Comhairle Contae Fhine Gall
Fingal County Council

An Roinn um Pleanáil agus Infrastruchtúr Straitéiseach
Planning and Strategic Infrastructure Department

Noeleen Keavey
Programme Officer
Environmental Licensing Programme
Office of Environmental Sustainability
Environmental Protection Agency
Headquarters, PO Box 3000
Johnstown Castle Estate
Co. Wexford Y35 W821

Re: Application to the EPA for a waste licence review

Dear Ms Keavey

With regard to your letter dated 22nd January 2016 an Environmental Impact Statement was submitted as part of planning application Reg. Ref. F98A/0312.

This related to full planning permission for a pharmaceutical finishing plant incorporating manufacturing areas, warehousing offices, laboratory and utility areas.

A copy of the Order dated 4th June 1998 granting planning permission with 9 no conditions, the Environmental Impact Statement and a copy of the planner's report dated 4th June 1998 are attached.

The planning authority has no observations to make in relation to this licence application.

Yours sincerely

Nicholas O'Kane
Senior Executive Planner
Planning Department – Blanchardstown Office
E: Nicholas.okane@fingal.ie

Date: 11th February 2016
Enc: 3

FILE

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Bosca 174,
46/49 Sráid Uí Chonaill Uacht,
Baile Átha Cliath 1.
Tel: (01) 872 7777

Fingal County Council
P.O. Box 174,
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Dublin 1.
Fax: (01) 872 0195

PLANNING DEPARTMENT

NOTIFICATION OF DECISION TO GRANT PERMISSION
LOCAL GOVERNMENT (PLANNING AND DEVELOPMENT) ACTS, 1963 TO 1993

Decision Order Number 2415	**Date of Decision** 04/06/98
Register Reference F98A/0312	**Date** 8th April 1998

Applicant Rottapharm Limited

Development for a Pharmaceutical Finishing Plant, incorporating Manufacturing Areas, Warehousing Offices, Laboratory, and Utility Areas.

Location Damastown, Mulhuddart, Dublin 15

Floor Area Sq Metres

Time extension(s) up to and including

Additional Information Requested/Received /

In pursuance of its functions under the above mentioned Acts, the Fingal County Council, being the Planning Authority for the County Health District of Dublin, did by Order dated as above make a decision to **GRANT PERMISSION** in respect of the above proposal.

Subject to the conditions (9) on the attached Pages.

Signed on behalf of the Fingal County Council

.....Sheila Gilb.....4th JUNE 1998
for Senior Administrative Officer

Murray O'Laoire Associates
Fumbally Court
Fumbally Lane
Dublin 8

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PLANNING DEPARTMENT

REG. REF. F98A/0312

Conditions and Reasons

1 The proposed development shall be retained in its entirety in accordance with the plans, particulars and specifications lodged with the application, as amended by unsolicited additional information received on 11/5/98 save as may be required by the other conditions attached hereto.

REASON: To ensure that the development shall be in accordance with the permission and that effective control be maintained.

2 Prior to the commencement of development, the applicant shall obtain the written agreement of the Planning Authority in respect of:-

(a) a tree survey of all trees and hedgerows on the site indicating exactly what is to be retained and outlining measures that will be taken to protect trees and hedgerows during construction works (the applicant is advised that the hedgerow along the west bank of the Pinkeen River should be retained and incorporated into the planting scheme for the site);

(b) details of boundary treatment between the application site and adjoining sites and the road;

(c) a landscape plan with full specifications and bill of quantities;

(d) a management agreement for the maintenance of the landscaped area upon completion of the development;

(e) clarification as to the need for gabion baskets along the banks of the Pinkeen River.

REASON: In the interest of the proper planning and development of the area.

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PLANNING DEPARTMENT

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3 A bond of £10,000 is required as security for the protection of trees and hedgerows on the site.

REASON: In the interest of visual amenities.

4 Prior to the commencement of development, the applicant shall obtain the written agreement of the Planning Authority in respect of an area reserved for the provision of car parking in accordance with Development Plan standards. According to Development Plan standards, the proposed development would require a total of 238 car parking spaces. Therefore an area shall be reserved for the future provision of 178 car parking spaces.

REASON: In the interests of orderly development.

5 Prior to the commencement of development, the applicant shall obtain the written agreement of the Planning Authority in respect of drawings of the proposed kitchen layout.

REASON: In order to comply with Health and Safety Regulations.

6 Prior to the commencement of development, the applicant shall obtain the written agreement of the Planning Authority in respect of the following details in relation to foul drainage:-

(a) details of finished floor levels, invert levels and gradient through the domestic system and the process system down to the public sewer;

(b) details of the proposed effluent treatment system and holding tank including invert levels and ground levels. The system shall be certified by a competent person conversant with chemical treatment systems;

(c) details of a sampling point on the chemical effluent line which will be easily accessible to County Council staff;

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PLANNING DEPARTMENT

(d) details of bunding arrangements for the warehouse;

(e) details of internal drainage for the warehouse showing drainage discharge to the chemical holding tank prior to treatment, in order to cater for waste water and fire water. All other areas which produce contaminated effluents shall also discharge to the drainage system taking chemical discharges;

(f) details of the pipes and inspection chambers serving the chemical drainage shall be constructed in chemically resistance materials. The pipes should be first class glazed vitreous pipes or other approved.

REASON: In the interests of orderly development.

7 The applicant shall apply for a license under the provisions of the Water Pollution Acts, to discharge to the public sewer.

REASON: In the interests of orderly development.

8 Prior to the commencement of development, the applicant shall obtain the written agreement of the Planning Authority in respect of the following details in relation to surface water drainage;

(a) details of the treatment of the streams traversing the site. In particular details of the Pinkeen River must be submitted to a scale of not less than 1/50 indicating the stepped treatment to the banks, as referred to in the EIS. The bed of the Pinkeen should be formed in concrete with 450mm upstands at either bank, be 4 metres wide and include low rise weirs at a minimum distance of 5 metres. The weir height may vary between 150mm and 300mm. Such works are required in order to provide an aesthetic appearance at low flows and to create flows which are of a poor quality, as indicated in the EIS;

(b) details of the proposed treatment of the water course which fronts the site and how the banks of

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PLANNING DEPARTMENT

REG. REF. F98A/0312

this stream will marry in with the proposal to provide berms as part of the landscaping works;

(c) details of the proposed link bridge and the means of bridging the water course crossed by the two access points;

(d) details of the surface water outfall points at the bank of the stream (ie. wing walls, head walls and aprons);

(e) the applicants shall consult with the Parks Department with respect of the proposed bank treatment of the Pinkeen and water courses before final submission to the Environmental Services Department.

REASON: In the interests of orderly development.

9 That all watermain tappings, branch connections, swabbing and chlorination to be carried out by the County Council, Sanitary Services Department and that the cost thereof be paid to the County Council before any development commences.

REASON: To comply with public health requirements and to ensure adequate standards of workmanship. As the provision of these services by the County Council will facilitate the proposed development it is considered reasonable that the Council should recoup the cost.

COMHAIRLE CHONTAE FHINE GALL
COUNTY OF FINGAL

CONF

Record of Executive Business and Manager's Orders

P/2415/98.

CONTRIBUTION:
Standard: Nil bo
Roads: bo Jnel
S. Sers. Estate
Open Space:
Other:
SECURITY:
Bond / C.I.F.:
Cash:

Register Reference: F98A/0312 Date: 8th April 1998

Correspondence Name and Address: Murray O'Laoire Associates
Fumbally Court
Fumbally Lane
Dublin 8

Development: for a Pharmaceutical Finishing Plant, incorporating Manufacturing Areas, Warehousing Offices, Laboratory, and Utility Areas.

Location: Damastown,
Mulhuddart,
Dublin 15

Applicant: Rottapharm Limited

App. Type: Permission

Zoning:

AW/LT)

Report of the County Planning Officer dated 4th June, 1998.

This is an application for **PERMISSION** for a Pharmaceutical Finishing Plant, incorporating manufacturing areas, warehousing, offices, laboratory and utility areas at Damastown, Mulhuddart, Dublin 15 for Rottapharm Limited. The application accompanied by an EIS.

The proposed development is located in an area zoned 'E', "to provide for industrial and related uses" in the County Dublin Development Plan, 1993.

HISTORY
There is one history files of relevance to this particular site.

Record of Executive Business and Manager's Orders

REG. REF.F98A/0312
LOCATION Damastown,

Reg.Ref. 92A/0975 Outline permission granted to the IDA for a light industrial development on 84 acres. There is no record of any applications been made for approval for this permission. However the lands have been the subject of a number of applications for permission. The site to which this application relates was part of the 1992 application.

OBJECTIONS
There have been no objections received on file to date.

INTERDEPARTMENTAL REPORTS
Environmental Services report that foul and surface water sewage disposal, and water supply are available, subject to a number of conditions to be agreed prior to the commencement of development.

The Roads Department report states that they have no objection to the proposed development, as long as car parking is in compliance with Council standards.

The Parks Department report no objections to the proposed development subject to a number of conditions relating to existing and proposed landscaping.

The Environmental Health Officer also reports no objection, subject to the approval of the proposed kitchen layout, prior to the commencement of development.

The file has not been referred to any other department for comment.

DESCRIPTION
This is an application for permission for a Pharmaceutical Finishing Plant, incorporating manufacturing areas, warehousing, offices, laboratory and utility areas at Damastown, Mulhuddart. The proposed site has an area of 20 acres and the buildings will occupy an area of approximately 5,800 sq. metres. The total floor area is stated as 8,314 sq. metres.

The proposed development consists of three buildings with administration production and warehousing functions. Each are linked by enclosed corridors, and also by a bridge structure across the Pinkeen River (linking the administration with the production and warehousing buildings). The buildings are of varying heights, ranging from 8.1 metres high for the administration building to 14.5 metres high for the warehouse. The administration building is a two storey structure, while the other buildings are single storey double height structures. Each will be finished in a light metal sandwich cladding with aluminium, double glazed, powder coated windows.

The administration building is located to the west of the Pinkeen River. It will accommodate the main reception, changing rooms, cafeteria, offices and

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LOCATION Damastown,

laboratory on the ground floor, with offices, archive and utility rooms at first floor level. An area at first floor level is also designated for future expansion.

The production building will be divided into various sections/rooms to accommodate the necessary manufacturing steps. These include dispensing, mixing, granulation, tablet compression, capsule filling and equipment cleandown. Filling and packaging will be separate from the production area.

The site will be served by two entrances. A personnel entrance is located on the west of the rover and provides access to the administration building and the car on the west of the site. There are 60 car parking spaces proposed. A goods entrance is located east of the river. This will provide access to the loading dock located on the south elevation of the warehouse.

The facility will produce packaged pharmaceutical products (tablets, capsules and sachets) for distribution to mainly export markets. The proposed processes involve the bulk preparation, formulation and finishing of pharmaceutical products and their final filling and packaging. The finished products will be packaged in cartons and outer shipping cases and stored before distribution. The products to be manufactured are as follows:-

- Glucosamine - an anti-rheumatic in sachet and capsule form;
- Bromelain - an anti-inflammatory enzyme produce in coated tablet form;
- Monofluourophosphate/Calcium - an anti-osteoporotic uncoated tablet form;
- Pro-Glutemacin - an anti-inflammatory in capsule form;
- Glucuronic Acid - a hepatic protector in capsule form;
- Cyclidrol - a mucolytic agent in capsule form.

APPRAISAL
The application has not been referred to the EPA as it does not require an IPC license. All pharmaceutical manufacturing plants require a license. However the EPA have indicated that this application relates to a pharmaceutical finishing plant which does not involve the production and mixing of chemicals. It is therefore the responsibility of the Planning Authority to ensure that the proposal is acceptable in terms of its impact on the environment and potential pollution affects.

An Environmental Impact Assessment has been carried out in order to assess the likely and significant impact of the proposed development. The impact was measured in terms of the affect on flora and fauna, water, wastes, air and climate, noise, socio-economic factors, history and archaeology, roads, visual impacts, human beings and material assets. Given the industrial zoning of the land, its poor quality visually, the industrial character of surrounding land uses and the lack of any residential uses in the vicinity, environmental impacts are minimal, and indeed positive in some aspects - employment and visual effects. Potential impacts in terms of air and water emissions will be controlled through the use of, inter alia, neutralisation/

REG. REF.F98A/0312
LOCATION Damastown,

holding tanks, an oil interceptor and specific ventilation systems. The proposed development will meet all available BATNEEC standards.

In general the mitigation proposals outlined in the EIS are satisfactory. Where less than satisfactory conditions will be used to strictly control potential impacts.

The proposed development will provide employment of 70 people once it is operational. In terms of traffic generation, it is estimated by the applicant that there will be a maximum of 50 employee cars per day, 6 HGV's per day and 2 delivery vans per day. The existing roads infrastructure in the vicinity are all comparatively new and have been designed to cater for increased traffic volumes for the foreseeable future. Therefore the increased volumes generated by the proposed development will have a negligible affect in the locality.

The site and surrounding lands are zoned for industrial purposes. The nearest house is 500 metres away to the south east (currently used as a residential drug treatment centre), and the nearest houses possible will be a minimum of 500 metres away due to zoning restrictions.

In terms of visual impacts the EIS concludes that the impact of the proposed development would be positive. I would therefore agree with this assessment. The site and surrounding landscape is in poor condition and therefore is visually unspectacular.

Although the proposed development is relatively high (14metres at its highest) the distance from other land uses, the topography and existing and proposed screening means that any visual impact will be minor.

RECOMMENDATION
I recommend that a decision to GRANT PERMISSION be made under the Local Government (Planning and Development) Acts, 1963-1993, subject to the following 9 conditions:-

Conditions and Reasons

As Amended by Unsolicited Additional Information Received on 11th May 1998.

1 The proposed development shall be ~~retained in its entirety~~ in accordance with the plans, particulars and specifications lodged with the application, save as may be required by the other conditions attached hereto.

REASON: To ensure that the development shall be in accordance with the permission and that effective control be maintained.

DPS
ENGINEERING

PROCESS ENGINEERS PROJECT MANAGERS

ENVIRONMENTAL IMPACT STATEMENT

ROTTAPHARM LTD.
Damastown, Mulhuddart,
Dublin 15.

DPS ENGINEERING & CONSTRUCTION,
St. Patricks House,
Lower Glanmire Road,
Cork.

CONTENTS

APPENDICES

1. Site Location Maps and Site Plan
2. Process Schematics
3. Soil and Groundwater Quality Investigation
4. Meteorological Data
5. Noise Monitoring

1.0 INTRODUCTION

Rottapharm Ltd. propose to construct a new Finished Pharmaceutical Manufacturing Facility at Damastown, Mulhuddart, Co. Dublin. The new development will comprise an Administration Building, a Bulk Manufacturing Building, a Secondary Manufacturing and Packaging Building and a Warehouse Building. The facility will produce Bulk Active and Solid Dosage Form Products.

The facility will be designed and constructed to reflect the Current Industry Standards ensuring it's operation is to the satisfaction of the relevant regulatory authorities, notably the Irish Medicines Board (IMB) for EU markets and the Food and Drug Administration (FDA) for US markets. It will incorporate up-to-date manufacturing technology to ensure necessary GMP Guideline compliance and cost effective operation.

DPS Engineering & Construction Ltd., as project engineering consultants have responsibility for full design, project management and validation of the new facility as well as preparation of this Environmental Impact Statement. The scope and format of this E.I.S. are in accordance with European Communities (Environmental Impact Assessment) Regulations, S.I. 349 of 1989 and European Communities (Environmental Impact Assessment) (Amendment) Regulation S.I. 84 of 1994.

2.0 NON-TECHNICAL SUMMARY

Rottapharm Ltd. proposes to construct a new Solid Dosage Form Pharmaceutical facility on a greenfield site at Damastown, Mulhuddart, Co. Dublin. The plant will manufacture tablets, granules and capsules. The facility will be a fully integrated unit and will incorporate Production Facilities, Filling, Dispensing and Packaging Areas, Warehousing, Laboratory Facilities, Utilities and Office and Administration Accommodation.

The land consists of grassland and hedgerows, lying to the east of the existing Yamanouchi site and to the west of the existing Loctite site. The existing Helsinn Birex Pharmaceuticals and Helsinn Chemicals sites lie to the Southwest and the new IBM facility to the Northwest. The site incorporates a section of the Pinkeen River which runs through it in a north/south direction.

A range of products is to be manufactured and packaged at the new facility. The core activity will be the production of Glucosamine Sachets and Capsules for anti-rheumatic treatments, Bromelain Tablets for anti-inflammatory treatments and selected other products.

The new facility will have a floor area of approximately 8000m^2 and while all manufacturing activities are carried out on a single ground floor level, upper floor areas are provided for Offices, Plant Rooms, USP Water Storage, Various Utilities and Access. The plant will be self-sufficient with respect to all utilities.

Process effluent will be generated by washing activities which will amount to approximately 25m^3/day in normal circumstances and to a maximum of 50m^3/day. This will be treated by automatic continuous pH monitoring and correction with acid/caustic followed by settling which will remove insoluble contaminants. This effluent will then be discharged to the municipal sewer leading to the primary treatment plant at Ringsend.

Domestic waste will be passed directly to this sewer and surface water will be directed to the River Pinkeen via an oil interceptor.

Emissions to atmosphere will arise from general and specific ventilation as well as from Tablet Coating Operations. All general and specific ventilation points will be fitted with high efficiency particulate filters or reverse jet type-dust collectors as necessary to prevent any dust emissions. All solvents used in Tablet Coating Operations will be recovered and collected as necessary to bring emission levels within those outlined in T.A. Luft. In general, all emissions will be within BATNEEC limits for pharmaceutical emissions.

Solid wastes will principally be packaging materials and general wastes. Any contaminated materials will be stored separately and disposed of as hazardous waste. General wastes will be disposed of to controlled landfill by local contractors.

2.0 NON-TECHNICAL SUMMARY (Cont'd)

Noise emissions will be minimised by the fact that noise sources are internal to the building and also noise control measures will be fitted to equipment such as air handling units, compressors and chillers. The distance to the nearest residence (approx. 500 metres) means that the impact of plant noise will be negligible, especially in light of the proximity of the N3 dual carriageway.

Flora and Fauna on the site and surrounding areas are unremarkable. Emissions from the plant will have no impact on these. Landscaping of the site will be carried out with particular emphasis on the Pinkeen River which shall be a focal point for the site.

A total of 70 people will be employed at the plant when it is in initial production with plans to double within 5 years. The construction phase will call for 100 - 150 people and will last 12 months with a further 2 month period required for commissioning. The development represents a modest but important contribution to local employment, and is in accordance with the Dublin County Draft Development Plan of 1991 which states as its employment objective: "It is the concern of the council that a range of job opportunities be available throughout the county and in areas of high unemployment, particularly the western towns."

Based on the office of Public Works sites and monuments records for County Dublin, there are no known sites or features of archaeological interest within the new site to be developed.

The development and landscape proposals are of a standard consistent with its surroundings and will include extensive screening by the use of planted raised earthen berms. Existing boundary hedges will be retained and augmented by further planting.

3.0 THE PROJECT

The proposed new development will comprise the following:

- Administration Building - including offices, changing rooms, canteen, reception area, laboratory and plant rooms.
- Manufacturing and Packaging Building - including change rooms, dispensing, filling and packaging rooms and plant rooms.
- Bulk Manufacturing Building - including change rooms, offices, dispensing, production and plant rooms.
- Warehouse Building - including storage areas, quarantine and sampling areas.

