ATTACHMENT L STATUTORY REQUIRMENTS

Attachment L.1 ***Section 40(4) WMA***

Dublin City Council has no legal offences or convictions to date under the Waste Management Act 1996.

Attachment L.2 ***Fit and Proper Person***

The site management organisational chart is as shown in Attachment C.1. The site manager and site operatives will be trained to an appropriate standard. The site manager and site operatives will attend at appropriate intervals Certified Training Programmes, such as those offered by the FAS Environmental Training Unit.

Dublin City Council proposes to have a competent contractor to operate the facility on a daily basis. The contract will require that all regulatory requirements are met. There will be a dismissal procedure in place where the contractor is in breach of the requirements to operate the facility in accordance with the conditions of the waste licence and planning permission.

The exact qualifications of personnel employed at the site are not known as of yet but the following qualifications will generally be required for the site personnel:

- A Site Manager who will be responsible for the day to day operation and supervision of the Civic Amenity Site, will be trained in EPA waste acceptance and handling procedures, and in the Environmental Management of the facility.
- The site operatives, who will also receive training in waste acceptance and handling procedures who will be responsible for operating the weighbridge and logging vehicles.

The site manager will hold a copy of the following documents:
- Waste Licence Application;
- Waste Licence Conditions as set down by EPA; and
- Facility Environmental Management Plan;

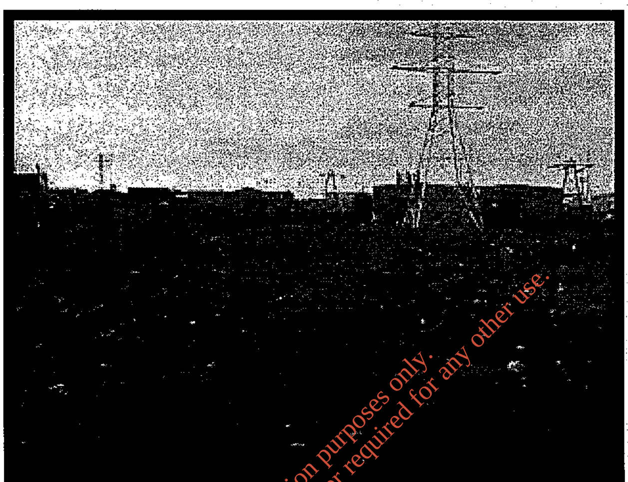
Training and awareness among facility staff will be achieved through external and in-house training as well as through prominent posting of environmental awareness material within the site office.

Dublin City Council will have the overall responsibility for the Civic Amenity Facility and will remain responsible for the site if the operation ceases.

APPENDIX 1

SITE INVESTIGATION FACTUAL REPORT

Dublin City Council
Comhairle Cathrach Bhaile Átha Cliath



SITE INVESTIGATION FACTUAL REPORT,

LABRE PARK, BALLYFERMOT, DUBLIN 10

JUNE 2005

TES
CONSULTING ENGINEERS

Table of Contents

1 INTRODUCTION

TES Consulting Engineers were requested by Dublin City Council to carry out a site investigation programme at Labre Park, Ballyfermot, Dublin 10. The purpose of the investigation was to determine the nature and extent (both lateral and vertical) of materials below surface.

The site investigation programme was required to expand on an initial investigation undertaken by Patel Tonra Ltd. as part of the environmental baseline assessment of the geological environment and included in an Environmental Impact Statement for a proposed Civic Amenity Site (CAS) within Labre Park.

The previous investigation indicated that materials have been infilled above the natural ground in the historical past. The findings of the initial investigation indicate that a mixture of waste materials exist within the site.

The objectives of this site investigation programme were as follows:

- To estimate the composition of the infilled material;
- To describe the composition of the soil/subsoil material underlying the infilled material;
- To obtain soil/subsoil samples in order to determine if soil/subsoil contamination has occurred;
- To drill groundwater monitoring boreholes to determine if groundwater contamination has occurred.

The site investigation programme was undertaken between March and April 2005.

2 SITE LOCATION AND EXISTING LAND-USE

Dublin City Council propose to develop a Civic Amenity Site for municipal waste recycling and recovery at Labre Park, Ballyfermot Dublin 10. The site will cover a total footprint of approximately 11,053m^2 and will include a number of distinct waste recycling/recovery compartments within the site, to include the following:

- General civic amenity and green waste deposit area – circa 4,412m^2;
- Waste electrical and electronic equipment storage area – circa 435m^2;
- Construction/demolition deposit area – circa 985m^2;
- Street cleaning deposit area for Dublin City Council – circa 1,010m^2; and
- Ancillary facilities (entrance road, reception area, weighbridge, etc.) – circa 4,211m^2.

The facility will provide a flat platform area to allow members of the public and the local authority to dispose of recyclable/recoverable materials in a controlled and environmentally responsible manner.

The current zoning of the subject site is to "*...Provide for the protection and creation of industrial uses, and facilitate opportunities for employment creation*".

