50 and 1.4 km west of the N2.

The site is currently undeveloped and comprises a grassed surfaced portion and a tarmacadam hardstanding area, with three disused building thereon. The site is not currently enclosed along its western boundary. It is bordered to the immediate north by a concrete processing activity and existing waste management facility, to the east by an active quarry, to the south by the Cappagh Road and to the west by a light industrial unit and undeveloped lands. A small café, Rose Café, is also located directly behind the light industrial unit, to its west.

The Thorntons Recycling site is zoned for heavy industry, under the Fingal Development Plan 2011 to 2017. There are a large number of commercial and industrial units within 1 km of the site boundary. In addition to the Millennium Business Park in which the site is located, the Northwest, Ballycoolin, Huntstown, Rosemont, Stadium, Keypoint and Premier Point Business Parks are also located nearby.

The nearest major residential zones are Finglas West, located approximately 1.5 km south east of the site, and Corduff, located approximately 2 km south west of the site. There is one residential dwelling located 300m south-east of the site on the Cappagh Road. An aerial view of the site is presented in Figure 1.

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3 INVASIVE SPECIES WITHIN THE STUDY AREA

3.1 Desktop Study

Butterfly bush (*Buddleja davidii*) and sycamore (*Acer pseudoplatanus*) were also noted within the site boundary. The invasive species listed in Table 1 have been recorded within the 10 km grid square (O04) in which the proposed development is located. None of these invasive species were listed within the 2 km (grid square O04A) in which the site is located and these species were not recorded within the site during surveys.

Table 1: Invasive Species within 10km of Site

Species	Date recorded
Giant Hogweed (<i>Heracleum mantegazzianum</i>)	20/08/2012
Himalayan Honeysuckle (<i>Leycesteria Formosa</i>)	31/07/2014
Winter Heliotrope (<i>Petasites fragrans</i>)	24/03/2014
Cherry Laurel (<i>Prunus laurocerasus</i>)	05/08/2005
Common Cord-grass (<i>Spartina anglica</i>)	15/07/2014

3.2 Results of the site walkover

One highly invasive species noted on Invasive Species Ireland's 'most-unwanted list' was recorded along the eastern boundary of the site during surveys¹. Two stands of Japanese knotweed (*Fallopia japonica*) were recorded on a bank immediately east of the site boundary (Irish Grid Ref: O 10405 40725). The underground rhizomes of this highly invasive plant can extend up to 7 meters from the parent plant and up to 3 meters in depth.

¹ www.invasivespeciesireland.com/most-wanted-species/



Plate 1: Japanese knotweed along the eastern boundary fence east of the buildings within the site



Plate 2: Close up of Japanese knotweed



Figure 1: The location of the Japanese Knotweed stands within the site

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4 PROPOSED MEASURES FOR THE MANAGEMENT OF JAPANESE KNOTWEED WITHIN THE DEVELOPMENT SITE

4.1 Project Ecologist

It is recommended that a Project Ecologist with appropriate experience and expertise will be employed for the duration of project to ensure that all the mitigation measures outlined in relation to the Invasive Species Management Plan are implemented. The Project Ecologist will be awarded a level of authority and will be allowed to stop construction activity if there is potential for significant adverse ecological effects to occur.

4.2 Invasive species

While it is extremely important and more efficient to contain invasive species at the point of infestation, care shall also be taken to ensure the plan shall also be adhered to ensure that the species is not spread outside the site.

Ecological walkover surveys shall be undertaken by a qualified ecologist, at intervals over the construction phase of the project to examine the study area for newly established invasive species. If an invasive species is recorded within the site NPWS and Fingal County Council shall be informed immediately and the final invasive species management plan amended.

The following recommendations will be adhered to as part of that plan:

- Japanese knotweed root systems can extend for up to 7m underground from stands of the plants visible above the ground and to a depth of 3m. Staff shall be made aware of this buffer zone when working within areas of infestation.
- Areas of infestation to be fenced from other works areas including a buffering distance of up to 7m around the areas of infestation.
- Areas of infestation shall be treated on site where possible by injecting stems of Japanese knotweed with herbicides.
- Care will need to be taken in areas of infestation to avoid the potential contamination of watercourses.
- The continual monitoring of areas of infestation will be required for the successful treatment of Japanese knotweed. Herbicides may need to be applied on more than one occasion to completely eradicate the species on site. New stands of invasive species may also occur over the course of the project.
- No works to take place in these areas without supervision.
- All machinery and vehicles operating within areas of infestation to be thoroughly checked and if necessary cleaned prior to leaving the area to protect against further spreading of Japanese knotweed.
- During vegetation clearance and the removal of rubbish and other waste materials from infested areas care must be taken to ensure that Japanese knotweed is not carried with these materials out of the site. Japanese knotweed plants (or other invasive species) should not be removed along with other vegetation during clearance works.
- No material shall be taken from areas of infestation (unless for disposal at a suitably licenced facility).

- All staff shall be made aware of nature of threat via toolbox talks as part of site inductions. Toolbox talks shall be undertaken with all personnel accessing the site to ensure that the details of the invasive species management plan are adhered to and to raise awareness of the potential threat of invasive species.
- Wheel washes shall be put in place at entry and exit points, if considered appropriate. Waste water from these facilities will need to be stored and treated to avoid further outbreaks.
- If operating within an area of known infestation all machinery, vehicles, equipment, footwear and clothing will need to be cleaned thoroughly (if necessary using steam cleaners) in a contained area to avoid further contamination.

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