A treatment facility for neutralisation of process plant effluent will be located externally to the east of the Manufacturing and Packaging Building.

The facility will be fire protected with a Sprinkler System. A Sprinkler Water Storage Tank and associated Pump House will be located on the eastern side of the site.

It is estimated that the construction phase of the project will last 12 months from July 1998 to July 1999. Production is intended to commence in October 1999.

3.0 THE PROJECT

3.2 Company Background

The history of the Rotta Research Group is somewhat complex and goes back to 1961 when Rotta Research Laboratorium, a pharmaceutical research, manufacturing and marketing company was established at Monza, Italy. In 1962, Rorer (USA) took a 50% share in the company. Rorer took over and managed the manufacturing and marketing side of the company, as part of Rorer Italia, while the R&D side of the company was run separately and independently under the name Rotta Research Laboratorium SpA.

During the 1960's and 1970's, Rotta Research Laboratorium SpA researched and developed new drugs, which it licensed out for sale around the world to companies including Rorer and Merck (USA).

In 1979, Rotta Research Laboratorium SpA purchased two manufacturing and marketing companies outside Italy: Delta (Portugal) and Opfermann (Germany).

In 1986, Rotta Research Laboratorium SpA bought back it's manufacturing and marketing activities from Rorer and regained the rights to the drugs it had developed and licensed out.

In 1987, it created a new company, Rottapharm Srl, to manufacture and market it's products in Italy.

In 1989, Rotta acquired a Spanish company, Laboratorios Gamir, which is now called Rottapharm SA.

In 1991, Rotta set up a subsidiary in France, Rottapharm Sarl.

In 1993, Rotta acquired the Spanish drug company Fides, which is now called Fides-Rottapharm.

In 1995, Rotta announced the signing of an important licensing-out agreement with Pfizer (USA).

Due to increased demand for finished forms of Rotta's main products, it is proposed to construct a new finishing plant at Mulhuddart, Dublin 15. This plant will be called Rottapharm Ltd. and will supply finished products to Rotta's world-wide markets.

The Rotta Group employs over 700 people world-wide in R&D, Manufacturing and Marketing roles. The proposed new Dublin facility will employ approximately 70 people initially on a single shift basis with plans to double this within five years.

3.0 THE PROJECT

3.3 Site Selection

The site selected for this development is a 20 acre site on industrially zoned land at Damastown, Mulhuddart, Dublin 15. The site incorporates a section of the Pinkeen River which runs in a north/south direction to where it joins the Tolka River. The site was chosen on the basis of it's infrastructural facilities, i.e. roads, sewer, etc. and the company's preference for a Dublin location.

3.0 THE PROJECT

3.4 Company Environmental Policy

ROTTAPHARM LIMITED
West Block
IFSC
Dublin 1
Ireland

Telephone: 67 00 127
Fax: 82 90 397
International Code: +353-1

Policy Statement on Environmental Protection

Rottapharm limited, a pharmaceutical manufacturer and marketing company, will adopt the following policy on environmental protection.

1. It will carry out its operations in such a way to minimize any adverse impact on the environment.

2. It will comply with all statutory legislation related to the environment, and appropriate codes of practice.

3. It will continually seek to reduce environmental impact through prevention, elimination and minimisation, where practical.

4. It will ensure that all staff shall be aware of their environment and shall implement the policy.

5. It will review annually its policy, and communicate any change to all its staff.

The responsibility for this policy implementation shall be with the General Manager

On behalf of General Manager of
ROTTAPHARM Limited

Dr. Luca Rovati

4.0 THE PROPOSED FACILITY

4.1 Layout of Plant

The new plant will be located on a 20 acre site at Damastown, Mulhuddart, Co. Dublin and will comprise of the following:-

4.1.1 Administration Building

- This building shall be located on the western side of the river and shall cater for Administration and Personnel facilities for the site including Reception Areas, Changerooms, Offices, Canteen Facilities, Toilets and Showers, Corridors and Plant Rooms. The main plant Laboratory will also be located in this building with adequate space provided for central Q.C./Q.A. activities.

- The floor area of the building will be utilised as follows:-

Ground Floor:	-	Reception, Offices Changerooms, Corridors etc.	492m^2
	-	Laboratory	344 m^2
			836 m^2
First Floor	-	Offices, etc.	782 m^2
	-	Plant Rooms	32 m^2
			814 m^2

- The building height will be 8.1m with first floor level at 3.5m.

4.1.2 Secondary Manufacturing and Packaging Building

- This building will be located on the eastern side of the river and shall cater for all Secondary Manufacturing, Filling and Packaging operations. A range of products are to be manufactured and packaged in this area including Glucosamine granules in sachets and capsules, Bromelain tablets and other products. In general, separate areas will be provided for Glucosamine and Bromelain production with each area having separate secondary Changerooms and In-Process Laboratories.

- The floor area of the building will be utilised as follows:-

Ground Floor:	-	Production	870 m^2
	-	Filling	225 m^2
	-	Packaging	405 m^2
	-	Corridors, etc.	373 m^2
			1873 m^2
First Floor:	-	Plant Rooms	732 m^2
	-	Corridors	213 m^2
			945m^2

- The building height will be 10.5m with first floor level at 5m.

4.0 THE PROPOSED FACILITY (Cont'd)

4.1.3 Bulk Manufacturing Building

- This building will also be located on the eastern side of the river and will cater for the bulk preparation of the Glucosamine Active Ingredient which will involve a simple bulk manufacturing step. The active ingredient will be collected in IBC's to be used in further processing steps in the Glucosamine Manufacturing Area.

  The Bulk Manufacturing Building will have it's own separate air handling units located in a plant room on the first floor and will share other utilities with the Secondary Manufacturing Area.

  The Bulk Manufacturing Building will have it's own dedicated secondary Changerooms and In-Process Laboratory.

- The floor area of the building will be utilised as follows:-

Ground Floor	-	Production	96m^2
	-	Offices	228m^2
			324m^2
First Floor	-	Plant Room	144m^2
	-	Stability Room	198m^2
			198m^2

- The building height will be 10.5m with first floor level at 5m.

4.1.4 Warehouse Building

- The Warehouse Building will also be located on the eastern side of the river and will be used for storing raw materials, finished products, packaging materials, etc. Separate Goods Inwards and Goods Outwards doors will be provided for segregation of materials. A Sampling Booth and Raw Material Quarantine Area will be provided at the Goods Inwards Area. The Warehouse will be designed to accommodate 3700 Europallets with the Pallet Racking Layout to allow for narrow aisle forktruck access. A dedicated Alcohol Storage Room will be provided for excise control.

  The Warehouse Building floor area will be 2520m^2 of which 1728m^2 will be used for the Pallet Racking. The remainder will be used for access corridors, excise storage rooms, sampling and quarantine areas, dynamic warehouse, etc.

  The building height will be 14.5m with a clear height below beams in the Warehouse of 12m.

4.0 THE PROPOSED FACILITY (Cont'd)

4.1.5 Access Corridors

The configuration of the 4 buildings will provide for logical movements of materials and personnel with unidirectional flow to be achieved where practical. Adequate corridor areas will be provided so that materials and personnel can move with adequate weather protection.

The Administration Building located on the western side of the river will be connected to the other buildings located on the eastern side by a link corridor and bridge.

4.0 THE PROPOSED FACILITY (Cont'd)

4.2 Processing Equipment

The manufacturing technology involved in the proposed plant is that of bulk preparation, formulation and finishing. The operations involved in production are:

- Dispensing
- Bulk Preparation
- Granulation
- Blending
- Sachet Filling
- Capsule Filling
- Capsule Bottling
- Tablet Compression
- Tablet Coating
- Blister Filling
- Packaging
- Other Operations

Process schematics are included in Appendix 2.

4.2.1 Dispensing

In the Bulk Manufacturing Area, Glucosamine Solid Active Materials are transferred from 25kg drums to FIBC's which will be used for further processing or for off-site sale. For further processing the contents of the FIBC are vacuum transferred to a vacuum drier along with quantities of other materials and are milled in-line. This dispensing operation will be carried out under clean conditions to minimise dust generation and operator exposure.

4.0 THE PROPOSED FACILITY (Cont'd)

In the Secondary Manufacturing Area solid raw materials are dispensed to Intermediate Bulk Containers from bags, drums and FIBC's. The materials are weighed and dispensed via a security sieve to the IBC. All dispensing operations will be carried out under clean conditions to minimise dust generation and operator exposure.

4.2.2 Bulk Preparation

The preparation of the Glucosamine Active Ingredient will require a simple bulk manufacturing step which will include charging by vacuum to a Double Cone Vacuum Drier via an in-line mill, mixing and wetting with purified water, vacuum drying, blending, cooling and discharging. The Drier will discharge to IBC's and to kegs.

4.2.3 Granulation

Certain products will require wet granulation to achieve the consistency required for tablet manufacture. This will be effected by a Fluid Bed Type Granulator System with a removable bowl. The Granulator System will be provided with all ancillary requirements including heated air handling, exhaust filtration, lifting and tilting device for bowl emptying, vessels for preparation of binder solutions, etc. Granulated product is collected in an IBC for further processing.

4.2.4 Blending

To achieve the required product uniformity blending is required. Blending will take place within dedicated Blending Rooms on Twin Plinth IBC Blenders with no exposure of products. Separate IBC Blenders will be provided for both the Glucosamine and Bromelain Area. Blending will be carried out for various time periods depending on the product in question.

4.2.5 Sachet Filling

An IBC containing the blended Glucosamine product will be transported to dedicated rooms where it will be lifted by an IBC Pillar Lifter unit and positioned on an IBC Discharge Station which shall feed to two Sachet Filling machines through charge chutes. The flow of product to the machines will be based on level in the product hoppers of the receiving machines. The machines comprise a powder dosing system and systems to seal, print, cut and checkweigh the sachets.

4.0 THE PROPOSED FACILITY (Cont'd)

4.2.6 Capsule Filling

Separate rooms will be provided for filling of capsules which will be carried out on dedicated machines for Glucosamine products and certain other products. An IBC of blended product will be lifted by a stacker truck and positioned on an IBC Discharge Station which shall feed a Capsule Filler via a charge chute. The flow of product to the Capsule Filler will be based on level in the product hopper of the Filler. Filled capsules will be collected in drums and moved to a holding area pending Q.C. release for packaging.

4.2.7 Capsule Bottling

Filled capsules will be manually charged to a Capsule Bottling machine where bottles of various sizes will be filled with known quantities of capsules and then capped.

4.2.8 Tablet Compression

Separate rooms will be provided for tablet compression which will be carried out in dedicated machines for Bromelain Products and certain other products. An IBC of blended product will be lifted by a stacker truck and positioned on a discharge station which will feed a Tablet Press via a charge chute. The flow of product to the Tablet Press will be based on level in the product hopper of the Press. Tablets will be dedusted, checkweighed, collected in drums and moved to a holding area pending Q.C. release for either coating or direct packaging.

4.2.9 Tablet Coating

The coating process will be carried out in two stages in stainless steel coating pans within a coating suite. The application of coating solutions will double the weight of the tablet cores. The coating process involves the application of Enteric Coating with a solvent solution of Shellac material followed by sub-coating and finishing with sugar-solution. The final stage of coating will be polishing with a wax solution. Coated tablets are collected in drums and held for in-process Q.C. pending release for blistering.

4.2.10 Blister Filling

Tablets and capsules are transported to dedicated Blister Filling Rooms where they are fed to the receiving hopper of a fully automated Blister Filling Machine. The machine comprises feed plates, form, fill and seal plates, cutting plates and various safety and product checking devices.

4.0 THE PROPOSED FACILITY (Cont'd)

4.2.11 Packaging

The finished products are packaged for shipment as required. Sachets and blisters are counted, cartoned, checkweighed and automatically packed into shipping cases. Capsule bottles are labelled automatically and loaded to cartons. All packaging operations will take place in separate rooms from the filling operations with machines linked by through wall conveyors.

4.2.12 Other Operations

Cleaning operations are responsible for most of the effluent from the plant. IBC's are thoroughly cleaned internally on an automatic IBC Washing Station. Hot and cold water rinses followed by final USP Purified Water rinse and drying with hot filtered air will be used. External surfaces of the IBC's will be manually cleaned. Cleaning facilities will be provided in each section of the production area for other equipment. A USP Purified Water recirculation loop is provided fed from a storage and distribution system located in a dedicated room on the first floor of the Secondary Manufacturing Building.

Maintenance and workshop facilities and equipment storage facilities will also be provided within the building.

Plant Rooms will be located on the first floors of the Secondary Manufacturing Area and Bulk Preparation Area and will include Air Handling Systems, Boilers, Compressors, MCC Room etc. A Chiller Compound will be located outside the buildings.

4.0 THE PROPOSED FACILITY (Cont'd)

4.3 Raw Materials & Products

4.3.1 The Products

The products to be manufactured at the Rottapharm facility are as follows:-

Product	Trade Name	Use
Glucosamine	Sachets: Dona, Xicil, GSC, Viartril S Capsules: Dona, Viartril S	An anti-rheumatic produced in sachet and capsule form
Bromelain	Ananase & Extranase	A vegetable based anti-inflammatory enzyme product produced in coated tablet form
Monofluourophosphate/ Calcium	Tridin	An anti-osteoporotic produced in uncoated tablet form.
Pro-Glutemacin	Afloxan	An anti-inflammatory produced in capsule form.
Glucuronic Acid	Jetepar	A hepatic protector produced in capsule form.
Cyclidrol	Mucoflux	A mucolytic agent produced in capsule form.

4.0 THE PROPOSED FACILITY (Cont'd)

The Glucosamine Area will be designed to annually produce:

- 150 Million Sachets
- 75 Million Capsules

with the flexibility to produce as an alternative:

- 80 Million Sachets
- 75 Million Capsules
- 70 Million Coated Tablets
- 100 Million Uncoated Tablets

The Bromelain Area will be designed to annually produce:

- 124 Million Coated Tablets

The Filling and Packaging Areas will be designed to produce annually:

- Fill 80 Million of 150 Million Sachets.
- Blister Pack 100 Million Uncoated Tablets.
- Bottle Fill 61.5 Million Capsules
- Blister Pack 13.5 Million Capsules
- Blister Pack 124 Million Coated Tablets
- Blister Pack 70 Million Coated Tablets

The Bulk Manufacturing Area will be designed to produce 460 tonnes of Bulk Active annually.

4.0 THE PROPOSED FACILITY (Cont'd)

4.3.2 Raw Materials

Raw Materials	Storage Container
Glucosamine Hydrochloride	25kg Keg
Anhydrous Sodium Sulphate	25kg Keg
Sorbitol Granules M.G.	25kg Bags & 1000 kg FIBC's
Citric Acid Powder	25kg Bag
Poliwax 4000	25kg Bag
Aspartame	25kg keg
Corn Starch	50kg Bag
Magnesium Stearate	15kg Bag
Talc.	25kg Bag
Mannitol M.G.	50kg Keg
Glutamine MFF	25 kg Keg
Orange Flavour	Carton
CA Gluc. Gran.	50kg Keg
Tricalcium Citrate	25kg Bag
Cab-O-Sil	20kg Bag
Stearic Acid	15kg Bag
Calcium Phos. Dibasic	23kg Bag
Di-Tab	25kg Bag
Lactose 80 Mesh	25kg Bag
Bromelain	25kg Keg
Shellac	Carton
Ethyl Alcohol	49.6 lt. Drum
Calcium Phosphate	23kg Bag
Jelly Solution	Drum
Sodium Hydroxide Soln. (1%)	Drum
Opalux 3084	Carton
Bee Wax	Carton
A-Tab	25kg Bag
Acetone	25lt. Drum
Ethyl Alcohol B	49.6lt. Drum
Acetate Cellulose	50kg Keg
Diethylphthalate	25kg Keg
Gum Arabic	25kg Keg
Titanium Dioxide	25kg Bag
Tween 60	25kg Keg
Beta-Carotene TP10%	Carton
Sodium Monofluoride	25kg Bag
Lactic Gum	25kg Bag
Nicotinamide	Carton
Polysorbate 60	Carton

4.0 THE PROPOSED FACILITY (Cont'd)

4.4 Material Storage and Handling

Raw materials will be delivered to the Goods Inwards Area of the Warehouse. These will be contained in cartons, bags, kegs, drums and FIBC's. A Quarantine Area with a Sampling Booth will be provided into which all incoming raw materials will first be placed until approved. They will then be moved to an approved raw material area and then to a staging area. The Warehouse is designed to separate raw materials from finished products with separate entrances for each. No raw materials or products will be stored externally. A pallet changing area will be provided in the warehouse where materials can be transferred to clean pallets for use in production.

The Glucosamine Active Ingredient (approx. 300 Tonnes/yr.), will be delivered to site in 25kg kegs. To ease material handling, a dedicated room will be provided for the transfer of the material to 500kg FIBC's for easier storage and downstream handling. The Glucosamine Active will be vacuum transferred with another ingredient to the Vacuum Drier under clean conditions. Dried material will be discharged from the Drier into either 25kg kegs for off-site sale or to 1500 lt. IBC's for further processing.

In general, in-production materials will be dispensed to IBC's in LAF booths via security sieves until the materials are discharged to filling and packaging machines. All IBC lifting will be by stacker truck except when lifting over the sachet fillers where a fixed pillar lifter device will be used.

All transfer steps where there is the possibility of dust generation will be protected by proprietary dust caps or other charging/discharging arrangements.

4.5 Landscape

The existing site consists at present of farmland slopes towards the South of the site. The overgrown hedgerows on the site will be removed as part of the development The site will be landscaped and extensive planting will be carried out, featuring native species. Particular emphasis will be placed on the Pinkeen River which shall be a focal point for the site. The river will be landscaped, with it's banks formed into terraces, whilst maintaining the existing channel. The terraces will provide a more diverse ecological environment in which to plant native marginal planting associated with water. A lawn-type sward will be utilised on grassed areas of the site.

Raised earthen berms of 2m height will be maintained on the site boundaries as screening from the service road to the south. These mounds will also be planted with native and semi-native deciduous and evergreen species.

The car park located on the west side of the site will have planting beds between the rows to accommodate ornamental groundcover and tree planting.

5.0 EMISSIONS TO THE ENVIRONMENT

5.1 Effluent

The effluent discharge philosophy is as follows:

Process drainage, which will result from bin washing and other cleaning operations, will be discharged to sewer, receiving eventual treatment at the Ringsend Sewage Treatment Plant. Treatment on-site at Rottapharm Ltd. will involve neutralisation and settling facilities, prior to release to sewer. Surface water will be discharged to the River Pinkeen, via an oil interceptor.

5.1.1 Process Effluent

The proposed facility is expected to produce effluent having the following characteristics:

pH	6-10
BOD	1,000 - 2,000 mg/lt.
COD	2,000 - 4,000 mg/lt.
Suspended Solids	100 - 200 mg/lt.

The normal flowrate expected is 25m^3/day with a maximum of 50m^3/day.

Effluent from the proposed plant would be discharged separately to the Council sewer, via a neutralisation/settling facility. The source of the effluent will be cleaning operations in the plant, principally the IBC Bin Washing System. Contaminants in the effluent will be solid and will thus settle readily in the treatment facility. Continuous pH monitoring and correction will be used to maintain a pH range of 6-10.