Labre Park is located approximately 30m south of Labre Park, Ballyfermot, Dublin 10 in the south central area of Dublin City (Refer to Figure 1). The site is bound to the south by the Grand Canal. The site is recessed approximately 150m to the west of the R112 road (Kylemore Road).To the north of the proposed site is Labre Park, which contains housing and temporary dwelling accommodation for the Travelling Community.

The subject site is located in an unused area of suburban land used historically for unauthorised dumping of waste materials and the grazing of a small number of horses. The grazing potential of the land is poor, due to the extent of infill material and lack of topsoil. Waste and debris is visually evident across the site.

The site does not contain any protected structures and is not located within a protected area. However the Grand Canal, which forms the southern boundary of the site, is part of a Proposed Natural Heritage Area (pNHA). The proposed development will not impinge on the Grand Canal.

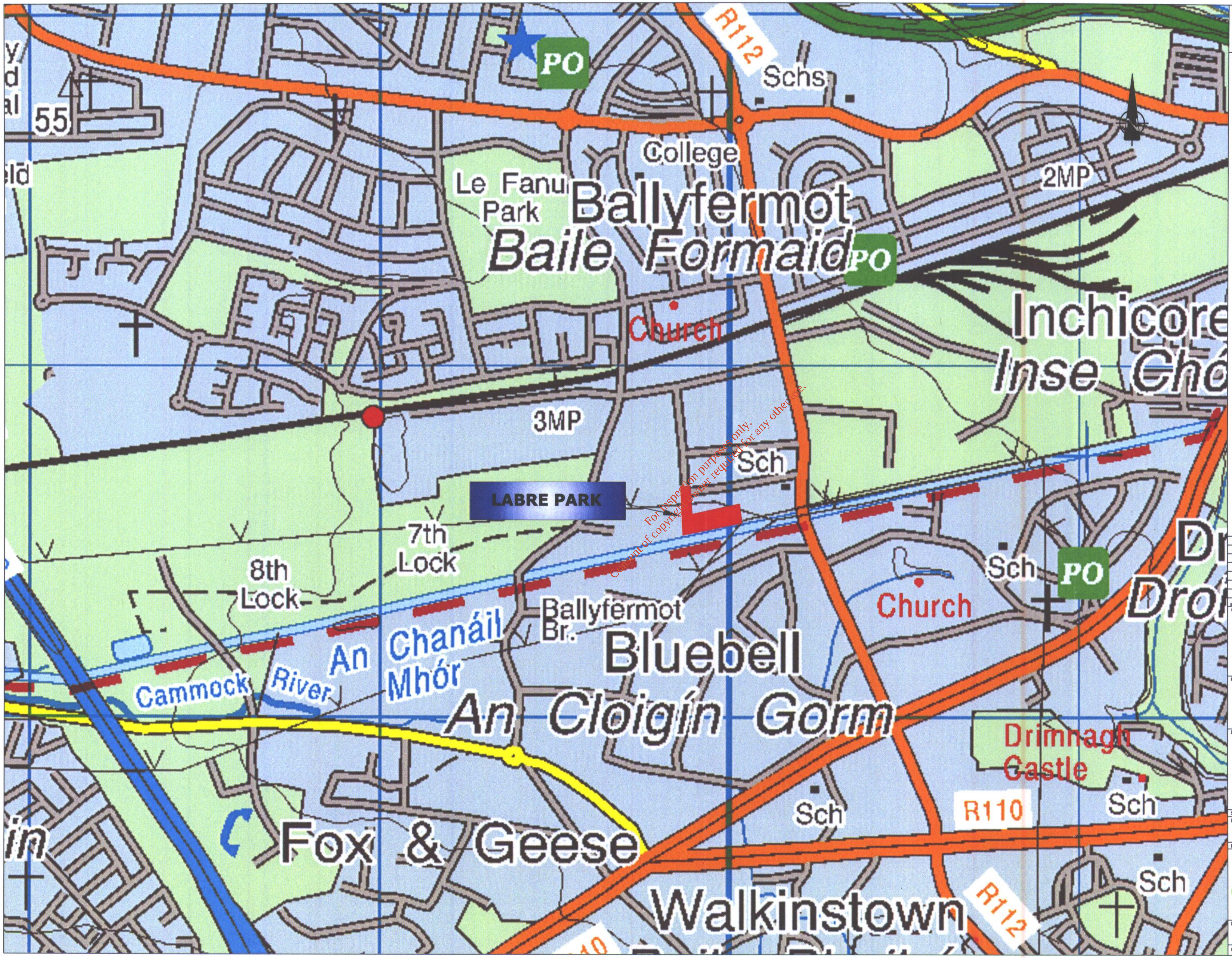
The Grand Canal is an artificial surface water body and is not hydraulically connected to the natural drainage in the area. The base and side walls of the Grand Canal are formed from compacted clay. A clay berm prevents any water from the site discharging to the Grand Canal.

A small stream flows in a west to east direction to the north of the site. This stream is referred to as the Galback Stream. The Galback Stream ultimately converges with the Cammock River to the east of the subject site. All surface and subsurface drainage in this region is towards the Galback Stream, which is considered to be the natural discharge zone of this site for both surface water and groundwater baseflow.

The site is traversed by two 110kV overhead lines and a 220kV line. A number of pylons to carry these overhead lines are located within the subject site.

A memorial exists inside the eastern boundary of the proposed site.

A combined sewer exists to the west of the subject site. Parallel to the combined sewer a foul sewer has been laid. To the east of the subject site a second foul sewer exists, which is parallel to Galback Stream and offset by approximately 20m. A mains water supply runs east to west along Labre Park, approximately 30m to the north of the subject site.



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Notes:

1. Figured Dimensions only to be taken from this drawing
2. All Drawings to be checked by the Contractor on site
3. Engineer to be informed of any discrepancies before any work commences
4. All levels relate to Ordnance Survey Datum at Malin Head

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Client: Dublin City Council
Comhairle Cathrach Bhaile Átha Cliath

Project: LABRE PARK CIVIC AMENITY SITE

Drawing Title: SITE LOCATION

Scale 1/10000 (A3)

Drawn by	Checked by	Date
MARK CONROY	ST	MARCH 2005

ENGINEER IN CHARGE:

TES CONSULTING ENGINEERS

UNIT 48/5, BLANCHARDSTOWN CORPORATE PARK, DUBLIN 15, IRELAND
TEL 01 8030401
FAX 01 8030410

Drawing No. Figure No. 1

Rev.

3 GEOLOGICAL AND HYDROGEOLOGICAL STUDY METHODOLOGY

3.1 Review of Existing Information

Existing geological and hydrogeological information for the site and its environs were reviewed from data retained by the Geological Survey of Ireland and from previous studies of Labre Park. The information sourced from the desk study was used to set the site in context and to assess the information gathered during the site investigation programme.

Previous studies contained within the Environmental Impact Statement (EIS) for Labre Park CAS, undertaken by Patel Tonra Ltd. (January 2005) were made available to TES Consulting Engineers.

Reference to the Geological Survey of Ireland (GSI) bedrock geology map for Kildare/Wicklow (1:100,000 scale Sheet 16, 1995), indicates that the bedrock underlying the subject site is classified as the Lucan Formation. The Lucan Formation, (also referred to as Calp Limestone) comprises a dark grey to black coloured limestone and shale.

Glacial deposits overlie bedrock throughout the subject site. In this area, the glacial deposits comprise Dublin boulder clay. The site investigation programme undertaken as part of the EIS, indicates that the glacial deposits comprise very compacted, medium brown clay material with large sub-rounded to angular limestone clasts. The Dublin boulder clay is a low permeability material.

GSI well-card data for the broad area of Ballyfermot record 8No. well records. Bedrock was encountered at depths ranging from 1.2m to 16.7m below ground level. Bedrock was not encountered in any of the trial pits excavated as part of the EIS.

The Calp Limestone is classified as a Locally Important Aquifer, which is moderately productive only in localised zones (Ll), as per the GSI aquifer classification system.

The compact and clay-dominant nature of the glacial deposits are considered to form a confining layer over the aquifer and impede infiltration of rainwater to the bedrock.

The site investigation programme for the EIS entailed the excavation of 6 No. trial pits within the site. A range of infill materials were noted in each of the excavations, ranging from Construction and Demolition (C&D) materials to municipal waste materials.

The EIS concluded that, due to the nature of the infill material, it was probable that the soil/subsoil environment was contaminated.

3.2 Design of Site Investigation Programme

The site investigation programme undertaken by TES Consulting Engineers was designed to expand on the previous investigation and inform the following:

- To estimate the composition of the infilled material;
- To describe the composition of the soil/subsoil material underlying the infilled material;
- To obtain soil/subsoil samples in order to determine if soil/subsoil contamination has occurred;
- To drill groundwater monitoring boreholes to determine if groundwater contamination has occurred.

3 No. Boreholes were drilled within the site by Glover Site Investigations on 18th March 2005. Drilling was supervised by personnel from TES Consulting Engineers. The records of the drilling programme are included in Appendix A.

30 No. Trial pits were excavated at the proposed site between April 12th 2005 and April 15th 2005. The excavation of the trial pits was supervised by personnel from TES Consulting Engineers. The records of the trial pitting programme are included in Appendix B.

Samples of the natural soil/subsoil material underlying the infilled material were retrieved during the trial pitting programme to ascertain if, and to what extent, the infilled material has resulted in contamination of the soil/subsoil environment. All samples were submitted to ALcontrol Laboratory for analysis.

Following the installation of the groundwater monitoring boreholes within the site, a sampling survey was undertaken on the 21st April 2005. During this survey, it was evident that borehole GW1 has been vandalised and rendered unusable. Various materials, predominantly gravel, had been inserted into the borehole standpipe and as such it was filled to above the watertable. It was not possible to expel this material from the borehole. The remaining two boreholes, GW2 and GW3, did not appear to have been tampered with. Following sufficient purging of standing water within the standpipe, the groundwater samples were obtained and submitted to ALcontrol Laboratory for analysis.