As the normal discharge of effluent will be neutral, the philosphophy for controlling discharge will be:

- A pH measuring device will be installed in the discharge pipeline.
- In normal operation, when pH is neutral, discharge will be direct to the sewer.
- In exceptional circumstances, when pH is measured outside the discharge limits of 6 - 10, a valve will automatically close and the effluent flow will be diverted to a 25m^3 holding tank.
- The volume of effluent which is outside specification will be automatically neutralised with authorisation by a technical supervisor.
- When the main flow has returned to within the specification limits, the direct discharge will resume automatically.

The holding tank will be lined reinforced concrete and adequate manholes and valve chambers will be provided for access.

5.0 EMISSIONS TO THE ENVIRONMENT (Cont'd)

5.1.2 Domestic Effluent

The domestic effluent due to the toilet and canteen facilities for the 70 staff will be discharged directly to the foul sewer.

5.1.3 Surface Water Run-Off

Uncontaminated rainwater will be discharged to the Pinkeen River, via an oil interceptor. This will guard against any leakage from motor vehicles using the site.

5.2 Atmospheric Emissions

As the proposed development comprises mainly dry processing of solids, dust generation is the main potential atmospheric contaminant. For this reason, sophisticated measures to prevent dust generation and contain any dust generated, are employed. The production areas will be equipped with specific and general ventilation systems to ensure removal of any dust. Specific ventilation will be passed through reverse jet type dust collectors, with backup HEPA filters. The general ventilation extract units will also be fitted with filters. The emissions will meet BATNEEC emission standards of 0.15mg/m^3 concentration of pharmaceutical dust expressed as the active ingredient, and 1.0mg/m^3 of total dust.

The plant boilers will be run on natural gas, and will meet all relevant BATNEEC emission standards.

Rottapharm's current Coating Process utilises the organic solvents Ethyl Alcohol and Acetone during the Enteric coating stage for Bromelain tablets. Rottapharm's R&D section are actively pursuing a coating process which will not require the use of solvents and hope to have such an aqueous based process developed by the end of 1998.

The coating of Ananase tablets requires 16.9kg Ethyl Alcohol per 326kg batch. The annual requirement for Ananase is 38 million 200mg tablets which is equivalent to 24 batches per year. Therefore, the total usage of Ethyl Alcohol for Ananase will be 406kg/yr.

The coating of Extranase tablets requires 27.8kg Ethyl Alcohol and 17kg Acetone per 200kg batch. The annual requirement for Extranase is 86.4 million 100mg tablets which is equivalent to 43 batches per year. Therefore the total usage of Ethyl Alcohol and Acetone for Extranase will be 1195kg/yr. and 734kg/yr. respectively.

Rottapharm have carried out tests at their existing Italian facility on levels of solvent emissions from Coating Operations. A range of flowrates from 1.5kg/hr to 4.9kg/hr of solvent were recorded.

Both Ethyl Alcohol and Acetone are Class III solvents according to T.A. Luft 1986 for Organic Compounds with concentration limit values for waste gas discharges of 150mg/m^3 and quantity limit values of 3.0kg/hr.

5.0 EMISSIONS TO THE ENVIRONMENT (Cont'd)

A suitable technology (i.e. low temperature condensation, carbon adsorption) will be utilised to ensure that emissions to air will meet the above emission limits. The Solvents will be recovered and collected for either re-use on-site for further use off-site.

5.3 Noise

Background Noise

The noise level in the area is dominated by traffic noise associated with the N3 dual carriageway. This road is used at high speed by traffic travelling to and from Navan and the North West of the country. Background noise is also present due to the three existing industrial facilities. Background noise levels have been measured at:

La_{eq} = 54.2 dB (A) Daytime

La_{eq} = 48.6 dB (A) Nightime

Site Noise

The noise sources in the new development will mostly be contained within the production buildings and thus will be of little significance from the point of view of environmental noise. The facility will be designed to ensure that noise levels due to the proposed development will meet limits of 50 dB (A) between 07.00 and 22.00 hours and 45 dB (A) at other times, at off-site locations. The principle sources of noise would be:

- Production Equipment, e.g. granulators, blenders, packaging machines. These are all located internally in the production building.
- Ventilation air handling units will be located on the first floor of the building and will be equipped with soundproof enclosures designed to ensure that they will have no significant effect on off-site noise levels.
- Compressors, boilers, etc. These will also be located in a plant room on the first floor of the building and will thus have little impact on off-site noise levels. They will also be equipped with appropriate noise control measures to maintain a sound level which will have no significant impact on off-site noise levels.
- Chiller compound will be located outside the main production buildings but the compound will be equipped with appropriate noise control measures.
- Forklift and vehicular movements. The entrance to the warehouse is to the south of the building and forklift and vehicular movements will not have any significant effect on noise levels in residential areas. Most forklift movements will take place within the building.

5.0 EMISSIONS TO THE ENVIRONMENT (Cont'd)

5.4 General Wastes

The principle wastes generated will be packaging materials and other general wastes. These will be stored in skips pending collection by a licensed contractor for landfill at the Fingal County Council tiphead at Balleally near Lusk. Packaging which has been contaminated by raw materials will be collected and disposed of separately. This will be performed by a fully licensed waste contractor and full documentation will be maintained.

Laboratory wastes including small quantities of solvents will be stored in a controlled manner and disposed of in a fully documented manner by licensed undertakers.

5.5 Clean Technology

The design of the plant takes into account opportunities for use of clean technologies and waste minimisation techniques to minimise any generation of waste.

- Dust in the most significant source which has the potential to create waste. This avoidance of dust generation at source is given prime consideration. Dispensing of loose raw materials is confined to Laminar Air Flow Booths, which minimise dust entertainment in the air. Material transfer to and from I.B.C.'s involves the use of proprietary dust caps to contain any dust within the process container. The fact that blending does not take place in fixed blenders, but retains the product within the I.B.C., also eliminates two material transfer steps which would have the potential to generate waste.
- Solvents used in the tablet coating process also have a significant potential to create waste. Rottapharm's intention is to eliminate this waste at source by substitution of the solvents with aqueous based coating solutions.
- Strict quality control procedures including approval of raw materials will be maintained. This will reduce the likelihood of off-specification product.
- PLC Control Systems on the processing equipment will also reduce the likelihood of off-specification product.
- Inventory control will be used to prevent over-ordering of raw materials. Also finished products will only be packaged to order, reducing waste of packaging materials.
- Opportunities for recycling of pallets, cardboard, paper etc., will be examined and implemented as appropriate.
- All material storage is internal and material transfer is within enclosed areas. This prevents the possibility of wind or rain damaging materials.
- The bin washing system which will be the primary liquid effluent source, will be semi-automated, which will minimise effluent generation.
- Programmed preventative maintenance will also be used which will minimise any loss which could arise due to equipment failure.

6.0 THE RECEIVING ENVIRONMENT

6.1 Land Use

The Rottapharm plant is to be sited in the townland of Damastown, Co. Dublin on fully serviced lands zoned for industrial use. This zoning objective was incorporated in the 1983 Dublin County Council Development Plan and has been reiterated in the 1991 Draft Plan. The general location of the site is close to the Meath-Dublin county boundary line, 0.3 kilometres north of the N3 Dual Carriageway and approximately halfway between Mulhuddart and Clonee. It lies within the valley of the Tolka River and is close to the centre of the area zoned for industrial and related uses. The current site occupies 20 acres of the designated 150 acre industrial zone.

Immediately to the West of the Rottapharm site, the lands are occupied by the Yamanouchi Ireland Company Ltd. Pharmaceutical Plant. IBM have established a plant to the North of the site and Helsinn Chemicals and Helsinn Pharmaceuticals have sites to the south west. Loctite have a site to the east of the Rottapharm site.

Beyond the designated industrial area, unzoned lands, for agriculture use, lie to the north and west. Future residential development is planned for the area adjacent to the East side of the industrial zone, at a distance of over 500 metres from the proposed plant.

The site incorporates a section of the Pinkeen River which runs in a north/south direction to where it feeds into the Tolka Rover south of the site. The Tolka River meanders gently in an easterly direction.

The site is approached from the N3 Dual Carriageway via a distributor road built by the Council in 1986/1987 to service the designated industrial zone. The nearest existing residential property is "Ashleigh House" which is situated approximately 500 metres to the south west of the site. This property is owned by Fingal County Council and is currently used as a residential drug treatment centre. This property is within the designated industrial zone. The closest significant residential area (existing or planned future) would be approximately 700 metres due south on the south side of the Navan Road.

6.2 Flora and Fauna

The site consists of sloping grassed field with the Pinkeen River running through it in a north/south direction. Hedgerows, consisting primarily of hawthorn and elder, overgrown with bramble and dog rose bushes are evident on the site. Such hedgerows are typical of the area and are unexceptional. This hedgerow will be removed as part of the development.

There are no "Areas of Scientific Interest" listed for the area. The closest, some 5km to the south is Luttrellstown Woods which are classed on a scale of importance as being of "Local" botanical interest.

6.0 THE RECEIVING ENVIRONMENT

6.3 Pinkeen and Tolka Rivers

Water quality in the Pinkeen and Tolka Rivers downstream of Mulhuddart was examined in 1987 and 1990 both chemically and biologically. It was found to be highly eutrophic (nutrient rich). This was attributed to run-off from agricultural land upstream. Water quality based on the An Foras Forbartha rating system was Q3 - Q2 (Doubtful to Poor).

The river was examined again in 1992 and 1993 and met the requirements for an A2 category river as defined in S.I. No. 294 of 1989 (European Communities (Quality of surface water intended for the abstraction of drinking water) Regulations 1989).

A summary of ranges obtained was:

Colour	20 - 40° Hazen
Turbity	1.5 - 6.6 ppm
Temperature	2.6 - 15°C
pH	7.5 - 8.5
BOD	0 - 2.7 mg/lt.
% D.O.	70 - 150
Faecal Coliform	100 - 7000/100ml.
Total Organic Nitrogen	1.2 - 3.6 mg/lt.

A category A2 surface water is defined (for the purposes of treatment for transforming surface water into drinking water) as:

"Normal physical treatment, chemical treatment and disinfection e.g. prechlorination, coagulation, flocculation, decantation, filtration, disinfection."

6.4 Groundwater and Soil

Seven cable tool boreholes were drilled on the site of the proposed development by Irish Geotechnical Services Ltd. A Groundwater and Soil Quality investigation was carried out and this report is included in Appendix 3. The boreholes were monitored for groundwater ingress potential, landfill gas ingress and tests were carried out on the recovered soil samples.

Four samples of the made ground were chemically analysed to determine sulphate content and pH. Results show low concentrations of sulphates (Class 1) and a near neutral pH. It was concluded that no special precautions are necessary to protect good quality foundation concrete. The samples also had their liquid and plastic limits assessed as well as analysis of their particle size distributions by wet sieving.

Groundwater was encountered in a number of the boreholes and water ingress was monitored over a certain period of time. Details of water ingress are shown on the borehole recordings.

6.0 THE RECEIVING ENVIRONMENT

The boreholes were also monitored for potential landfill gas build-up. Gas readings taken have shown no Methane to be present and a maximum level of 0.30% carbon dioxide across the site. Oxygen levels of approximately 20% were recorded in the boreholes monitored. It was concluded that no gas preventative measures will be required in the construction of the development.

6.5 Air Quality & Climate

Air quality in the vicinity of the site is regarded as good. The County Council has monitored air quality on an on-going basis. These samples were analysed by Gas Chromatography/Mass Spectroscopy which would detect concentration in parts per billion. No more than trace (i.e. less than 10$\mu g/m^3$) amounts of any compound were measured.

Meteorological data is also presented in Appendix 4. This indicates that the North Dublin area experiences predominantly south-westerly winds of speed 4-16 knots and a relatively low annual rainfall (750mm).

6.6 Noise

There are several noise sources in the area, namely the four existing plants : Helsinn Chemicals, Helsinn Birex Pharmaceuticals, Yamanouchi, Mallinckrodt Medical, as well as traffic noise from the N3 dual carriageway which is the dominant noise source in the area due to the speed and volume of its traffic. The nearest residence, Ashleigh House is located directly adjacent to the N3 and thus the development will have little impact on noise levels at this location.

Noise monitoring has been carried out in the area and this gives a good indication of baseline noise levels. The results obtained were mean equivalent continuous noise levels. The results obtained were mean equivalent continuous noise levels of:

Daytime	54.2 dB(A)
Nightime	48.6 dB(A)

Results of this monitoring are included in Appendix 5.

6.7 Socio Economic Factors

The subject site is located at Damastown in County Dublin, approximately 0.75km East of the border between County Meath and County Dublin. Approximate distances to urban centres include Dublin City Centre, 13km to the South East; Lucan population 12,259, 7km to the South; Leixlip, population 11,938, 7.5km to the South West; Maynooth, population 4,768, 12km West of the site; Navan, population 3,660, 32km North West of the site and Dunboyne, population 1,989, 4km to the West.

6.0 THE RECEIVING ENVIRONMENT

The proposed development site is situated immediately off the Dublin-Navan Road (N3). This road has been upgraded to dual carriageway in accordance with National Roads improvement proposals. Additionally, the M50 motorway by-pass of Dublin is accessible at Blanchardstown approximately 5.5km from the proposed site. The motorway by pass will also form a part of the intended Euroroute E01 extending between the ports of Larne and Rosslare. Dublin International Airport is approximately 12km East North East of the subject site. The nearest mainline railway station is at Clonsilla, approximately 3km South of the subject site. This station forms part of the Iarnrod Eireann suburban network. Journey time to Clonsilla from Connolly Station in Central Dublin is about half an hour.

The site lies entirely within the County Dublin District Electoral Division (DED) of Blanchardstown-Tyrrelstown, which along with the adjoining DED of Blanchardstown-Blakestown, may be considered the primary hinterland of the site. The secondary hinterland includes parts of County Meath and County Kildare approximating largely to Dunshaughlin Rural District in Meath and Celbridge No.1 Rural District in Kildare. The modal breakdown of people travelling to work in Meath and Kildare according to 1986 Census data shows that in the case of both counties, at least 60% of the travelling workforce did so by car. In contrast, less than 10% travelled by public transport. The relatively high mobility of the private car means that the subject site would be accessible to a large percentage of the population of Dunshaughlin Rural District and Celbridge No. 1 Rural District and thus these areas provide a suitable secondary hinterland.

The subject site is located in an area which experienced population growth at a rate well above the average for the State as a whole. This rate of growth, although still high, is much less than for the period of the 1970's and is expected to moderate further. It seems likely that the recommended population capacity to 2001 of 15,000 persons for the combined towns of Maynooth, Leixlip and Celbridge, which was provided for by the revised ERDO Eastern Region Development Strategy 2001, represents the highest level of likely growth in the area. (It should be noted that the ERDO strategy was not adopted by the Government or the Local Planning Authorities and therefore has no statutory effect). As a result of this high level of immigration, the population age profile reveals a youthful population for the primary and secondary hinterlands.

Preliminary results from the 1991 Census of Population indicate a slowing down in the rate of growth in the Greater Dublin Area over the past five years. During this period, the population of Dublin-Belgard grew by 4.6%, while the rate of increase for Dublin-Fingal was 10.3%. The population of Co. Kildare grew by 5.4%, but the increase recorded by Co. Meath was just 1.6% during this period.

6.0 THE RECEIVING ENVIRONMENT

6.7 Socio Economic Factors (Continued)

Despite the national drop in total number of persons at work between 1981 and 1986, the site hinterlands witnessed an increase in the size of the workforce, reflecting the high rate of development and population growth in the area. Nevertheless the site hinterlands experienced a sharp rise in the unemployment rate which although lower than the national rate of unemployment, constituted a greater rise in absolute terms. Since 1986, unemployment has been declining slightly. However, the levels still remain high and the combined effect of an increased labour supply due to the young nature of the population plus emigrants returning home from abroad, means that the employment situation faces increasing pressure. The sectoral composition of employment reflects the subject sites proximity to Dublin City with a greater proportion of the workforce employed in services and fewer employed in agriculture.

SECTORAL COMPOSITION OF EMPLOYMENT 1986

	Agriculture	Industry	Services
State	15.0%	29.0%	56.0%
Dublin Region*	0.8%	25.5%	73.3%
Celbridge No. 1 R.D.	6.0%	28.0%	66.0%
Meath County	19.2%	34.5%	46.3%

(Source : Census of Population)

* from Greater Dublin Area Development Programme, Final Report

6.8 History and Archaeology

6.8.1 Blanchardstown

The subject site is located approximately 4km from the village of Blanchardstown. As a settlement, the growth of Blanchardstown can be defined by two distinct stages separated by quite a lengthy period. Along with the neighbouring settlement of Lucan, Clondalkin and Tallaght, Blanchardstown's origins lie in the Anglo-Norman period from the 12th to the 15th Century. During this period Blanchardstown relates to the increase in the size and influence of the Dublin Region within Ireland during the 20th Century. As a result of this phenomenon settlements like Blanchardstown, Lucan, Clondalkin and Tallaght have assumed new town or satellite town roles at the fringe of the Dublin Metropolitan Region.

6.0 THE RECEIVING ENVIRONMENT

Approximately 2.5km to the East of Blanchardstown is situated the List 3 structure of Dunsink Observatory. (List 3 structures include State Buildings which the Planning Authority desires to have preserved). The listed structure includes the South Dome and Observatory House. Between 1782 and 1921 the Observatory belonged to Trinity College Dublin. Since 1947 it has been used by the School of Astronomical Physics of the Dublin Institute for Advanced Studies. The Observatory is located on a hill described as "commanding a delightful prospect". The buildings themselves convey a warm solid yet unobtrusive 18th Century feel. Sir William Rowan Hamilton (1805-1865) who was the author of the acclaimed "Lectures on Quaternions" in 1835 was connected with Dunsink Observatory.

About 1km North East of Mulhuddart Bridge (which is located approximately 2km to the North West of Blanchardstown Village) can be found fragments of the 14th Century nave and chancel as well as the 15th Century tower of the parish church of the Blessed Virgin Mary. The church and graveyard are located on a hill which provides a pleasant view over and beyond the rich lowlands towards the distant mountains in the South. Richard Belling, Secretary to the Supreme Council of the Catholic Confederation of Kilkenny who it is suggested may have been the author of "Vindiciae Catholicorum Hiberniae" is buried in the graveyard. Nearby to the South of the Church and graveyard is Lady Well which is a List 2 structure as well as the Church. In former times the well was a place of popular pilgrimages. Clonsilla Protestant Church 3.5km West of Blanchardstown, contains the Evie Hone window (St. Fiacre 1937).

6.8.2 Local Demesnes

There are a number of splendid demesnes in the hinterland of the subject site. These include the riverside Lucan demesne, the Carton demesne at Maynooth and Luttrellstown Woods about 3km North of Lucan. Lucan house which stands in the grounds of Lucan demesne is a Palladian design which was built by Agmondisham Vesey, The Second in 1772 to replace the 16th Century Sarsfield Castle, whose ruins still stand. In the demesne is located a memorial to Patrick Sarsfield in the form of a garden ornament.

Carton demesne is a 1,000 acre area of land at the eastern end of Maynooth main street. Within the demesne an artificial lake is fed by the Rye Water. In the late 17th Century the grounds and parklands surrounding Carton House were laid out in an open natural fashion. A shell cottage was built by the side of the artificial lake and hundreds of trees were planted.