4 FINDINGS OF SITE INVESTIGATION PROGRAMME

4.1 Estimation of Composition of Infill Material

Construction and demolition (C&D) waste, municipal waste and loose fill were found to be overlying natural soil/subsoils in all trial pits. This infill material resulted from historical dumping of waste on site. Historically, waste and debris was used as a means of raising the topographic elevation of lands, which were low lying and waterlogged, as was the natural setting of this site and surrounding area.

The predominant material encountered within the site comprised clay dominant C&D waste. At deeper levels the infill material generally comprised a varying quantity of scrap metal, timber, cloth, bricks, concrete, road surfacing, plastic and glass. Certain trial pits encountered intervals of old municipal waste, however this was not uniform in thickness across the site.

The infill material was recorded at depths ranging from approximately 0m to 2m below ground level (bgl). A varying thickness of loose clay with cobbles was found overlying the waste materials in each trial pit. Black cinders were noted in trial pit TP6.

4.2 Description of Soil/Subsoil Material

A total of 30 No. trial pits were excavated between April 12th 2005 and April 15th 2005, using a JCB Back Hoe excavator. The locations of these trial pits are shown on Figure No. 2. The subsoil material encountered was logged by TES Consulting Engineers and a detailed descriptive log of each trial pit is included in Appendix B. All subsoils encountered were described in accordance with BS5930.

Trial pits were excavated to depths varying between 3m bgl and 4m bgl. Refusal was not met in any of the 30 No. trial pits. The majority of trial pits consisted of fill from 0-2m bgl and old municipal waste from 2-3m bgl. This old municipal waste has largely degraded. In general, natural subsoil was encountered at 3m bgl in the trial pits on site. This soil consisted of green to grey clay with sub-rounded cobbles.

The material encountered during the drilling within the site generally comprised brown to black clayey till with small rounded pebbles. Shatterings of glass were recorded in the top 4m of BH2.

No water ingress or formation collapse was recorded in any of the 30 No. trial pits excavated during the period of site investigation.

In general, the natural subsoil material (below the infilled material) was predominantly a clay-rich till with a variable content of silt, gravels, cobbles and municipal waste. The colour of the clay till varied from dark brown overlying green/grey subsoil. The strength of the clay till was firm to stiff.

4.3 Results of Soil/Subsoil Analysis

A composite sample of natural soil was collected from each of the 30 No. trial pits TP1-TP30, at depths ranging from 2m bgl to 3.5m bgl. Each sample was taken from 0.2m-0.3m below the infill material/natural soil interface.

All soil testing was carried out in accordance with the applicable sections of British Standard 1377 (Soil Analysis).

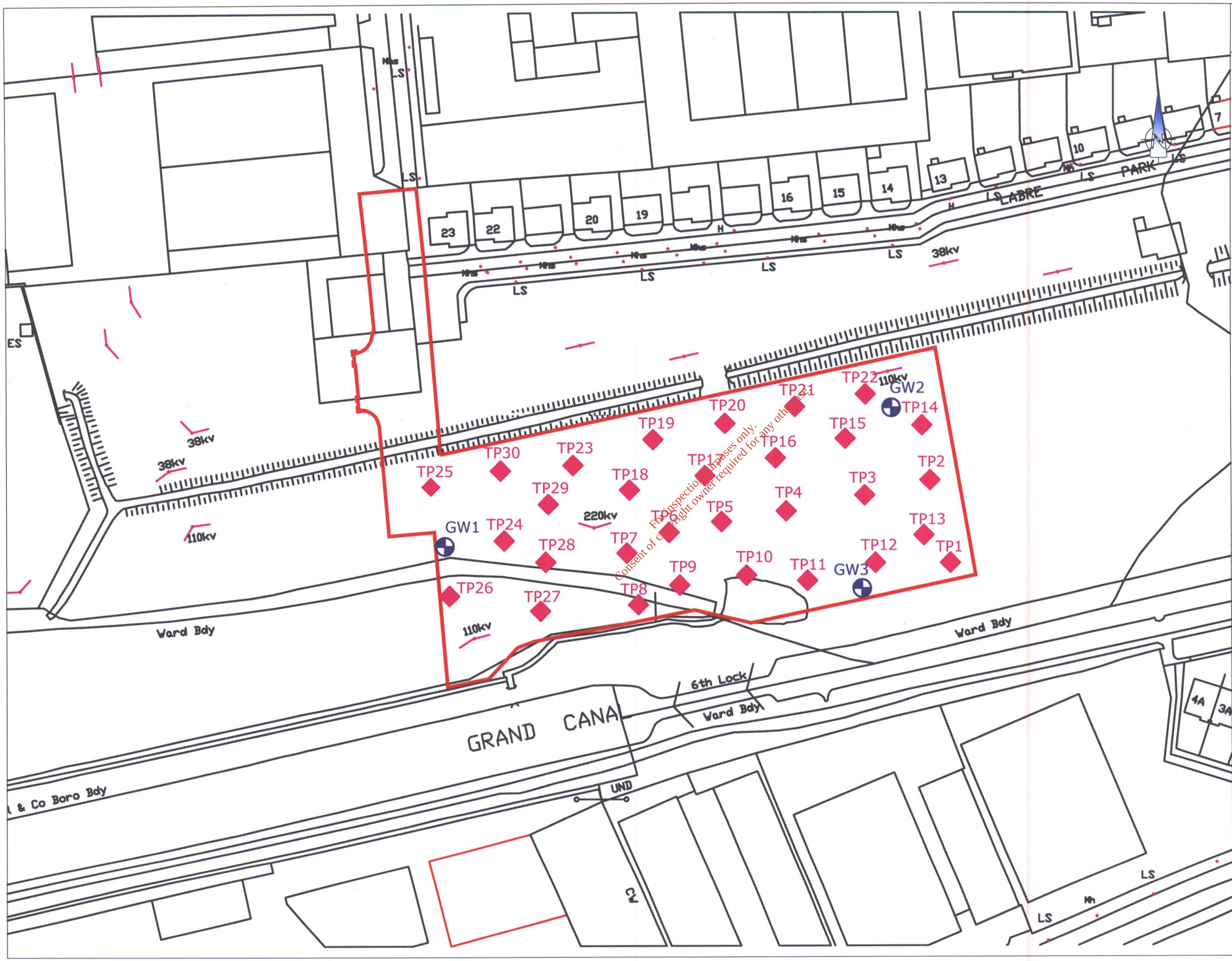
The samples were then delivered to ALcontrol Laboratories in order to determine the extent, if any, of the leaching of contaminants into the underlying soil. The laboratory analysis undertaken included:

- Natural Moisture Content;
- Heavy Metals (Arsenic, Cadmium, Chromium, Copper, Nickel, Zinc, Lead, Mercury, Selenium and Boron);
- Total Phenols;
- Gasoline Range Organics (GRO);
- Diesel Range Organics (DRO);
- Mineral Oils;
- BTEX Compounds (Benzene, Toluene, Ethylbenzene, Total Xylene);
- Semi-Volatile Compounds (screened number of samples); and
- Volatile Compounds (screened number of samples).

The results for the soil samples collected from the site are included in Appendix C, and summarised in Table 4.3.1 below.

The results of the soil analysis were compared to the Dutch Standards for assessment of contaminated soils. This standard is considered to be the most relevant and appropriate means of determining if the soil is contaminated and to what extent. The Dutch Standards provides two levels, a target level and an intervention level. At concentrations below the target level, the soil may be considered to be uncontaminated and there is no demonstrable pollution of the soil. If a soil is found to be above the intervention concentration, remedial works are required. The remedial works will be aimed at reducing the concentration levels to the target concentration for particular constituents.

Based on the sample retrieved, the natural moisture content of the soil/subsoil material varies from 16.5% to 74.6%. This would suggest that the soil/subsoil environment varies from relatively unsaturated to heavily saturated.



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Notes:

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4. All levels relate to Ordnance Survey Datum at Malin Head.

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Client

Dublin City Council
Comhairle Cathrach Bhaile Átha Cliath

Project

LABRE PARK CIVIC AMENITY SITE
WASTE LICENSE APPLICATION

Drawing Title

SITE INVESTIGATION MONITORING POINTS

Scale 1 : 1000 (A3)

Drawn by	Checked by	Date
Mark Conroy	Siobhain Tinnelly	June 2005

ENGINEER IN CHARGE: Dermot Burke

TES
CONSULTING ENGINEERS
UNIT 4B/5,
BLANCHARDSTOWN CORPORATE PARK,
DUBLIN 15.
IRELAND
TEL. 01 8030401
FAX. 01 8030410
email administration@tesltd.ie

Drawing No.

Figure 2

Rev.

Table 4.3.1: Soil Chemistry

Parameter	Unit	Dutch Limits		TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8	TP9	TP10	TP11	TP12	TP13	TP14	TP15
		TV	IV															
Diesel Range Organics	mg/kg			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Mineral Oil	mg/kg	50	5000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Petrol Range Organics	mg/kg			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzene	mg/kg	0.05	2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toluene	mg/kg	0.05	130	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ethylbenzene	mg/kg	0.05	50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Xylene	mg/kg	0.05	25	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Volatile Organics	µg/kg			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Semi Volatile Organics	µg/kg			Note1	Note 1	<100	<100	<100	<100	<100	Note 1	Note 1	Note 1	<100	Note 1	<100	Note 1	<100
Natural Moisture Content	%			72.1	24.4	26.2	34.5	50.7	36.1	49.6	49.2	30.2	16.5	15.6	74.6	47.6	21.4	21.8
Total Phenols	mg/kg			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	mg/kg	29	55	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cadmium	mg/kg	0.8	12	1	1	2	2	2	2	1	2	1	2	2	2	2	4	2
Chromium	mg/kg	100	380	17	27	19	35	52	50	28	48	20	25	17	31	49	23	21
Copper	mg/kg	36	190	32	25	25	18	50	25	16	37	27	26	41	60	40	29	33
Lead	mg/kg	85	530	60	19	27	19	83	17	12	52	44	31	37	139	59	35	22
Mercury	mg/kg	0.3	10	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Nickel	mg/kg	35	210	19	42	33	30	59	43	18	50	32	42	42	49	55	42	39
Selenium	mg/kg			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	mg/kg	140	720	148	132	108	133	243	187	72	245	139	136	133	273	212	158	149
Boron	mg/kg			2	1	<1	<1	3	<1	<1	<1	<1	4	2	6	4	3	2

Note 1: Semi Volatile Organic compounds detected, reference Appendix C for compounds detected and concentrations.