6.0 THE RECEIVING ENVIRONMENT

The woods at Luttrellstown border the River Liffey for most of their length. Their importance has merited their designation as an Area of Scientific Interest. The main reasons for the designation are the botanical and ornithological qualities of the area. The woods are described as estate woodlands with diverse bird life and unusual plants. At the western end of the woods is located the Anna Liffey mills, while to the north is situated the List 2 Structure, Luttrellstown House.

6.8.3 Archaeology

The research involved in this section included an inspection of the National Museum of Ireland records regarding archaeological sites and finds in this area and of the records of the Office of Public Works concerning Sites and Monuments in County Dublin. Historical references to any standing monuments in this area were also checked.

6.8.4 Archaeological Assets

A study of the National Museum of Ireland records regarding archaeological sites and finds, revealed that one find of archaeological potential had been made in the townland of Damastown. The archaeological feature concerned is a large stone with the dimensions of approximately 3ft. x 2ft. almost entirely submerged in a field at the Western Boundary of Damastown in the direction of Clonee. Two iron hooks are attached to the stone. Although found in the townland of Damastown, the location of this archaeological feature would not therefore be affected by the proposed development. The National Museum has no records of the recovery of any finds from the townlands of Huntstown, Little Pace or Macetown South.

Based on the Office of Public Works Sites and Monuments records for County Dublin there are no known sites or features of archaeological interest within the area to be developed. The nearest standing Monuments are a well (Lady's Well) and a Church in the townland of Tyrrelstown approximately 2.5km from the development site. Areas of associated settlement related to these monuments would not be endangered by the development. In any case no obvious traces of the existence of such are apparent.

7.0 IMPACT OF THE DEVELOPMENT

7.1 Flora & Fauna

The development will have minimal impact on local flora and fauna. The overgrown hedgerow through the site will be removed, however this hedgerow is typical of the area and unexceptional. Certain boundaries of the site will retain the existing hedgerows, with additional planting on the Southern boundary on a raised earthen berm of height 2m, consistent with that provided at the existing Yamanouchi site. This planting will both offset the effect of the hedgerow removal and give improved screening of the plant from the N3 roadway.

7.2 Water

All plant effluent will be eventually discharged to sewer. Prior to this it will be treated by neutralisation with settlement of suspended solids. Continuous pH monitoring and correction will be used to maintain an outlet pH between 6 and 10. Any contaminants in the effluent will be insoluble and will readily settle out. This effluent treatment will be a carried out on a diverted stream based on in-line pH monitoring in a $25m^3$ neutralization/holding tank. Normal discharge will be direct to the Council sewer. The effluent emitted is due to washing operations and is expected to be approximately $25m^3$/day under normal circumstances with a maximum of $50m^3$/day. This is discharged to sewer which goes to the Ringsend Sewage Treatment Plant. This plant receives approximately $330,000m^3$/day and thus the additional load is negligible.

Surface water will be allowed run-off to the Pinkeen River via an oil interceptor. This will be uncontaminated and of no environmental significance to the aquatic environment.

There will be no discharge to groundwater, as areas where spillage could occur will be fully drained and there is no bulk storage of liquids other than water. For the same reasons, soil quality will not be affected.

7.0 IMPACT OF THE DEVELOPMENT (Cont'd)

7.3 Wastes

Solid wastes associated with the plant will primarily be packaging materials and other general wastes. These will be collected in skips pending collection by a licensed contractor. Packaging which has been contaminated by raw materials or other process materials will be collected and disposed of separately. This will utilise the technique of deep burial. This will be performed by a fully licensed waste undertaker and full documentation will be maintained. General waste will be collected by Ipodec Ltd. and landfilled at the Fingal Co. Council tiphead at Balleally near Lusk. Opportunities for recycling of pallets, packaging materials and paper, etc. will be examined and implemented as appropriate. Small quantities of laboratory organic and aqueous liquid wastes, will be disposed of in a controlled manner to licensed undertakers. Since all wastes are handled in a controlled manner and licensed contractors and waste undertakers are used, the impact of wastes generated will be minimal.

7.4 Air & Climate

All air emission points will be designed to meet BATNEEC and T.A. Luft limits. Dust emissions will meet the limits of 0.15mg/m^3 concentration of pharmaceutical dust expressed as active ingredient, as well as the total dust limit of 1.0mg/m^3. Solvent emissions will be controlled to meet BATNEEC and T.A. Luft Standards of 150mg/m^3 and a maximum of 3kg/hr All emission points will be periodically sampled to ensure compliance with these limits. Thus air quality will not be affected by the development. Also, the development is neither of a size nor nature which could affect the climate.

7.5 Noise

Due to the proximity of the N3 dual carriageway to the site, the dominant noise source in the area is traffic. The road is heavily used by traffic between Dublin and Navan, and the North West of the country, travelling at high speed. All equipment in the new plant will be specified so that noise levels contributed by the development will not exceed 50 dB (A) between 7.00 and 22.00 and 45 dB (A) otherwise, outside the site boundary. For these reasons, local residents will not be affected by the development in terms of noise emissions.

7.0 IMPACT OF THE DEVELOPMENT (Cont'd)

7.6 Socio Economic Factors

During the construction phase of this development, approximately 100-150 persons will be occupied on a full-time basis, for approximately 12 months. These jobs will span a wide range of building and construction skills.

Once the plant is operational, employment will be provided for 70 people, of whom 50 will be engaged in production and related activities.

These opportunities will be both for school leavers and those with third level qualifications, in technical, science and engineering disciplines. The skills required will range from highly qualified technical personnel including Chemists, Pharmacists and Engineers through maintenance skills and operating skills. Skills of operating personnel will be developed by on-site training by the company.

The total capital cost of the proposed development is approximately IR£12.5 million.

7.7 History and Archaeology

There are no known archaeological features in the area to be developed by Rottapharm. The nearest standing monuments are a well and church in the townland of Tyrrelstown, approximately 2.5km away, any areas of associated settlement would not be affected by the development. Thus the proposed plant would have no impact on the cultural heritage of the area.

7.8 Roads

With a workforce of 70, it is anticipated that the number of cars arriving on site will be approximately 50 per day. In comparison with the volume of traffic which uses the N3 Dual Carriageway, this additional traffic will be negligible. The majority of this traffic will also be travelling from Dublin City in the morning and returning in the evening, whereas the greater volume of traffic will be travelling in the opposite direction. The fact that the proposed site is accessed via a slip road and two roundabouts, also means that the site can be reached easily and without causing traffic congestion, even at peak times.

Deliveries, shipments and service vehicles will amount to approximately 6 trucks per day and 2 vans per day. These will generally not arrive at peak periods. Again the slip road and roundabout system will ensure that such traffic does not cause congestion. The service road to the South of the Rottapharm site is only used by vehicles coming to and from Helsinn Chemicals, Helsinn Birex Pharmaceuticals, Yamanouchi and some other small companies.

7.0 IMPACT OF THE DEVELOPMENT (Cont'd)

The construction phase of the project is expected to generate approximately 60 vehicle movements per day. Contractors are expected to operate a pick-up system which will minimise the number of vehicles arriving in the morning period. Again, the accessibility of the site will mean that there is no significant impact on traffic levels or congestion.

7.9 Visual Impact

The proposed development is composed of four buildings, an Administration Building, a Secondary Manufacturing Building, a Bulk Manufacturing Building and a Warehouse Building. These buildings are connected via a link corridor and also by a bridge structure which crosses the existing stream on the site. The buildings are of varying height with the Administration Building being 8.1 metres high and the warehouse building being 14.5 metres high.

The building layout is oriented in response to the geometry of the existing stream, as well as the site contours which run at an angle to the main road, so as to minimise the effects on the existing landscape.

The Administration Building is a stand alone building 40 metres back from the access road and clad in a light metal sandwich panel with aluminium double glazed powder coated windows. It is linked to the production warehouse buildings across the stream by an elegant bridge structure. The scale of the warehouse building is reduced by introducing a stepped elevation with the front section of the warehouse building being of the reduced heights to match the Administration Building. The Secondary Manufacturing Bulk and Warehouse buildings are also clad in light coloured metal sandwich panels and here the use of different colour and texture helps to both break down the scale of the buildings and also to link the overall composition of the development.

A separate entrance for staff and service traffic is proposed, located on either side of the existing stream. The car parking for the complex is located to the left of the Administration Building but will be screened by a line of trees to minimise it's visual impact when viewed from the main road. The site will be strategically landscaped as described earlier in Section 4.5 which will serve to enhance the environment of the existing site and this will include the retention of trees were possible as well as the revival and reinforcement of the existing stream by means of grassed terraces.

Overall it is felt that the visual impact will be one of improving and enhancing the environment of the area.

7.0 IMPACT OF THE DEVELOPMENT (Cont'd)

7.10 Other Impacts

Human Beings

Due to the low level of emissions, proximity of other plants and distance to residential areas, the new development is neither a threat nor a nuisance to human beings.

Material Assets

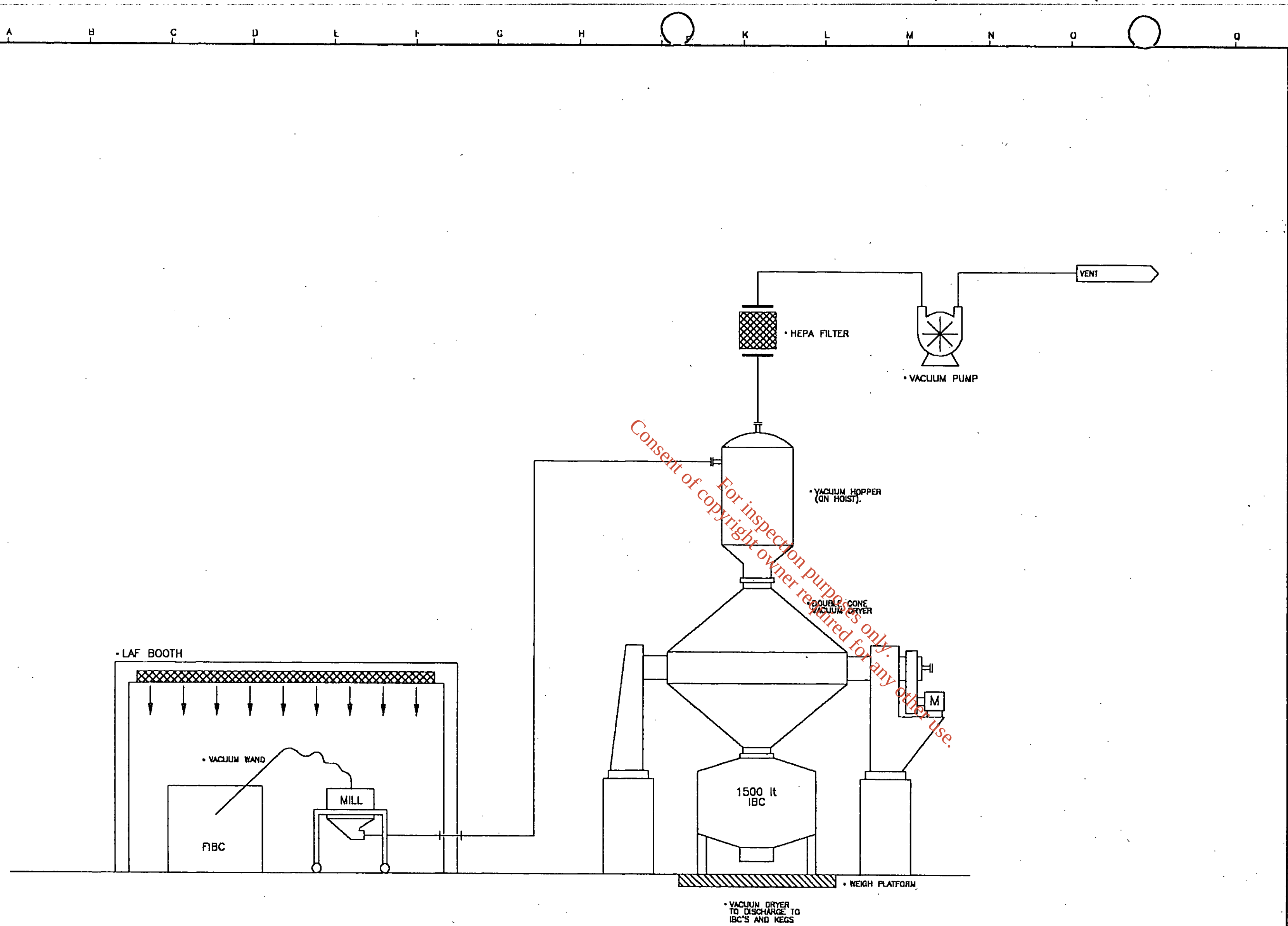
As the development is entirely on industrially zoned land and three other plants are already in production in this zoned area, there will be no impact on the material assets of the area.

APPENDIX 1

Site Location Maps and Site Plans

APPENDIX 2

Process Schematics



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TITLE

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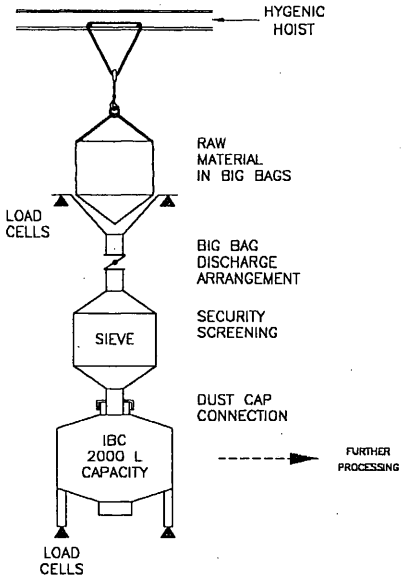

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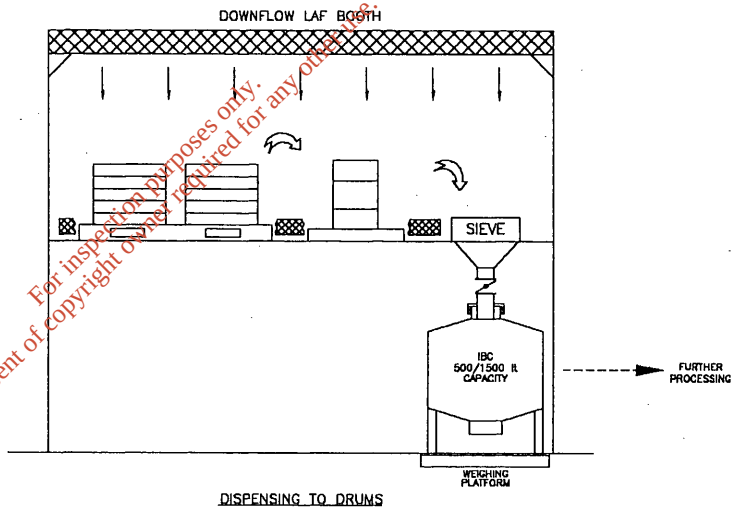

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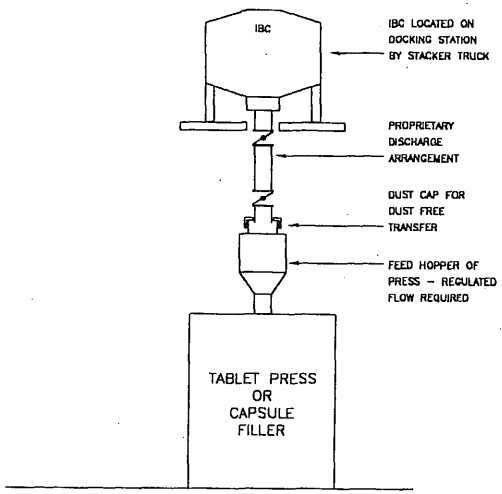

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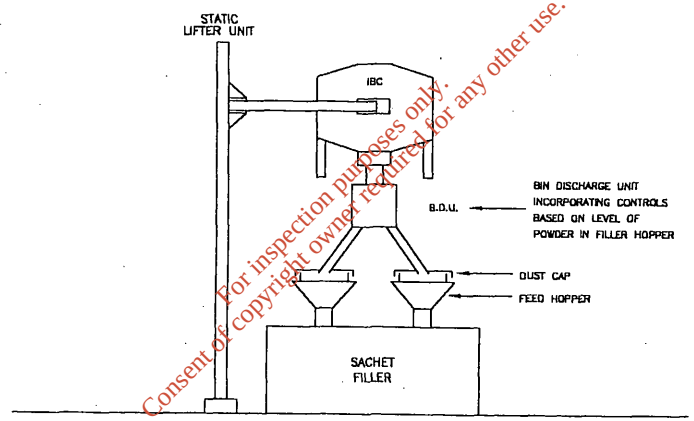

SACHET FILLING

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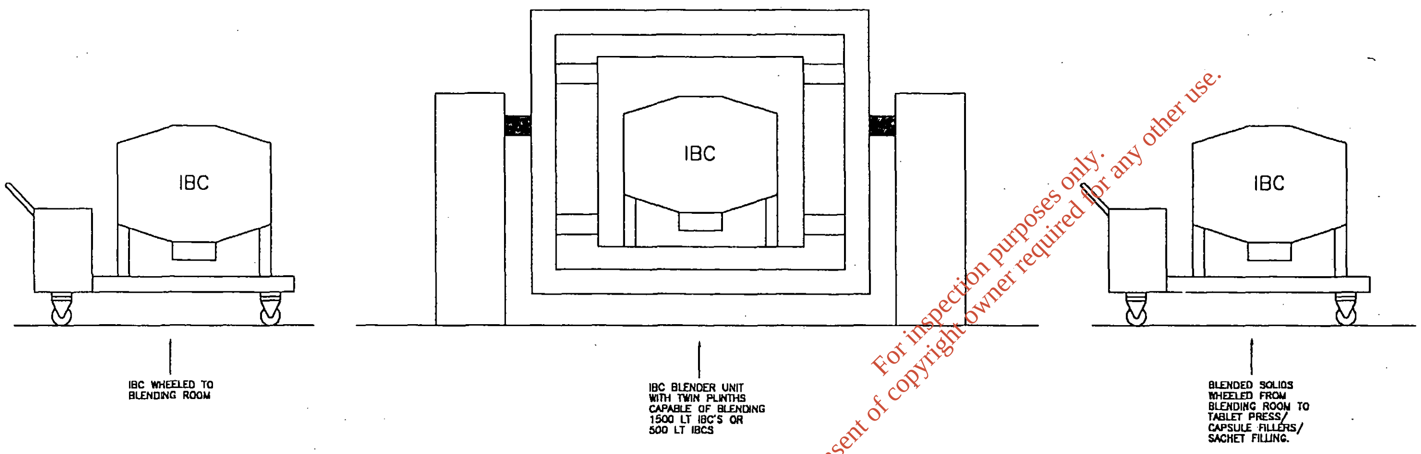