Table 4.3.1: Soil Chemistry

Parameter	Unit	Dutch Limits		TP16	TP17	TP18	TP19	TP20	TP21	TP22	TP23	TP24	TP25	TP26	TP27	TP28	TP29	TP30
		TV	IV															
Diesel Range Organics	mg/kg			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Mineral Oil	mg/kg	50	5000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Petrol Range Organics	mg/kg			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzene	mg/kg	0.05	2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toluene	mg/kg	0.05	130	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ethylbenzene	mg/kg	0.05	50	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Xylene	mg/kg	0.05	25	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Volatile Organics	µg/kg			<1	<1	<1	<1	<1	<1				<1		<1			
Semi Volatile Organics	µg/kg			<100	<100	<100	<100	<100	Note 1				<100		<100			
Natural Moisture Content	%			20.9	43.6	40	22.4	25.6	20	23.4	17.4	52.2	25.6	29.7	31.5	36.5	23.8	39.6
Total Phenols	mg/kg			<0.01	<0.01	<0.01	<0.01	<0.01	4.66				<0.01		<0.01			
Arsenic	mg/kg	29	55	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cadmium	mg/kg	0.8	12	2	1	1	2	2	2	3	2	2	2	3	1	2	1	1
Chromium	mg/kg	100	380	38	60	53	32	32	25	26	22	49	29	34	26	48	18	45
Copper	mg/kg	36	190	27	39	28	37	30	34	3448	41	38	39	22	24	25	31	35
Lead	mg/kg	85	530	22	30	14	41	28	67	243	53	42	169	34	27	17	54	39
Mercury	mg/kg	0.3	10	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Nickel	mg/kg	35	210	59	60	50	51	56	39	65	40	54	50	45	35	44	28	46
Selenium	mg/kg			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	mg/kg	140	720	185	254	200	179	214	146	330	157	215	193	145	133	175	129	195
Boron	mg/kg			4	3	2	4	4	6	1	<1	2	<1	<1	2	<1	1	<1

The concentration of total Phenols is below the detection limit of the laboratory, indicating that the soil environment is not impacted by any industrial material with associated phenol. The results would suggest that infilled material does not contain materials typically associated with Phenols, such as cresols, preserves and dyes.

The concentrations of Diesel Range Organics (DRO), Mineral Oil, Petrol Range Organics (PRO) and BTEX Compounds from all soil samples are below the detection limit of the laboratory, indicating the soil environment has not been impacted by any hydrocarbon material. This would suggest that the infilled material does not contain any hydrocarbon product.

The concentration of Volatile Compounds (61 No. compounds, EPA 624/8260 Suite) is below the detection limit of the laboratory, indicating that the soil environment is not impacted by any semi volatile organic compounds.

The concentration of Semi-Volatile Compounds (60 No. compounds) are predominantly below the detection limit of the laboratory, however some semi-volatile compounds at varying concentrations were detected in Trial Pits TP8, TP9, TP10, TP12, TP14 and TP21.

The concentration of compounds detected in TP10, TP14 and TP21 are just slightly above the detection limit of the laboratory. The compounds detected are Pyrene, Anthracene and some derivatives. At the concentrations detected, the material would not be considered to be contaminated. The concentration of compounds detected in TP8, TP9 and TP21 were slightly higher and again the compounds detected are Anthracene and Pyrene and some derivatives. The maximum concentrations detected in the trial pits was 2.7mg/kg, which while elevated would not be considered to be grossly contaminated. Even at the concentration recorded when compared to the Dutch Standards on contaminated soils, this material would not be considered grossly contaminated.

The geographical location of the trial pits was assessed, however no regular pattern was observed as to hot spots for elevated compounds. The trial pits logs were also assessed to determine if similar infill material was noted. However, the material recorded in these trial pits was logged as predominantly C&D waste in a clay matrix and no obvious contaminant material was noted. The Anthracene and Pyrene (with derivatives) compounds detected are considered to be Polycyclic Aromatic Hydrocarbon (PAH) compounds and are usually associated with asphalt, coal tar, heavy fractions of petroleum distillation and creosote. However owing to the findings of the DRO/PRO/Phenol analysis (i.e. no product detected in analysis) the source is unlikely to be from petroleum or creosote, therefore the most likely source is from asphalt or coal tar (or similar materials) embedded in the C&D waste.

The concentration of metals in the soil/subsoil is generally low, with all concentrations below the Dutch Intervention limits (with the exception of Cu concentration in TP22). The elevation of copper in TP22 would appear to be isolated and abnormally high with respect to other concentrations recorded. This may result from laboratory error or from fouling of the sample with infill material when being retrieved from the trial pit. Alternatively, an area where scorched copper wiring was located may have resulted in the isolated peak in concentration, which is not recorded elsewhere within the site.

In conclusion, the soil/subsoil material does not appear to be grossly contaminated, when compared to the Dutch Standards on contaminated soils, due to the material infilled in this site. While some elevated compounds were detected, it should be noted that the soil samples were retrieved from 0.2m to 0.3m below the interface with the infill material and would represent concentration of materials approaching maximum concentration. Due to the compactness and composition of the natural soil/subsoil material, it is considered unlikely that significant leaching of material will occur.

It is also noted that the infilled material is quite old and the material has degraded to a significant extent. The concentration recorded on site would suggest that the infill material is not resulting in significant contamination of the soil/subsoil material on-site and therefore does not pose a significant risk to areas off-site. The thickness (7m to 9m) and low permeability characteristics of the Dublin boulder clay will offer natural protection against any mobilisation of contaminants to the watertable.

4.4 Description of Bedrock Material and Groundwater Inflows

In total, 3 No. boreholes were drilled by Glover Site Investigations, to depths varying from 12m (GW3) to 18m (GW1) below ground level. The logs for each borehole are included in Appendix A, herein. The locations of these monitoring points are shown in Figure 2.

Each borehole was drilled at 150mm diameter through the unconsolidated subsoil and weather bedrock zone and thereafter drilling continued at 150mm diameter in the bedrock. 50mm diameter screen and casing standpipe was installed into each borehole and the annulus was refilled with a pea-gravel around screened sections and bentonite seal around blank casing. A concrete plinth was constructed around each borehole and secure well head protection was embedded in to the concrete.

Rockhead (i.e. interface between subsoil material and rock) was encountered in each borehole. The depth at which rockhead was encountered varied slightly from 7m bgl at GW1 and GW3 to 9m bgl at GW2. Owing to the topographic elevation of the land, the elevation of rockhead would appear to be quite consistent across the site.

The material returned to the surface during drilling was collected and assessed in order to provide a general description of the bedrock encountered in each borehole. The bedrock encountered in boreholes GW2 and GW3 was similar and comprised a wet, soft to hard, grey to blue coloured, fine-grained limestone. The bedrock encountered in GW1 comprised hard, dry, light blue/grey limestone. The description of the bedrock is considered to be consistent with the classification of the Lucan Formation.

Water strikes were encountered in the bedrock zone in each borehole, with the exception of borehole GW1. Borehole GW1 was found to be dry throughout, however it was retrofitted appropriately, to allow slow inflow of groundwater from the saturated bedrock.

4.5 Results of Groundwater Analysis

Groundwater samples were taken from borehole GW2 and GW3 on the 21st April 2005. Due to the vandalism of GW1, it was not possible to retrieve a sample from this monitoring point. These samples were collected in order to establish the existing baseline groundwater quality to determine if, and to what extent, the infill of waste material within the site has resulted in groundwater contamination.

There was no visible or olfactory evidence of contamination observed in the water at the monitoring points during the groundwater sampling survey. The borehole was cloudy with suspended solid content, however this would be considered normal for a monitoring point screened through the subsoil environment.

Alcontrol Geochem, who are an ISO 17025 and UKAS accredited laboratory, carried out chemical and microbiological analyses on the water samples. A comprehensive suite of parameters was requested for analysis so that the groundwater could be fully characterised. These parameters analysed included organics, inorganics, metals, major anions and cations, and mineral oils.

The results of all water analyses are presented in Appendix D and summarised in Table 4.5.1 below. Table 4.5.1 includes the Maximum Admissible Concentrations (MACs) quoted in the Parametric Values of Statutory Instrument No. 439 of 2000 (European Community Drinking Water Regulations). S.I. No. 439 of 2000 is the current legislation for drinking water having come into force on the 1st January 2004. These are considered the most appropriate standards with which to compare the groundwater analytical results. It should be noted that the groundwater in this area would most likely not meet drinking water standards even if this area was not infilled with materials, however comparison with the Drinking Water Standards does allow an objective assessment of the water quality.

The reported concentrations for all parameters are within the corresponding MACs quoted in the Drinking Water Regulations with the exception of the detected values for ammoniacal nitrogen and manganese at both monitoring points GW2 and GW3 and nickel at GW2. In general, the concentrations reported for GW2 were slightly more elevated than the values reported for the corresponding parameters in GW3.

The reported ammoniacal nitrogen concentrations are elevated above the corresponding MAC quoted in the Drinking Water Regulations in all of the water samples. The value measured in the sample taken from GW2 is particularly elevated with a reported value of 9.9mg/l, compared with 4.9mg/l at GW3. The manganese concentrations of both groundwater samples are in excess of the MAC value for manganese quoted in the Drinking Water Regulations (0.05mg/l). GW2 has a value of 1.043mg/l of nickel and GW3 has a value of 1.127 mg/l of nickel.

Finally, the nickel value detected in GW3 of 7ug/l is well within the given MAC value of 20ug/l. However, the concentration of nickel in GW2 is elevated relative to this concentration with a recorded value of 28ug/l.