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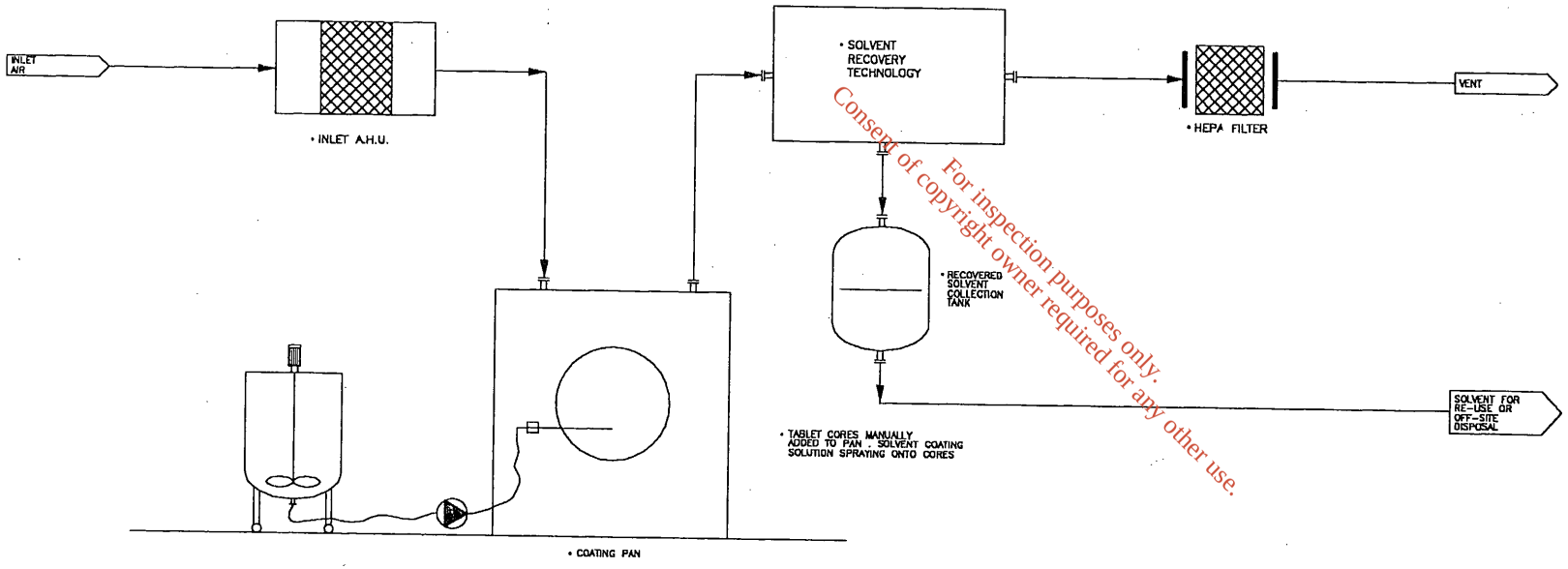

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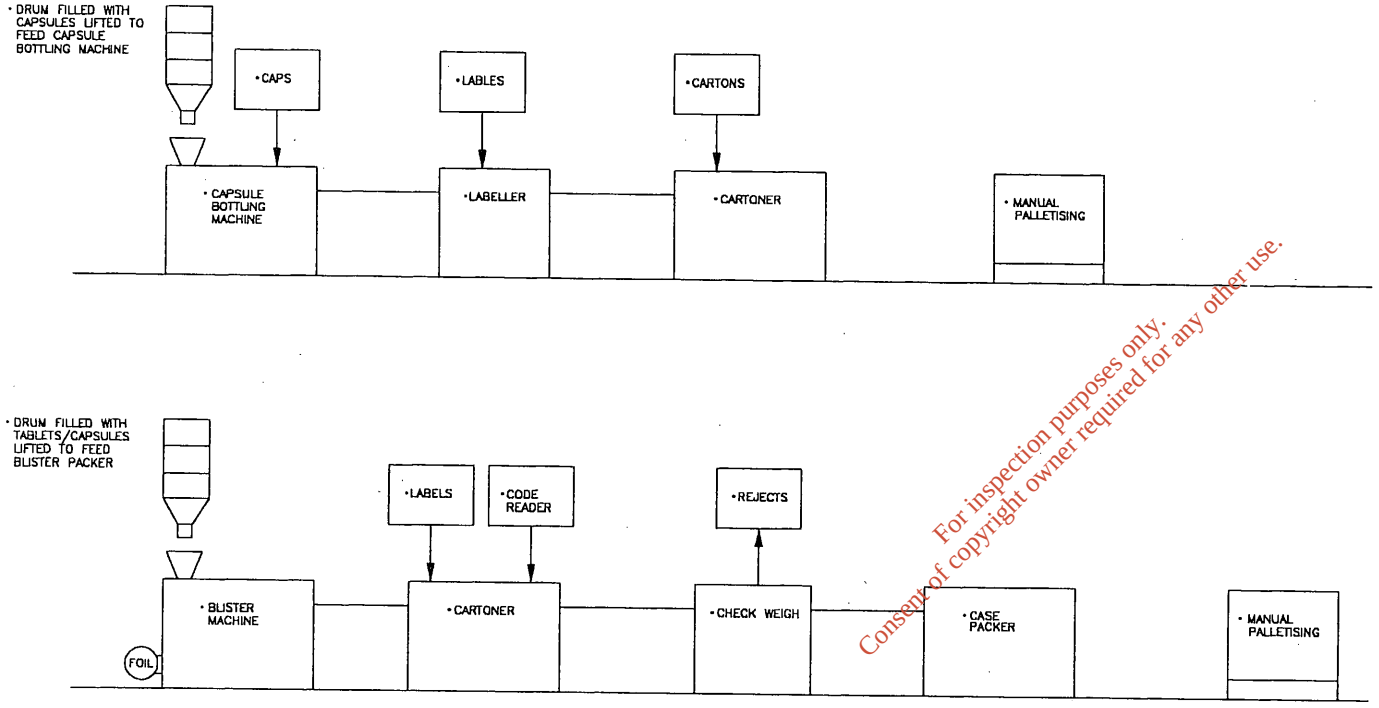

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DATE: 1/4/98	DRAWING NUMBER: 97017-SK-053 REV: A

APPENDIX 3

Soil and Groundwater Quality Investigation

Site Investigation
For
Proposed Industrial Dev. (Macetown)
On Behalf Of
Horgan Lynch & Partners
Consulting Engineers

FOREWORD

Notes on Site Investigation Procedure

The following notes should be read in conjunction with the report. Any modifications to the procedures outlined below are indicated in the main text.

GENERAL

The recommendations made and opinions expressed in the Report are based on the "Boring Records, an examination of samples and results of the site and laboratory tests. No responsibility can be held for conditions which have not been revealed by the boreholes, for example, between borehole positions. Whilst the report may express an opinion on a possible configuration of strata both between borehole positions and below the maximum depth of the investigation, this is for guidance only and no liability can be accepted for its accuracy.

BORING TECHNIQUE

Unless otherwise stated the 'Shell and Auger' technique of soft ground boring has been employed. Whilst this technique allows the maximum data to be obtained on strata conditions, a degree of mixing of some layered soils, (e.g. thin layers of coarse and fine granular material) is inevitable. Specific attention is drawn to this factor where evidence of such a condition is available.

GROUND WATER

The ground water conditions entered on the Boring Records are those appertaining at the time of the investigation. The normal rate of boring does not usually permit the recording of an equilibrium water level for any one water strike. Moreover, ground water levels are subject to variations caused by seasonal effects or changes in local drainage conditions. The table of each Boring Record shows the ground water level at the quoted borehole and casing depths, usually at the start of the day's work. The word "none" indicates that ground water was sealed off by the borehole casing.

GAS MONITORING

Unless otherwise stated gas monitoring is carried out using a GA90 infra red gas detector. The gases monitored for and levels noted are recorded and plotted on the relevant test data sheets. Unless stated otherwise no monitoring is carried out for gas pressure or to calculate gas flow rates.

ROUTINE SAMPLING

Undisturbed samples of predominantly cohesive soils are obtained in a 102mm diameter open-drive sampler, complying with the requirements of the British Standard Code of Practice B.S. 5930. Large disturbed samples of granular soils, or of soils in which undisturbed sampling is not possible or appropriate, are taken form the boring tools and sealed into polythene bags. Small disturbed samples are taken at frequent intervals of depth and sealed into 0.5 kg glass jars or polythene bags for subsequent visual classification. Where encountered in sufficient quantity, samples of groundwater are taken.

Unless otherwise stated in the main text, disturbed soil samples may not be at their natural water content.

REPORT ON A SITE INVESTIGATION AT MACETOWN INDUSTRIAL ESTATE, DAMASTOWN, DUBLIN FOR A NEW INDUSTRIAL DEVELOPMENT ON BEHALF OF HORGAN LYNCH & PARTNERS CONSULTING ENGINEERS

REPORT NO. 4582 **MARCH 1998**

I. INTRODUCTION

A new industrial development is to be constructed in a green field site at the Macetown Industrial Park, Damastown, Dublin.
An investigation of sub-soil conditions was ordered by the projects consulting engineers, Horgan Lynch & Partners.

The programme of the investigation included,

- The construction of seven exploratory boreholes to establish stratification. During the course of boring in-situ tests were performed at regular intervals and representative soil samples were recovered for visual examination and laboratory analysis.
- The monitoring of the boreholes for potential landfill gas build up.
- The carrying out of laboratory soils testing on selected soil samples.
- The issuing of a completed geotechnical report.

This report details the findings of the investigation and relates these findings to the design and construction of foundations for the proposed structure.

II.FIELDWORK

Cable Tool Boring

The site is located in Macetown Industrial Park, Dublin and a total of seven cable tool boreholes were constructed on the site. The locations of these are shown on the site plan enclosed in Appendix IV to this report.

Full descriptions and depths of the strata encountered are given on the individual boring records enclosed in Appendix I. These records also give details of sampling, in-situ testing and comment on groundwater conditions pertaining at the time of the investigation. Note is also made on any obstructions preventing normal borehole advancement

Boreholes 1, 2 and 3 reveal similar stratification with topsoil and a brown silty clay with roots extending from ground level to depths of 1.00m at Bh1 and 3 and to a depth of 1.20m at Bh2. This is underlain by a stiff to very stiff brown silty gravelly clay which extended to depths of between 2.60 and 3.20m where it overlay a very stiff to hard black silty gravelly clay. All of these boreholes were terminated in this stratum on obstructions at depths of between 6.80 and 7.00m.

At Bh's 4 and 7 topsoil and some made ground and silty clays with organics extended to depths of between 0.80 and 1.90m where it was underlain by the stiff to very stiff brown gravelly clays. These strata extended to depths of 4.10m at Bh4 and to 3.00m at Bh7 at which depths a dense silty sandy gravel was encountered. Both boreholes were terminated in this gravel stratum on obstructions at depths of 7.60 and 7.30m respectively.

Boreholes 5 and 6 encountered topsoil and silty clays which extended to depths of 1.50m and 0.60m respectively at which depth a very stiff to hard brown silty gravelly clay was encountered. Both boreholes were terminated in this stratum on an obstruction at a depth of 6.90m in Bh5 and at 6.00m in Bh6.

Groundwater was noted in some of the boreholes and full details of groundwater findings are enclosed in the relevant boring records.

Gas Monitoring

As part of the site investigation contract the boreholes were monitored for potential landfill gas build up. Monitoring was carried out by an IGSL environmental chemist using a GA 90 Infra-Red Detector. The results of the gas monitoring are shown in Appendix II.

This machine monitors for Oxygen, Methane and Carbon-Dioxide. It utilises the principle of Infra red absorption for the quantitive analysis of gases. It also records the barometric air pressure at the time of each reading.

Readings taken for Methane gas using the GA 90 Infra Red detector show no methane present in the monitoring locations.

Carbon Dioxide was present in the some of the standpipes with maximum levels of 0.30% being recorded.

III. TESTING.

During the course of the investigation standard penetration tests were carried out to establish relative in-situ soil strengths at intervals in each of the boreholes.

(a) Standard Penetration Tests

The relative in-situ strength of the sub-soils was established at intervals by standard penetration test . A conical point is driven into the soil and the blow count for 300mm of penetration is recorded in four 75mm increments.

Results are presented in the right - hand column of the boring records and tabulated below .

Fig 1.1 - SPT Summary Table

Stratum	Range of N Values	Comment
Made Ground	5 - 10	Variable
Silty Clays	8 - 14	Firm
Brown Gravelly Clays	15 - 62	Very Stiff to Hard
Sandy Gravels	34 - 60	Dense
Black Gravelly Clays	59 - 99	Hard

(b) Laboratory Testing

Disturbed soil samples were recovered and returned to IGSL's soils laboratory where a programme of soils testing was scheduled and carried out.

All of the test data is included in Appendix III and results discussed in the following paragraphs.

1. Chemical Analyses :

Four samples of the made ground have been analysed to determine sulphate content and pH.

Results show concentrations of sulphate falling into the Class 1 category with a near neutral pH. No special precautions are necessary to protect good quality foundation concrete.

2. Classification Tests

A number of samples of the brown and black gravelly clays have had their liquid and plastic limits assessed.

Results have been plotted on the Casagrande chart and show clay soils of low plasticity.

3. Wet Sieve Analysis

Three samples of the gravel stratum have been analysed by wet sieving techniques to ascertain their particle size distributions.

Results show a well graded fine to coarse sandy silty gravel and all results are plotted graphically on the relevant sieve sheets.

III . DISCUSSION

It is proposed to construct a new industrial development at a green field site in Macetown Industrial Estate, Damastown, Dublin.

At the request of the projects consulting engineers I.G.S.L. carried out a site investigation which comprised the drilling of seven boreholes, the monitoring of these boreholes for potential landfill gas ingress and the carrying out of tests on the recovered soil samples.

Boreholes 1, 2, 3, 5 and 6 show generally similar stratification with topsoil and silty clays extending from ground level to depths of between 0.60m and 1.50m. These strata were underlain by a brown gravelly clay which extended to depths of 3.00m at Bh1, 3.20m at Bh2, 2.60m at Bh3, 6.90m at Bh5 and to a depth of 6.00m at Bh8.

Boreholes 5 and 6 were terminated in the brown gravelly clays while at boreholes 1, 2 and 3 the brown gravelly clay was underlain by a very stiff to hard black boulder clay.

At Bh's 4 and 7 the silty organic clays and made ground extended to depths of up to 1.90m where they were underlain by the brown boulder clays. This gravelly clay stratum extended to 4.10m at Bh4 and to 3.00m at Bh7 at which depth a dense gravel was encountered.

Groundwater was encountered in some of the boreholes and details of water ingress are shown on the bottom of the detailed boring records.

The upper made ground and silty (organic) clays are considered unsuitable for foundation purposes and foundations will have to be transferred below these strata onto the more competent brown gravelly clay stratum.

Where conventional foundations are placed on the brown gravely clays at depths of between 1.00 and 1.90 an allowable bearing pressure of the order of 200 - 250 kN/M^2 can be utilised.

Chemical analysis has shown low sulphates in the soils and a near neutral pH and no precautions need be taken to protect good quality foundation concrete.

Gas readings taken have shown no Methane to be present and a maximum level of 0.30% Carbon Dioxide.

Carbon dioxide is a non-flammable asphyxsiant with a short term exposure limit of 1.50% and a long term exposure limit of 0.50%.

The recommended D.O.E. guidelines state that " *if Methane in concentrations greater than 1% by volume or Carbon Dioxide in concentrations greater than 0.50% by volume is located on the site then specialised solutions are required to develop the site* ".

From these guidelines and looking at the levels of gas across the site (i.e. max. levels of 0.30% of CO_2) no gas preventative measures will be required in the construction of this development.

APPENDIX I: CABLE TOOL RECORDS

REPORT NO.	GEOTECHNICAL BORING RECORD	I.G.S.L.

CONTRACT:	Proposed Industrial Development	BOREHOLE NO.:	1
		SHEET:	1 of 1
CLIENT:	Horgan Lynch & Partners	DATE STARTED:	24.3.98
	BOREHOLE DIAM.(mm) 200	DATE COMPLETED:	24.3.98
LOCATION:	Macetown Industrial Estate, Dublin	BORED BY:	I.G.S.L.
	BOREHOLE DEPTH 7.00	LOGGED BY:	I.G.S.L.
	CASING DEPTH (m) 7.00		

DOWNHOLE DEPTH (m)	DESCRIPTION	SYMBOLIC LOG	ELEVATION (mOD)	DEPTH (m)	SAMPLES: SAMPLE REF.	SAMPLES: SAMPLE TYPE	SAMPLES: DEPTH RECOVERED	FIELD TEST RESULTS
0	Top Soil			0.20				Depth N
	Stiff brown silty CLAY with some gravel				6450	D	0.50	0.50 14
1				1.00	6451	D	1.00	1.00 18
	Stiff to very stiff brown silty gravelly CLAY with cobbles							
2					6452	D	2.00	2.00 30
					6453	D	2.50	
3				3.00	6454	D	3.00	3.00 59
	Very stiff to hard black gravelly silty sandy CLAY with cobbles and boulders							
4					6455	D	4.00	4.00 62
5					6456	D	5.00	5.00 79
6								6.00 81
					6457	D	6.50	
7				7.00				7.00 Ref
	Refusal							
8								
9								

Remarks.

Chiselling

From 6.60 - 7.00 for 2hrs

Water level observations during boring

DATE	HOLE DEPTH	CASING DEPTH	DEPTH TO WATER	REMARKS
24.3	1.40	1.40	1.40	Seepage
	1.40	1.40	1.30	20 mins
	7.00	Nil	6.00	Bh End

FIELD TEST KEY: U-U100, Db-Disturbed Sample, S-SPT, W-Water Sample, R-Refusal.

GEOTECHNICAL BORING RECORD

I.G.S.L.

REPORT NO.		BOREHOLE NO.:	2
CONTRACT:	Proposed Industrial Development	SHEET:	1 of 1
CLIENT:	Horgan Lynch & Partners	DATE STARTED:	25.3.98
	BOREHOLE DIAM.(mm) 200	DATE COMPLETED:	25.3.98
LOCATION:	Macetown Industrial Estate, Dublin	BORED BY:	I.G.S.L.
	BOREHOLE DEPTH 7.10	LOGGED BY:	I.G.S.L.
	CASING DEPTH (m) 7.10		

DOWNHOLE DEPTH (m)	DESCRIPTION	SYMBOLIC LOG	ELEVATION (mOD)	DEPTH (m)	SAMPLES: SAMPLE REF.	SAMPLE TYPE	DEPTH RECOVERED	FIELD TEST RESULTS: Depth	N
0	Top Soil			0.20					
	Firm brown silty CLAY with some gravel				6458	D	0.50	0.50	8
-1					6459	D	1.00		
				1.20					
	Stiff to very stiff brown silty gravelly CLAY with cobbles				6460	D	1.50	1.50	23
-2					6461	D	2.00		
					6462	D	2.50	2.50	27
-3				3.20					
	Hard black gravelly silty sandy CLAY with cobbles and boulders				6463	D	3.50	3.50	77
-4					6464	D	4.50	4.50	85
-5					6465	D	5.50	5.50	95
-6					6466	D	6.50	6.50	50 for150mm then Ref
-7				7.00					
	Refusal								
-8									
9									

Remarks.

Chiselling

From 4.00 - 4.40 for 1hr
From 7.00 - 7.20 for 2hrs

Water level observations during boring

DATE	HOLE DEPTH	CASING DEPTH	DEPTH TO WATER	REMARKS
25.3	7.00	Nil	Dry	Bh End

FIELD TEST KEY: U-U100, Db-Disturbed Sample, S-SPT, W-Water Sample, R-Refusal.

REPORT NO.	GEOTECHNICAL BORING RECORD	I.G.S.L.

CONTRACT:	Proposed Industrial Development	BOREHOLE NO.:	3
		SHEET:	1 of 1
CLIENT:	Horgan Lynch & Partners	DATE STARTED:	25.3.98
	BOREHOLE DIAM.(mm) 200	DATE COMPLETED:	26.3.98
LOCATION:	Macetown Industrial Estate, Dublin	BORED BY:	I.G.S.L.
	BOREHOLE DEPTH 6.80	LOGGED BY:	I.G.S.L.
	CASING DEPTH (m) 6.80		

DOWNHOLE DEPTH (m)	DESCRIPTION	SYMBOLIC LOG	ELEVATION (mOD)	DEPTH (m)	SAMPLES: SAMPLE REF.	SAMPLES: SAMPLE TYPE	SAMPLES: DEPTH RECOVERED	FIELD TEST RESULTS
0	Top Soil			0.20				Depth N
	Firm brown silty CLAY with some gravel and roots				6467	D	0.50	0.50 11
-1				1.00	6468	D	1.00	1.00 15
	Stiff to very stiff brown silty gravelly CLAY with cobbles							
-2					6469	D	2.00	2.00 32
				2.60				
	Hard black gravelly silty sandy CLAY with cobbles and boulders				6471	D	2.80	3.00 75
-3								
-4					6472	D	4.00	
								4.50 99
-5								
					6473	D	5.50	
-6								6.00 Ref
				6.80				
-7	Refusal							
-8								
9								

Remarks.

Chiselling

From 5.00 - 5.70 for 1hr
From 6.60 - 6.80 for 2hrs

Water level observations during boring

DATE	HOLE DEPTH	CASING DEPTH	DEPTH TO WATER	REMARKS
27.3	6.80	Nil	Dry	Bh End

FIELD TEST KEY: U-U100, Db-Disturbed Sample, S-SPT, W-Water Sample, R-Refusal.

REPORT NO.	GEOTECHNICAL BORING RECORD	I.G.S.L.

CONTRACT:	Proposed Industrial Development	BOREHOLE NO.:	4
		SHEET:	1 of 1
CLIENT:	Horgan Lynch & Partners	DATE STARTED:	18.3.98
	BOREHOLE DIAM.(mm) 200	DATE COMPLETED:	18.3.98
LOCATION:	Macetown Industrial Estate, Dublin	BORED BY:	I.G.S.L.
	BOREHOLE DEPTH 7.60	LOGGED BY:	I.G.S.L.
	CASING DEPTH (m) 7.60		

DOWNHOLE DEPTH (m)	DESCRIPTION	SYMBOLIC LOG	ELEVATION (mOD)	DEPTH (m)	SAMPLES: SAMPLE REF.	SAMPLES: SAMPLE TYPE	SAMPLES: DEPTH RECOVERED	FIELD TEST RESULTS
0	Top Soil			0.20				Depth N
	Brown silty CLAY with roots, organics and occ. fine gravel			0.80				
-1	Stiff to very stiff brown silty gravelly CLAY with cobbles				6424	D	1.00	1.00 15
-2								2.00 21
-3					6425	D	3.00	3.00 34
-4				4.10				
	Dense fine to coarse sandy silty GRAVEL with cobbles and boulders				6426	D	4.50	4.50 51
-5								
-6					6427	D	6.00	6.00 58
-7								
					6428	D	7.50	7.50 Ref
-8	Refusal			7.60				
9								

Remarks.

Chiselling

From 5.00 - 5.60 for 1hr
From 7.30 - 7.60 for 2hrs

Water level observations during boring

DATE	HOLE DEPTH	CASING DEPTH	DEPTH TO WATER	REMARKS
19.3	5.00	5.00	5.00	strike
	5.00	5.00	4.50	20 mins
	7.60	Nil	2.50	Bh End

FIELD TEST KEY: U-U100, Db-Disturbed Sample, S-SPT, W-Water Sample, R-Refusal.

REPORT NO.	GEOTECHNICAL BORING RECORD	I.G.S.L.

CONTRACT:	Proposed Industrial Development	BOREHOLE NO.:	5
		SHEET:	1 of 1
CLIENT:	Horgan Lynch & Partners	DATE STARTED:	19.3.98
	BOREHOLE DIAM.(mm) 200	DATE COMPLETED:	19.3.98
LOCATION:	Macetown Industrial Estate, Dublin	BORED BY:	I.G.S.L.
	BOREHOLE DEPTH 6.90	LOGGED BY:	I.G.S.L.
	CASING DEPTH (m) 6.90		

DOWNHOLE DEPTH (m)	DESCRIPTION	SYMBOLIC LOG	ELEVATION (mOD)	DEPTH (m)	SAMPLES: SAMPLE REF.	SAMPLES: SAMPLE TYPE	SAMPLES: DEPTH RECOVERED	FIELD TEST RESULTS
0	Top Soil			0.20				Depth N
	Stiff to very stiff mottled brown silty gravelly CLAY				6430	D	0.50	0.50 24
1				1.50	6431	D	1.50	1.50 37
2	Very stiff to hard brown silty gravelly CLAY with cobbles and boulders							
3					6432	D	3.00	3.00 56
4								
					6433	D	4.50	4.50 62
5								
6					6434	D	6.00	6.00 50 for150mm then Ref.
				6.90				
7	Refusal							
8								
9								

Remarks.

Chiselling

From 6.50 - 6.90 for 2hrs

Water level observations during boring

DATE	HOLE DEPTH	CASING DEPTH	DEPTH TO WATER	REMARKS
19.3	4.60	4.60	4.60	seepage
	4.60	4.60	4.50	20 mins
	6.90	Nil	3.50	Bh End

FIELD TEST KEY: U-U100, Db-Disturbed Sample, S-SPT, W-Water Sample, R-Refusal.

REPORT NO.	GEOTECHNICAL BORING RECORD	I.G.S.L.

CONTRACT:	Proposed Industrial Development	BOREHOLE NO.:	6
		SHEET:	1 of 1
CLIENT:	Horgan Lynch & Partners	DATE STARTED:	20.3.98
	BOREHOLE DIAM.(mm) 200	DATE COMPLETED:	20.3.98
LOCATION:	Macetown Industrial Estate, Dublin	BORED BY:	I.G.S.L.
	BOREHOLE DEPTH 6.00	LOGGED BY:	I.G.S.L.
	CASING DEPTH (m) 6.00		

DOWNHOLE DEPTH (m)	DESCRIPTION	SYMBOLIC LOG	ELEVATION (mOD)	DEPTH (m)	SAMPLES: SAMPLE REF.	SAMPLES: SAMPLE TYPE	SAMPLES: DEPTH RECOVERED	FIELD TEST RESULTS
0	Top Soil			0.10				Depth N
	Firm grey brown silty gravelly CLAY			0.60	6436	D	0.50	0.50 23
1	Very stiff to hard brown silty gravelly CLAY with cobbles and boulders				6437	D	1.50	1.50 32
2								
3					6438	D	3.00	3.00 39
4					6439	D	4.50	4.50 55
5								
6				6.00	6440	D	6.00	6.00 Ref
	Refusal							
7								
8								
9								

Remarks.

Chiselling

From 5.80 - 6.00 for 2hrs

Water level observations during boring

DATE	HOLE DEPTH	CASING DEPTH	DEPTH TO WATER	REMARKS
20.3	6.00	Nil	Dry	Bh End

FIELD TEST KEY: U-U100, Db-Disturbed Sample, S-SPT, W-Water Sample, R-Refusal.

REPORT NO.	GEOTECHNICAL BORING RECORD	I.G.S.L.

CONTRACT:	Proposed Industrial Development	BOREHOLE NO.:	7
		SHEET:	1 of 1
CLIENT:	Horgan Lynch & Partners	DATE STARTED:	23.3.98
	BOREHOLE DIAM.(mm) 200	DATE COMPLETED:	23.3.98
LOCATION:	Macetown Industrial Estate, Dublin	BORED BY:	I.G.S.L.
	BOREHOLE DEPTH 7.30	LOGGED BY:	I.G.S.L.
	CASING DEPTH (m) 7.30		

DOWNHOLE DEPTH (m)	DESCRIPTION	SYMBOLIC LOG	ELEVATION (mOD)	DEPTH (m)	SAMPLES: SAMPLE REF.	SAMPLES: SAMPLE TYPE	SAMPLES: DEPTH RECOVERED	FIELD TEST RESULTS
0	Top Soil			0.10				Depth N
	MADE GROUND (Comprised of brown and black silty gravelly clays , damp with some timber / decaying wood)				6442	D	0.50	0.50 5
-1								1.00 7
					6443	D	1.50	1.50 10
				1.90				
-2	Stiff brown silty gravelly CLAY with occ. cobbles				6444	D	2.00	2.00 17
-3				3.00	6445	D	3.00	3.00 34
	Dense fine to coarse sandy silty GRAVEL with frequent cobbles and occ. boulder							
-4					6446	D	4.00	
								4.50 53
-5					6447	D	5.00	
-6					6448	D	6.00	6.00 60
-7					6449	D	7.00	
				7.30				7.30 Ref
-8	Refusal							
9								

Remarks.

Chiselling

From 5.00 - 5.60 for 1.25hrs
From 6.90 - 7.30 for 2hrs

Water level observations during boring

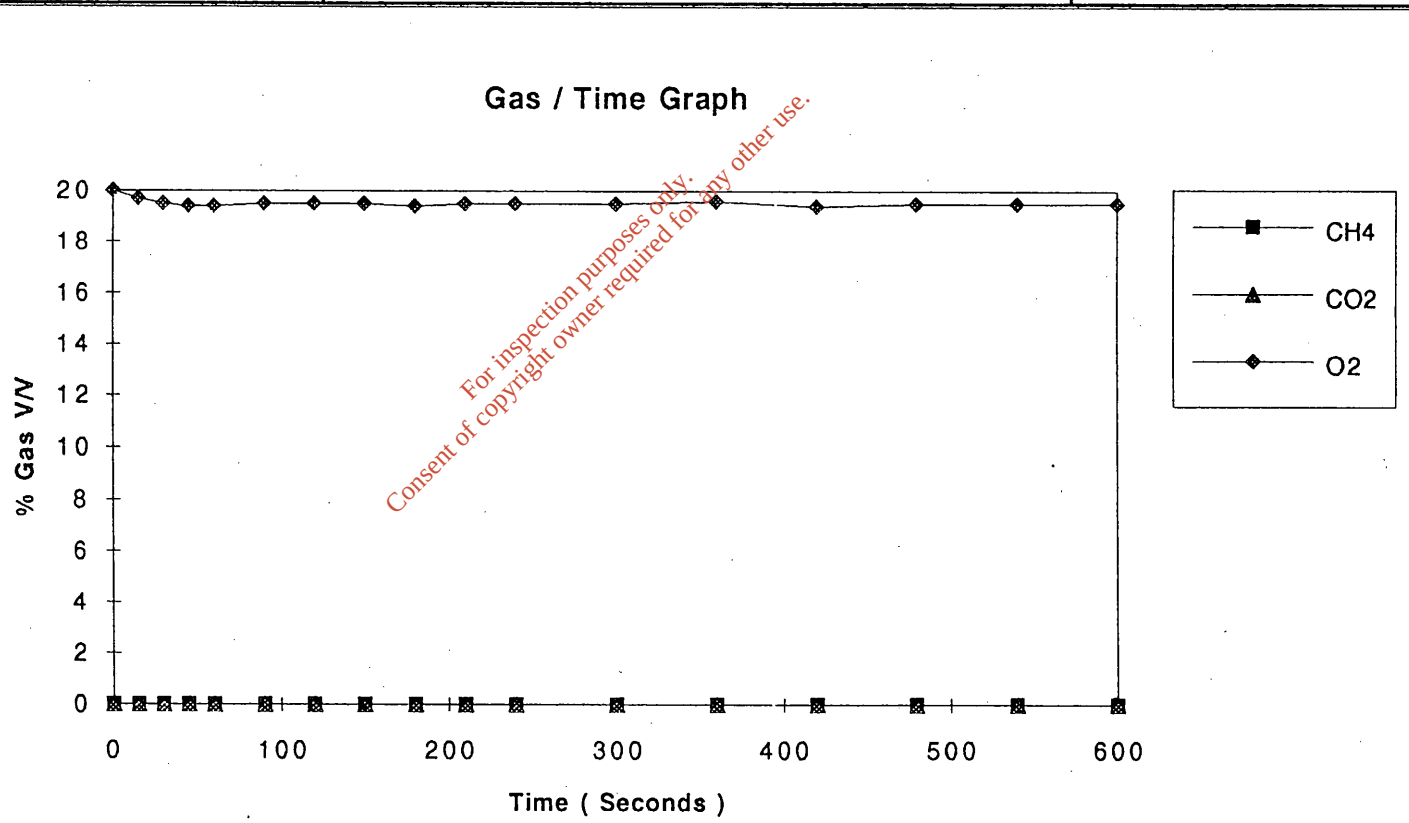
DATE	HOLE DEPTH	CASING DEPTH	DEPTH TO WATER	REMARKS
23.3	3.00	3.00	3.00	strike
	3.00	3.00	2.40	20 mins
	7.30	Nil	2.60	Bh End

FIELD TEST KEY: U-U100, Db-Disturbed Sample, S-SPT, W-Water Sample, R-Refusal.

APPENDIX II : GAS MONITORING RESULTS

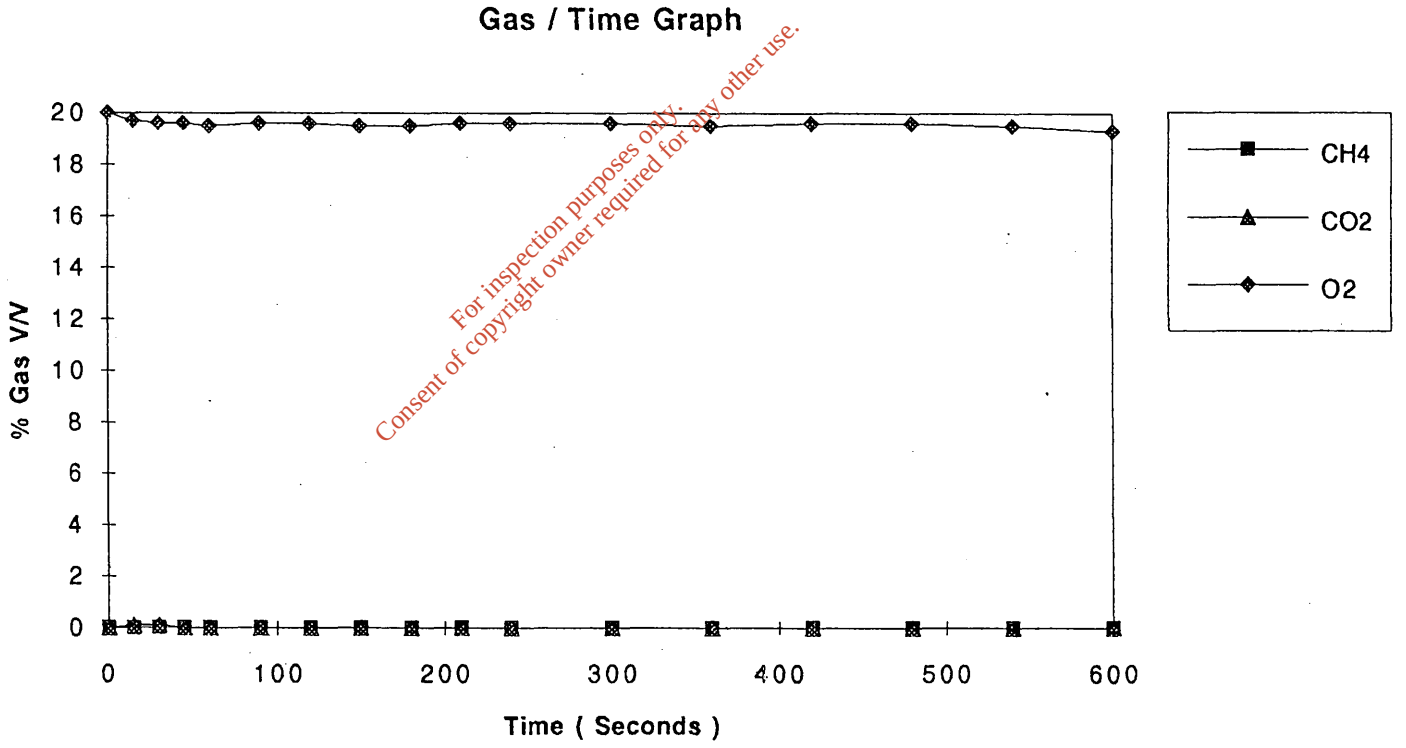
Report No.	GAS MONITORING DATA SHEET	I.G.S.L.
Contract: Macetown Industrial Development	Location 2	Date: 25.3.98
Client: Horgan Lynch & Partners	Air Pressure (MB): 1004	Depth:

Time	CH4	CO2	O2
0	0	0	20
15	0	0	19.7
30	0	0	19.5
45	0	0	19.4
60	0	0	19.4
90	0	0	19.5
120	0	0	19.5
150	0	0	19.5
180	0	0	19.4
210	0	0	19.5
240	0	0	19.5
300	0	0	19.5
360	0	0	19.6
420	0	0	19.4
480	0	0	19.5
540	0	0	19.5
600	0	0	19.5



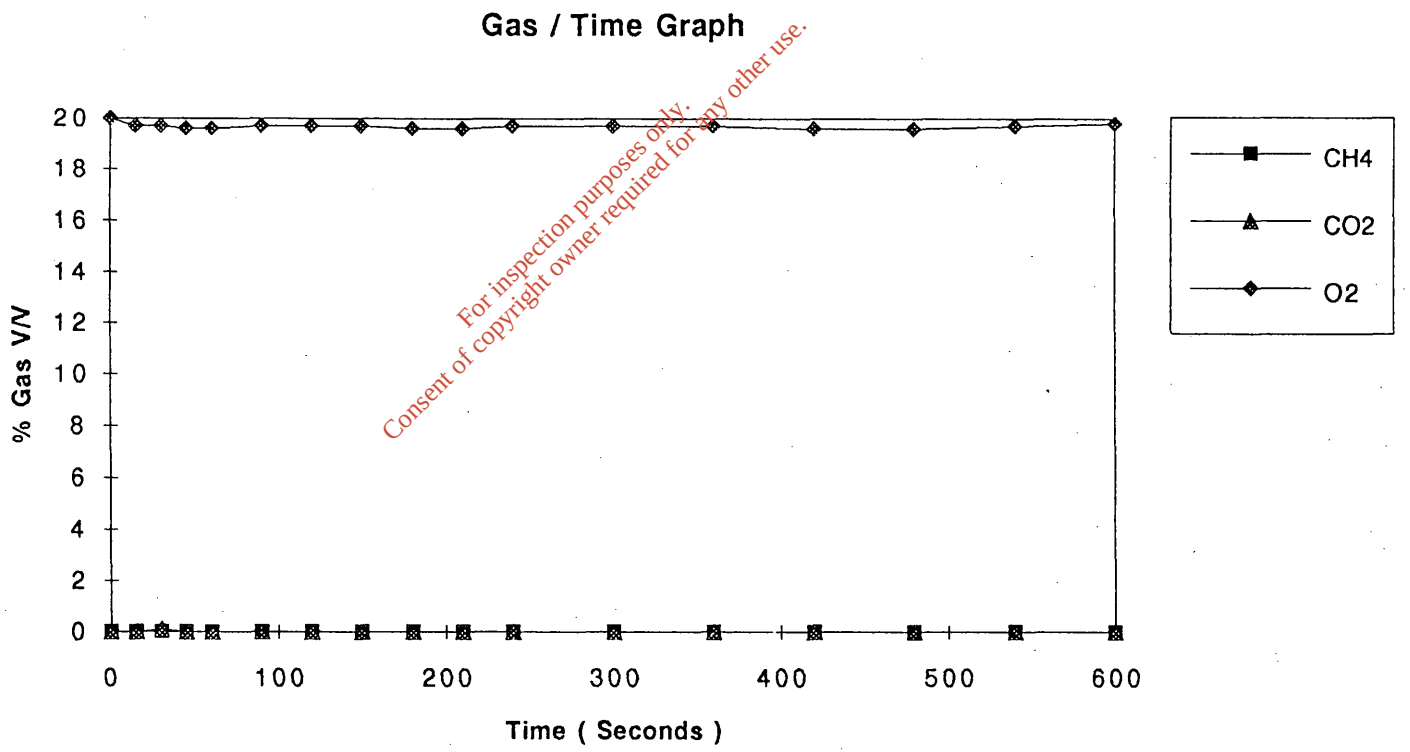
Report No.	GAS MONITORING DATA SHEET	I.G.S.L.
Contract: Macetown Industrial Development	**Location** 4	**Date:** 18.3.98
Client: Horgan Lynch & Partners	**Air Pressure (MB):** 1004	**Depth:**