The groundwater quality would not be considered to be contaminated due to the infilled material. Elevated concentrations of manganese and nickel can naturally occur in the subsoil environment and mineralisation in groundwater can occur. Elevated concentrations of ammoniacal nitrogen can occur due to leaching from waste material or can be naturally occurring in anaerobic environments. The low lying areas of Ballyfermot would historically have been waterlogged, with a high watertable and as such the environment would have been anaerobic. Ammoniacal nitrogen concentrations of the levels recorded at Labre Park have been recorded in other such anaerobic environments.

Owing to the overall chemical composition of the groundwater in each borehole, it is not considered that the material infilled within the site is currently resulting in a significant risk to the groundwater environment.

The two boreholes available for sampling are considered to be downgradient, with respect to groundwater flow. The chemical analysis of the groundwater at the downgradient boundary of the site is not considered to pose a risk to the groundwater environment off-site.

Table 4.5.1: Results of Groundwater Analysis

Parameter	Units	M.A.C.	Detection Limit	GW2	GW3
pH		6.5<pH<9.5	0.01	7.71	7.51
Electrical conductivity EC	µS/cm	2500	0.014	1311	1192
Dissolved oxygen (DO)	mg/l		0.1	7	6.1
Total Organic Carbon (TOC)	mg/l		2	6	7
Total solids	mg/l	n/a	1	585	596
Total alkalinity (as CaCO3)	mg/l	30 MRC	1	470	400
Ammonia as NH4-N	mg/l	0.3	0.2	9.9	4.9
Total Oxidised Nitrogen (TON)	mg/l	n/a	0.3	<0.3	0.5
Chloride Cl	mg/l	250	1	47	26
Sulphate SO4	mg/l	250	3	79	84
Potassium K	mg/l	12	0.2	9.2	1.8
Sodium Na	mg/l	200	0.2	36	12
Calcium Ca	mg/l	200	0.05	153.5	180.9
Magnesium Mg	mg/l	50	0.005	36.2	21.62
Zinc Zn	mg/l	1	0.003	0.062	0.022
Iron Fe	mg/l	0.2	0.005	<0.005	<0.005
Manganese Mn	mg/l	0.05	0.001	1.043	1.127
Lead Pb	µg/l	10	5	5	<1
Copper	µg/l	2000	5	3	3
Mercury Hg	µg/l	1	0.05	<0.05	<0.05
Nickel Ni	µg/l	20	1	28	7
Arsenic	µg/l	10	5	3	3
Cyanide CN	µg/l	50	50	<50	<50
Cadmium Cd	µg/l	5	0.4	<0.4	<0.4
Chromium Cr	µg/l	50	1	28	21
Total Phenols (HPLC)	mg/l	0.0005	0.01	<0.01	<0.01
Diesel Range Organics (DRO)	µg/l	10	10	<10	<10
Mineral Oil	µg/l	10	10	<10	<10
Petrol Range Organics C4-C10	µg/l	10	10	<10	<10
Petrol Range Organics C10+	µg/l	10	10	<10	<10
Bezene	µg/l	10	10	<10	<10
Toluene	µg/l	10	10	<10	<10
Ethylbenzene	µg/l	10	10	<10	<10
Total Xylene	µg/l	10	10	<10	<10
Semi-Volatile Organic Compounds	µg/l		1	<1	<1
Volatile Organic Compounds	µg/l		1	<1	<1

Legend < = Less than

M.A.C = Maximum Admissible Concentration under S.I. No. 439, 2000(European Communities Drinking Water Regulations).

5 CONCLUSIONS

- Various materials have been deposited within this site over an extended period of time. The material is mixed in composition and varies both laterally and vertically across the site.

- The site investigation programme was designed to estimate the composition of the infilled material. Excavations were undertaken in a regular grid within the main potion of the site, to the south of Galback Stream.

- 30 No. trial pits were excavated within the waste and continued into the natural soil/subsoil environment.

- 30 No. soil samples were retrieved to establish if leaching of contaminants from the infill material has resulted in pollution of the subsoil environment.

- 3 No. boreholes were drilled to establish if leaching of contaminants has resulted in pollution of the groundwater environment.

- Following the drilling of the boreholes and prior to groundwater sampling, one of the boreholes (GW1) was vandalised and rendered unusable for sampling purposes.

- The detailed analysis of the soil and groundwater samples indicates that the materials deposited within the site have not resulted in gross contamination of the soil or groundwater environment.

- Dublin City Council propose to develop Labre Park as a Civic Amenity Site. It is recommended that during the development of the site, care is taken to minimise excavations of the infill material.

- Owing to the results of the site investigation, it is proposed that the materials within the site should remain in-situ and largely undisturbed.

- If any excavations are required, the surplus soil should be either reused within the site or exported to an appropriate disposal area. The soil material is clarified as inert and therefore will not require special disposal arrangements.

- Due to the nature of some of the materials deposited, that will degrade over time, care should be exercised in the design of the facility to ensure that differential ground settlement does not affect any structures. The ground bearing capacity should be examined in the detailed design stage.

- Any surface charring of the ground, i.e. resulting from old bonfires, from burnt out cars, etc., will be excavated and will be sent off-site for specialist treatment

- The development of the site will not result in any significant cumulative impact on the soil or groundwater environment, subject to appropriate drainage and discharge arrangements.