Time	CH4	CO2	O2
0	0	0	20
15	0	0.1	19.7
30	0	0.1	19.6
45	0	0	19.6
60	0	0	19.5
90	0	0	19.6
120	0	0	19.6
150	0	0	19.5
180	0	0	19.5
210	0	0	19.6
240	0	0	19.6
300	0	0	19.6
360	0	0	19.5
420	0	0	19.6
480	0	0	19.6
540	0	0	19.5
600	0	0	19.3



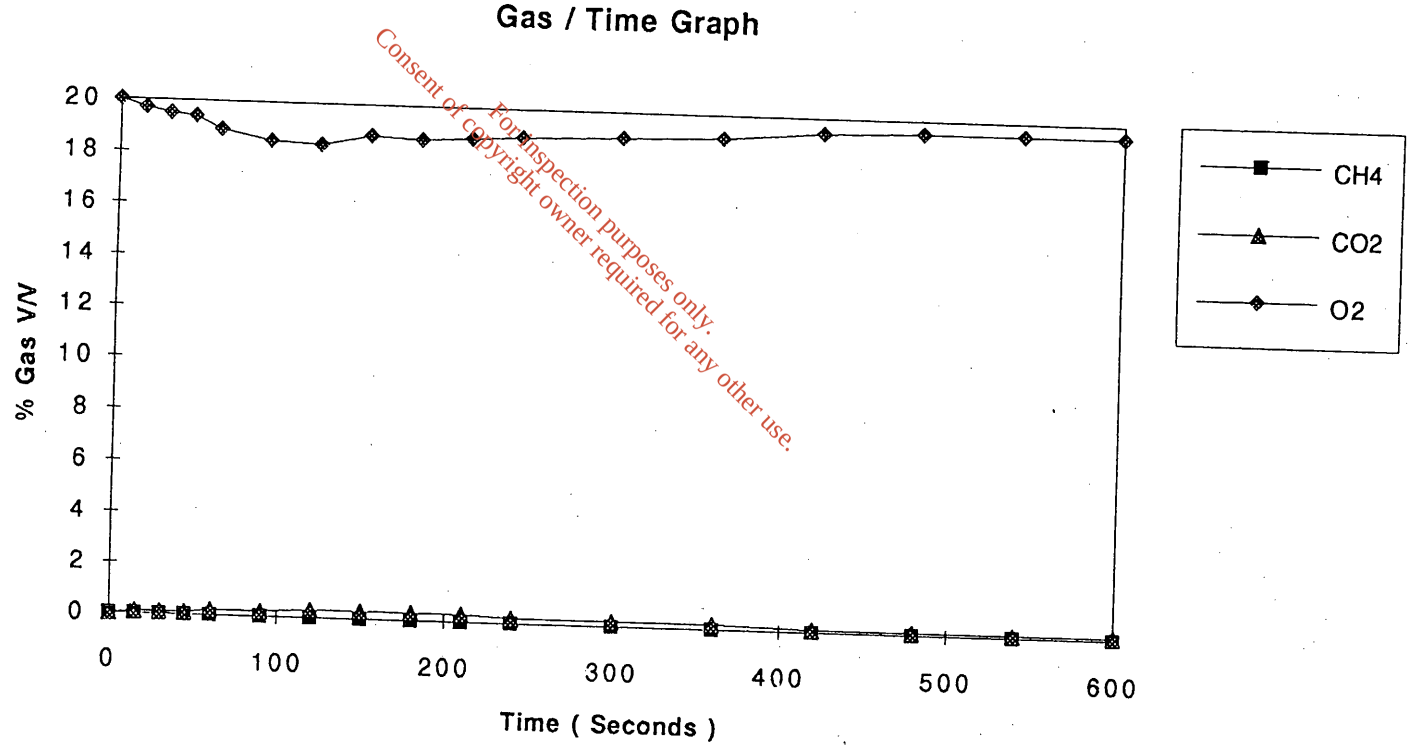
Report No.	GAS MONITORING DATA SHEET	I.G.S.L.
Contract: Macetown Industrial Development	Location 6	Date: 20.3.98
Client: Horgan Lynch & Partners	Air Pressure (MB): 1004	Depth:

Time	CH4	CO2	O2
0	0	0	20
15	0	0	19.7
30	0	0.1	19.7
45	0	0	19.6
60	0	0	19.6
90	0	0	19.7
120	0	0	19.7
150	0	0	19.7
180	0	0	19.6
210	0	0	19.6
240	0	0	19.7
300	0	0	19.7
360	0	0	19.7
420	0	0	19.6
480	0	0	19.6
540	0	0	19.7
600	0	0	19.8



Report No.	GAS MONITORING DATA SHEET	I.G.S.L.
Contract: Macetown Industrial Development	Location 7	Date: 23.3.98
Client: Horgan Lynch & Partners	Air Pressure (MB): 1004	Depth:

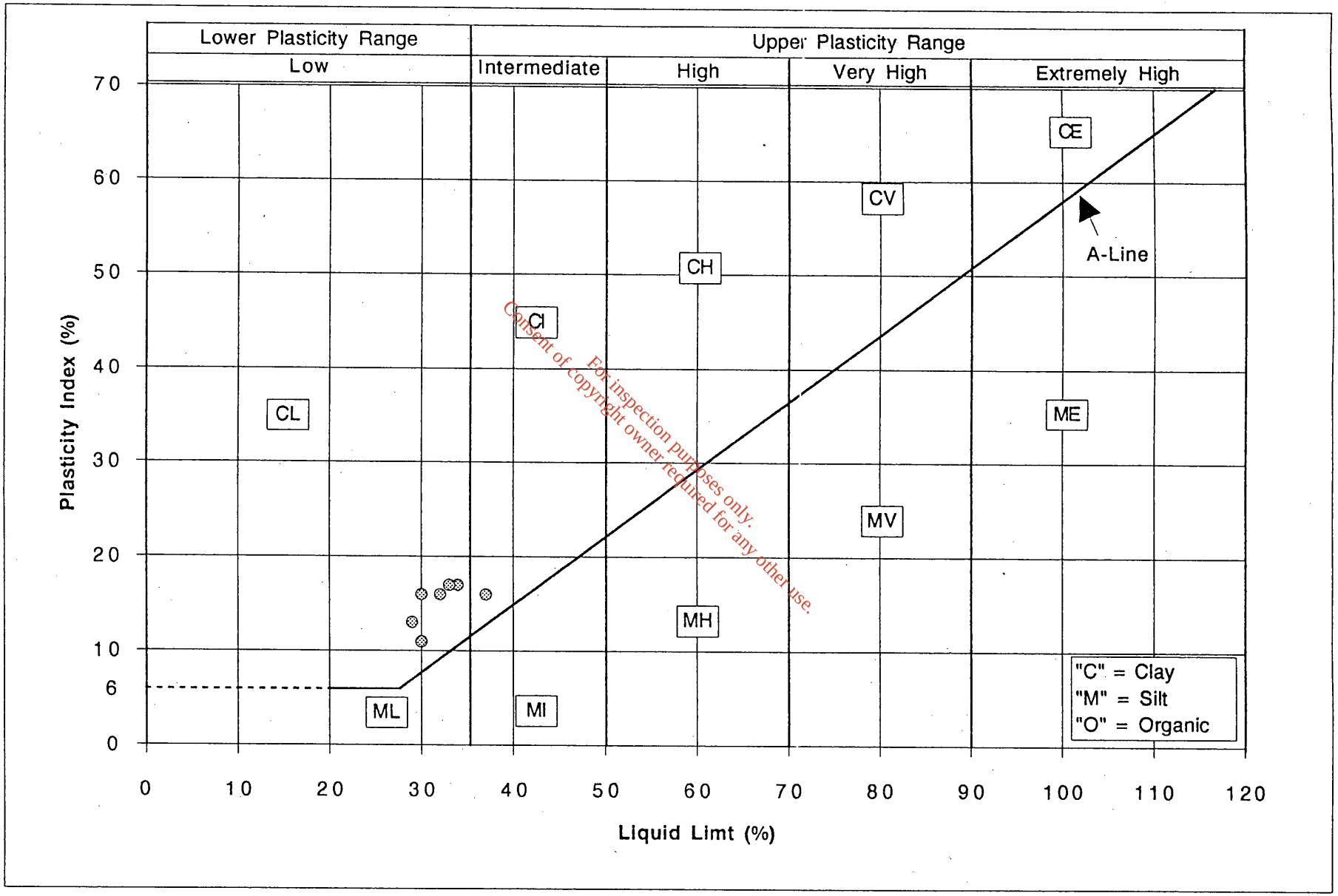
Time	CH4	CO2	O2
0	0	0	20
15	0	0.1	19.7
30	0	0.1	19.5
45	0	0.1	19.4
60	0	0.2	18.9
90	0	0.2	18.5
120	0	0.3	18.4
150	0	0.3	18.8
180	0	0.3	18.7
210	0	0.3	18.8
240	0	0.2	18.9
300	0	0.2	19
360	0	0.2	19.1
420	0	0.1	19.4
480	0	0.1	19.5
540	0	0.1	19.5
600	0	0.1	19.5



APPENDIX III : LABORATORY TEST RESULTS

Report No.	CLASSIFICATION TEST RESULTS	IGSL
Contract:	Macetown Industrial Development	

Borehole No.	Depth (M)	Reference No.	Description	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Water Content %	pH	Sulphate Content %
1	2.00	6452	Brown silty gravelly CLAY	32	16	16	15.76		
1	4.00	6455	Black silty gravelly CLAY with cobbles	30	19	11	12.78		
2	2.50	6462	Brown silty gravelly CLAY with cobbles	30	14	16	14.98		
3	2.80	6471	Grey black silty gravelly CLAY with cobbles	29	16	13	10.09		
4	3.00	6425	Brown silty gravelly CLAY	34	17	17	14.69		
5	1.50	6431	Brown silty gravelly CLAY with cobbles	33	16	17	13.81		
6	1.50	6437	Brown silty gravelly CLAY	37	21	16	15.71		



Report: **CHEMICAL ANALYSIS TEST RESULTS** **I.G.S.L**

CONTRACT : Proposed Industrial Development
CLIENT : Horgan Lynch & Partners

BOREHOLE NO.	SAMPLE NO.	DEPTH (M)	SAMPLE TYPE	TEST CODE	SULPHUR TRIOXIDE		Class	PH Value
					SO3 in water	SO3 IN SOIL		
1	6451	1.00	D	S	\	0.09	Class 1	8.00
3	6469	2.00	D	S	\	0.12	Class 1	7.00
5	6430	0.50	D	S	\	0.08	Class 1	7.50
7	6443	1.50	D	S	\	0.16	Class 1	7.50

NOTE: SO3 IN WATER IS PARTS PER 100,000
TEST CODES: S = SOIL W = WATER

mastown Bh4/6426/4.5m

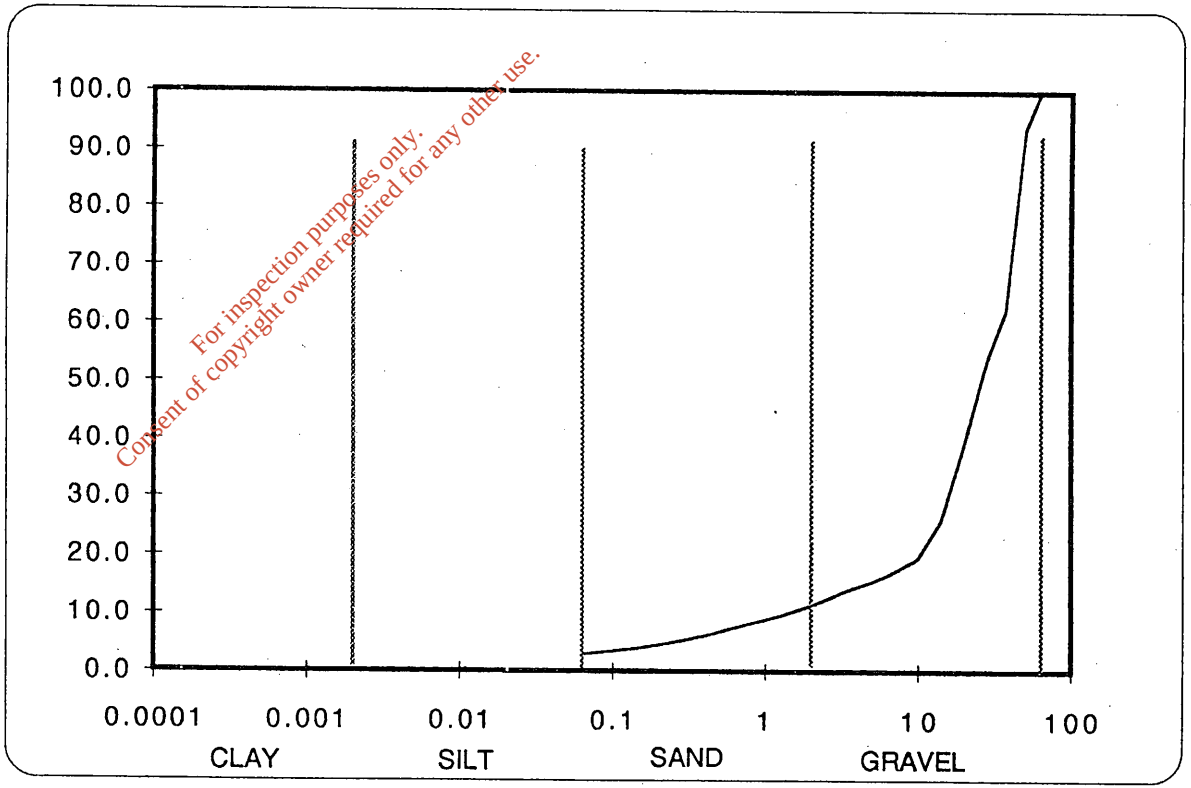
Report No.

PARTICLE SIZE ANALYSIS

I.G.S.L

CONTRACT: Proposed Industrial Development - Macetown
BOREHOLE No. 4
SAMPLE No. 6426
DEPTH: 4.50
TEST METHOD: Wet Sieve

particle size	%passing	
75	100.0	COBBLES
63	100.0	GRAVEL
50	93.7	
37.5	62.3	
28	53.6	
20	39.3	
14	25.8	
10	19.5	
6.3	16.6	
5	15.5	
3.35	14.0	
2	11.5	SAND
1.18	9.5	
0.6	7.5	
0.425	6.4	
0.3	5.5	
0.15	4.0	
0.063	3.0	SILT/CLAY
0.04		
0.03		
0.02		
0.013		
0.009		
0.005		
0.002		



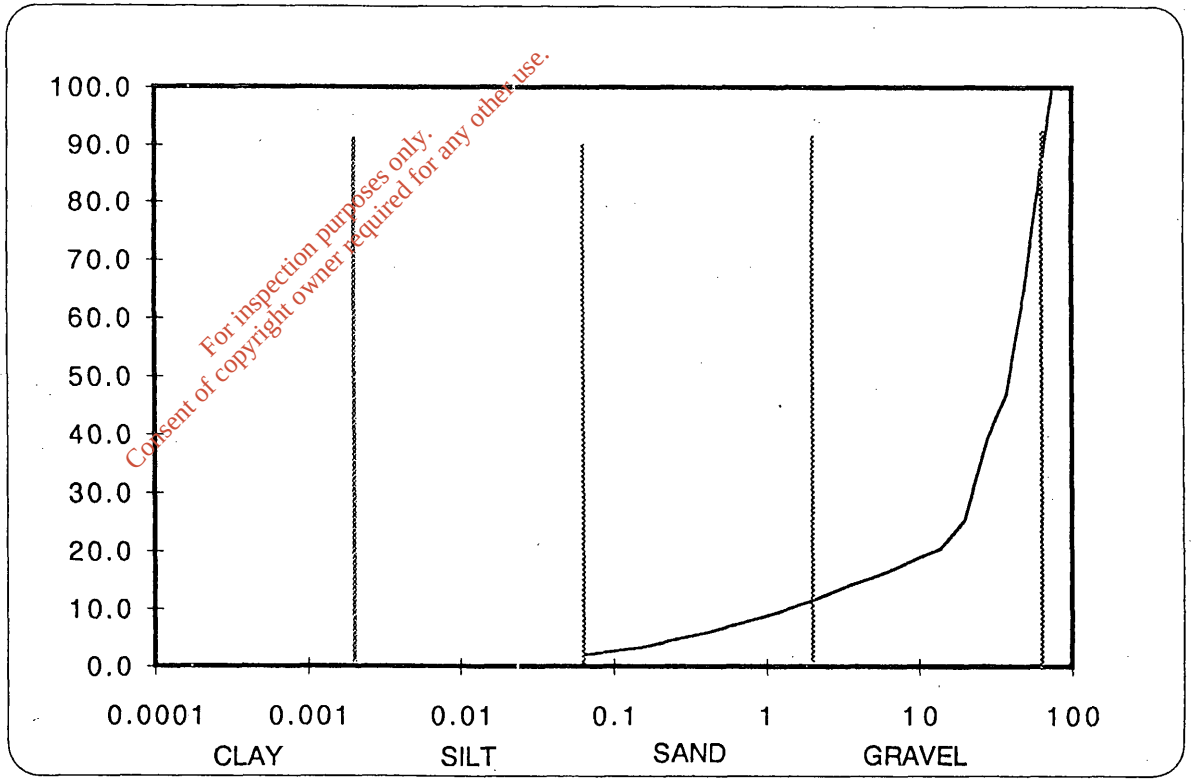
Report No.

PARTICLE SIZE ANALYSIS

I.G.S.L

CONTRACT: Proposed Industrial Development - Macetown
BOREHOLE No. 4
SAMPLE No. 6428
DEPTH: 7.50
TEST METHOD: Wet Sieve

particle size	%passing	
75	100.0	COBBLES
63	86.1	GRAVEL
50	65.9	
37.5	46.9	
28	39.4	
20	25.5	
14	20.6	
10	19.0	
6.3	16.6	
5	15.6	
3.35	14.0	
2	11.6	SAND
1.18	9.5	
0.6	7.2	
0.425	6.1	
0.3	5.2	
0.15	3.4	
0.063	2.0	SILT/CLAY
0.04		
0.03		
0.02		
0.013		
0.009		
0.005		
0.002		



amastown Bh7/6447/5m

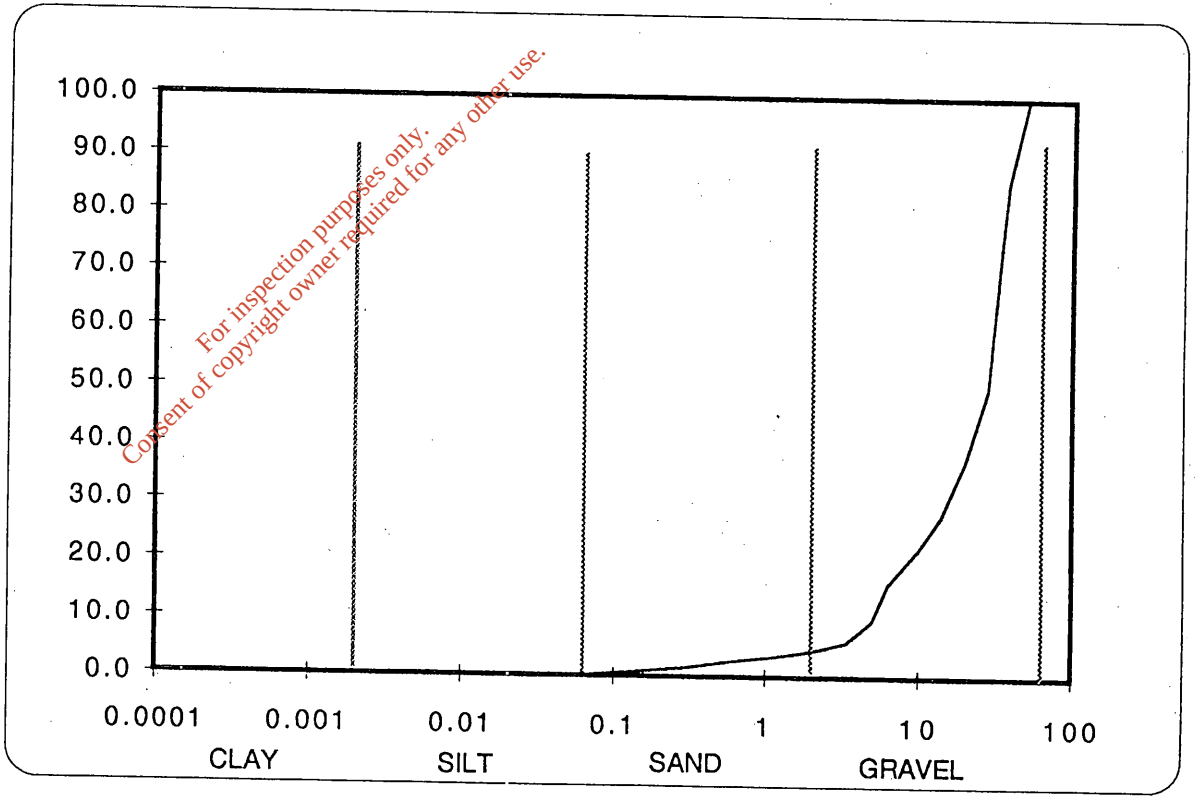
Report No.

PARTICLE SIZE ANALYSIS

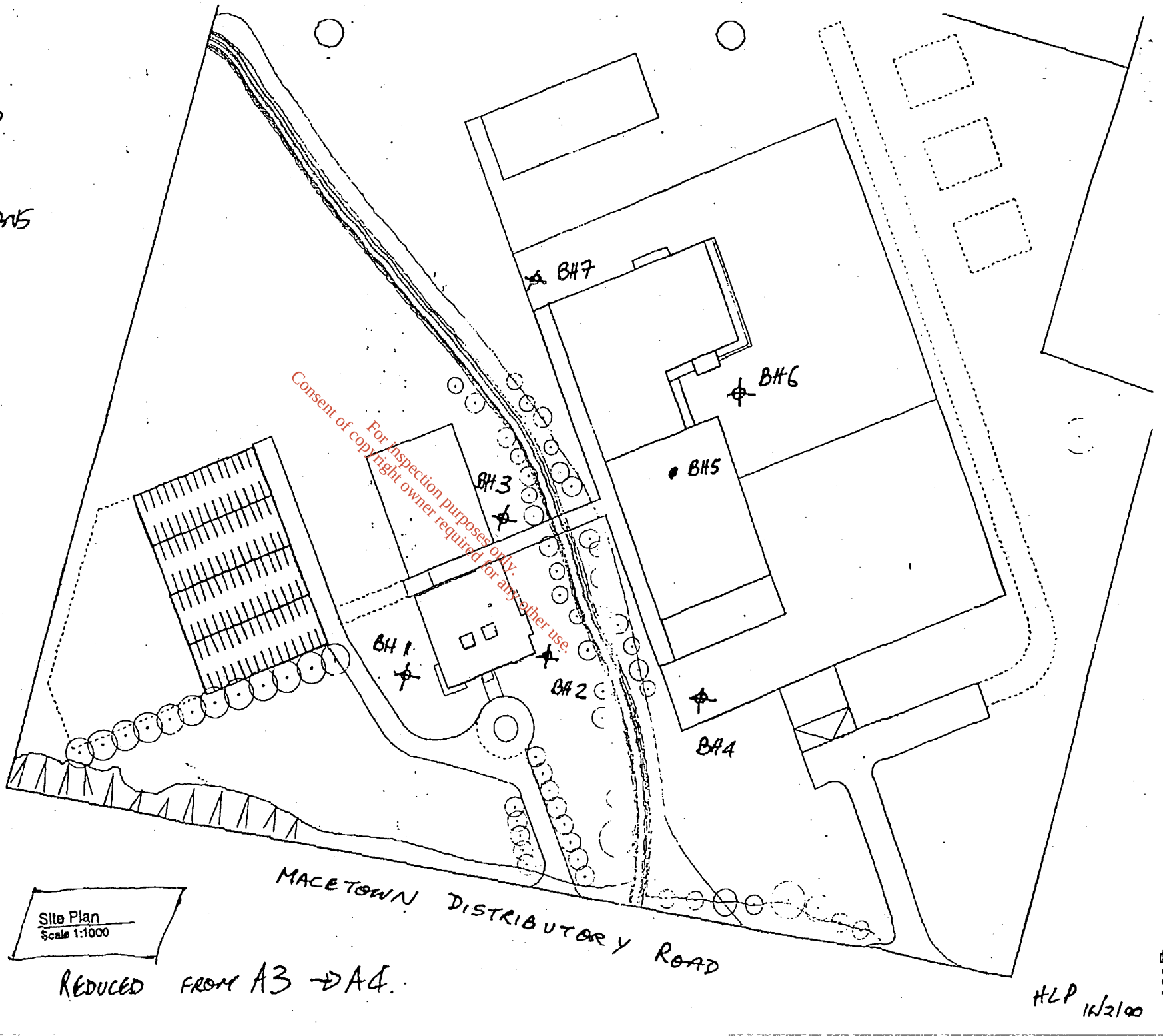
I.G.S.L

CONTRACT: Proposed Industrial Development - Macetown
BOREHOLE No. 7
SAMPLE No. 6447
DEPTH: 5.00
TEST METHOD: Wet Sieve

particle size	%passing	
75	100.0	COBBLES
63	100.0	
50	100.0	
37.5	85.3	
28	49.9	
20	37.4	GRAVEL
14	27.7	
10	22.1	
6.3	16.0	
5	10.0	
3.35	6.1	
2	4.6	
1.18	3.6	
0.6	2.7	
0.425	2.2	SAND
0.3	1.6	
0.15	0.9	
0.063	0.2	
0.04		
0.03		
0.02		
0.013		SILT/CLAY
0.009		
0.005		
0.002		



APPENDIX IV: SITE PLAN

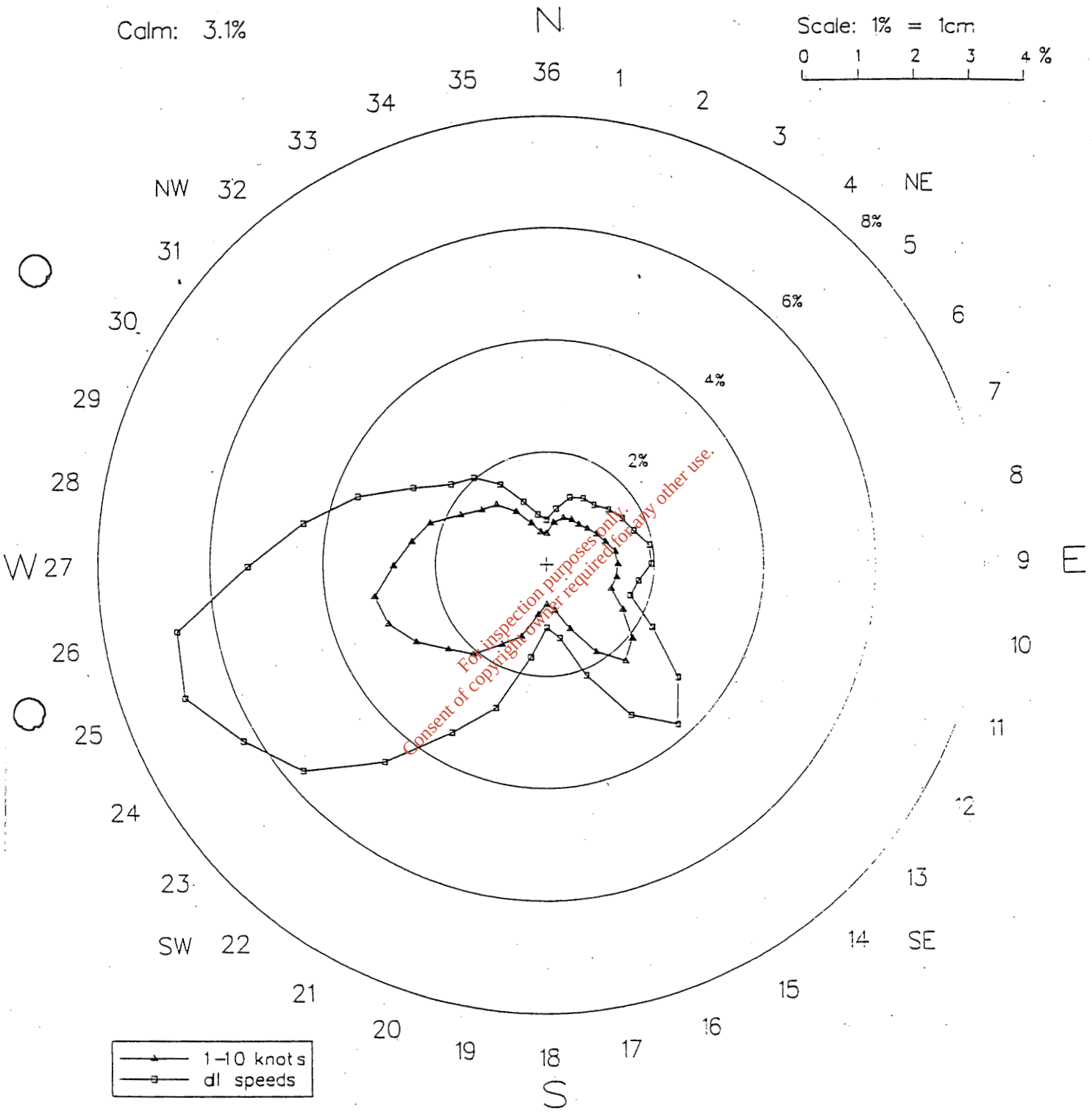


APPENDIX 4

Meterorological Data

Dublin Airport 1965–1994

Percentage Frequency of Occurrence of Wind Directions



Percentage Frequency of Occurrence of Wind Speeds

+ less than 0.1

0	1–3	4–6	7–10	11–16	17–21	22–27	28–33	34–40	41–47	over 48	knots
3.1	11.0	17.3	26.6	28.0	9.7	3.6	0.6	+	+	0.0	%

mean wind speed: 9.9 knots

standard deviation: 6.0 knots

anemometer height: 12m

Meteorological Service, Glasnevin Hill, Dublin 9.

number of simultaneous occurrences of specified ranges of mean hourly wind speed and direction

Dublin Airport — all months — (january 1965 to december 1994)

direction in degrees	wind speed in knots												
	calm	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	over 63	total
010		644	718	636	486	119	40	12						2655
020		704	773	858	702	177	111	6	1					3332
030		741	777	902	781	263	85	9	3					3561
040		658	782	982	808	282	87	2	1					3602
050		587	833	1164	1002	303	68	3						3960
060		594	927	1295	1110	274	65	3						4268
070		703	1047	1308	997	331	127	26						4539
080		821	1216	1367	1182	335	145	37						5103
090		924	1254	1300	1106	403	107	34						5128
100		996	1307	1162	835	200	51	10	1					4562
110		1008	1240	1103	716	213	66	9						4355
120		1111	1485	1700	1186	284	140	30	1					5937
130		1131	1750	2572	2041	567	216	38	5					8320
140		1171	1870	2930	2876	704	269	51	3					9874
150		1000	1532	2253	2441	721	220	43	5					8215
160		795	973	1450	1713	484	138	22						5575
170		618	683	881	982	277	78	5						3524
180		546	574	751	791	253	48	7						2970
190		484	777	1124	1362	494	176	9	2					4428
200		671	1073	1843	2418	860	251	34	5					7155
210		642	1283	2386	3258	1114	341	55	3	2				9084
220		840	1525	3108	4168	1642	627	104	6					12020
230		809	1764	3557	5508	2332	850	129	16	2				14967
240		965	2152	4055	5692	2418	970	161	27	4				16444
250		937	2290	4765	5967	2629	1219	224	42	9				18082
260		965	2422	4887	5638	2352	1103	220	27	8				17622
270		1073	2194	4002	4257	1718	604	136	33	1				14018
280		1116	2020	3359	3358	1176	464	82	12					11587
290		985	1838	3041	2492	818	264	42	5					9485
300		913	1490	2318	1915	468	147	25	1	1				7278
310		766	1267	1988	1496	279	78	21	4					5899
320		793	1169	1723	1301	274	69	9						5338
330		686	900	1278	1116	276	81	15						4352
340		517	660	898	813	182	57	6						3133
350		451	497	605	580	169	79	3						2384
360		448	504	508	464	134	45	4	1					2108
total	8104	28813	45566	70059	73558	25525	9486	1626	204	27				262968

percentage frequency of simultaneous occurrences of specified ranges of mean hourly wind speed and direction

Dublin Airport — all months — (january 1965 to december 1994)

direction in degrees	calm	wind speed in knots 1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55	56-63	over 63	total
010		0.2	0.3	0.2	0.2	0+	0+	0+						1.0
020		0.3	0.3	0.3	0.3	0.1	0+	0+	0+					1.3
030		0.3	0.3	0.3	0.3	0.1	0+	0+	0+					1.4
040		0.3	0.3	0.4	0.3	0.1	0+	0+	0+					1.4
050		0.2	0.3	0.4	0.4	0.1	0+	0+						1.5
060		0.2	0.4	0.5	0.4	0.1	0+	0+						1.6
070		0.3	0.4	0.5	0.4	0.1	0+	0+						1.7
080		0.3	0.5	0.5	0.4	0.1	0.1	0+						1.9
090		0.4	0.5	0.5	0.4	0.2	0+	0+						2.0
100		0.4	0.5	0.4	0.3	0.1	0+	0+	0+					1.7
110		0.4	0.5	0.4	0.3	0.1	0+	0+						1.7
120		0.4	0.6	0.6	0.5	0.1	0.1	0+	0+					2.3
130		0.4	0.7	1.0	0.8	0.2	0.1	0+	0+					3.2
140		0.4	0.7	1.1	1.1	0.3	0.1	0+	0+					3.8
150		0.4	0.6	0.9	0.9	0.3	0.1	0+	0+					3.1
160		0.3	0.4	0.6	0.7	0.2	0.1	0+						2.1
170		0.2	0.3	0.3	0.4	0.1	0+	0+						1.3
180		0.2	0.2	0.3	0.3	0.1	0+	0+						1.1
190		0.2	0.3	0.4	0.5	0.2	0.1	0+	0+					1.7
200		0.3	0.4	0.7	0.9	0.3	0.1	0+	0+					2.7
210		0.2	0.5	0.9	1.2	0.4	0.1	0+	0+	0+				3.5
220		0.3	0.6	1.2	1.6	0.6	0.2	0+	0+					4.6
230		0.3	0.7	1.4	2.1	0.9	0.3	0+	0+	0+				5.7
240		0.4	0.8	1.5	2.2	0.9	0.4	0.1	0+	0+				6.3
250		0.4	0.9	1.8	2.3	1.0	0.5	0.1	0+	0+				6.9
260		0.4	0.9	1.9	2.1	0.9	0.4	0.1	0+	0+				6.7
270		0.4	0.8	1.5	1.6	0.7	0.2	0.1	0+	0+				5.3
280		0.4	0.8	1.3	1.3	0.4	0.2	0+	0+					4.4
290		0.4	0.7	1.2	0.9	0.3	0.1	0+	0+					3.6
300		0.3	0.6	0.9	0.7	0.2	0.1	0+	0+	0+				2.8
310		0.3	0.5	0.8	0.6	0.1	0+	0+	0+					2.2
320		0.3	0.4	0.7	0.5	0.1	0+	0+						2.0
330		0.3	0.3	0.5	0.4	0.1	0+	0+						1.7
340		0.2	0.3	0.3	0.3	0.1	0+	0+						1.2
350		0.2	0.2	0.2	0.2	0.1	0+	0+						0.9
360		0.2	0.2	0.2	0.2	0.1	0+	0+	0+					0.8
total	3.1	11.0	17.3	26.6	28.0	9.7	3.6	0.6	0.1	0+				

total number of observations = 262968 the entry "0+" indicates the percentage is between zero and 0.05

STATION NAME: Dublin Airport

RP5 60min= 15.4 MM : RP5 2d=53.0 MM : ANNUAL RAINFALL = 750

RAINFALL IN MM. FOR A RANGE OF DURATION AND RETURN PERIOD

	RETURN PERIOD (YEARS)						
JRATION	1/2	1	2	5	10	20	50
15 min	4.7	6.0	6.7	9.5	11.8	14.4	18.7
30 min	6.2	7.8	8.8	12.4	15.4	18.9	24.4
60 min	7.9	10.0	11.1	15.4	18.9	22.9	29.4
2 hr	10.9	13.5	15.1	20.1	24.2	28.8	36.1
4 hr	14.8	18.2	20.0	26.0	30.6	35.8	43.6
6 hr	17.5	21.5	23.7	30.7	36.3	42.4	51.6
12 hr	22.8	27.5	30.2	38.7	45.3	52.2	63.1
24 hr	27.5	33.1	36.4	46.6	54.6	63.0	76.0
48 hr	34.3	41.0	44.4	56.2	65.2	74.2	88.8

APPENDIX 5

Noise Monitoring

Mean and Standard Deviation

Daytime 07.00 hours to 22.00 hours
Night time 22.00 hours to 07.00 hours

Location: Western boundary of plant

Hours: 07.00 to 22.00		L_{Aeq}	L_{A10}	L_{A90}
N = 121	**Mean**	54.2	56.0	49.0
	S.D.	2.1	2.0	1.6
Hours: 22.00 to 07.00		L_{Aeq}	L_{A10}	L_{A90}
N = 70	**Mean**	48.6	50.4	44.5
	S.D.	2.8	2.6	1.5