

**DUBLIN CORPORATION**  
**DRAINAGE DEVELOPMENT DIVISION**

**RIVER DODDER — 1986 FLOODING  
REPORT**

December 1986

Chief Engineer  
Engineering Services

DUBLIN CORPORATION

ENGINEERING DEPARTMENT

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1. INTRODUCTION

The River Dodder is one of Dublins best known and most important rivers. Its upper reaches stretch from Kippure to Bohernabreena where it forms a reservoir system which is an integral part of the water supply to Dublin. Flowing through open countryside and thereafter through the suburbs of the city the river and its surrounding parklands are an extremely important amenity. Besides its visual attraction the river is widely used by fishermen and by a variety of sporting and recreational interests over its 16 mile long course.

The river has long been noted for its flashy character and quick response to rainstorms. Because of its mountainous upper catchment, which exhibits high run-off from the heavy rainfall, and because its catchment area is large in proportion to its length it has had many serious floods over the years. In a paper read to the Old Dublin Society, "Weather in Old Dublin" by F.R.Met. Soc. Vol.13 1953, Dublin Historical Society, reference is made to floods on the Dodder, the most recent being September 1787, November 1794, December 1802 ("this must rank as the most serious of all Dublin floods"), September 1807, January 1851 etc. Writing in 1844 Mallet refers to a "a recent flood of appalling circumstances which finally led to expensive litigation".

Detailed records extend back as far as the 1880's. The construction of the reservoir system at Bohernabreena in 1883 has, no doubt, helped to alleviate the problem of flooding in the downstream reaches of the river. Nevertheless, there have been several major floods since it's construction. The flood of the 25th August 1905 and that of the 3rd/4th September 1931 are generally accepted as the two greatest floods in the present century prior to 1986.

The weather during the summer of 1986 was cool and broken. Consequently soil moisture contents were unusually high on Mon. 25th August when an off-shoot from hurricane "Charlie" moved north-eastwards over the country causing huge amounts of rainfall, particularly in the Dublin and Wicklow areas. In a 24-hour period in excess of 200 mm (8 inches) fell in the Kippure area and 100 mm (4 inches) in parts of the south city area. The resulting river flood waters overflowed the banks at various sections of the River Dodder causing widespread hardship to the owners of many properties and economic loss to the community of several tens of millions of pounds.

During and in the weeks following the storm Corporation Personnel were engaged in an operation which aimed to bring immediate relief to the victims. Rivers were cleared of obstructions, debris cleaned from roads, water pumped from private and residential property, house drains cleared and for certain old or needy citizens houses washed down. A team of Engineers from the Main Drainage Division began to systematically record details of the flood. Special attention was paid to the points where the flood waters overtopped the banks, the extent of the flood plain, and to times and levels of peak flood. Surveys were then carried out along the river to ascertain the amount of damage caused and to examine the river cross-sections and characteristics, many of which have changed over the previous decades. Finally an analysis was initiated into the causes of the flood, the likelihood of it happening again and into possible ways of alleviating certain future floods on the river.

The results of the investigation are presented herein and in an associated Book of Photographs and Book of Drawings.

## 2 SCOPE OF REPORT

The report seeks to give a general picture of the river and its catchment. Details of previous flooding on the river are examined and the role of the Reservoirs at Bohernabreena explained. An attempt has been made to record the 1986 flooding in great detail and this has been presented in a section by section manner to enable the reader to quickly identify areas of particular interest. This is followed by an analysis of the rainfall, river flows and extent of flooding.

The cost of immediate repair work has been estimated for the various sections of the river. General descriptions of such work have been given on the accompanying Drawings. Very preliminary proposals and cost estimates for work which would eliminate floods of different magnitudes and return periods are presented, and certain stretches of the river where available monies could be most gainfully spent have been identified.

The report covers the section of the river inside the city boundary and the common boundary between city and county plus the Reservoir area at Bohernabreena. The length of river inside the Dublin County Area is being investigated by County Council Engineers.

## 3 THE RIVER DODDER

### 3.1 General Information

The River Dodder rises at Kippure (near Dublin-Wicklow County boundary) at an elevation of 2,473 ft. (753.8m) O.D., and flows down through the (developing) suburban areas of Tallaght Rathfarnham/Terenure and through the 'city' areas of Donnybrook and Ballsbridge, before discharging into the Liffey estuary at Ringsend. (See Catchment Map overleaf). The total length of the river from source to outfall is approximately 16.8 miles (27km<sup>2</sup>) and the total catchment area approximately 28,000 acres (113.3km<sup>2</sup>). Between the source of the river at Kippure and the spillway crest at the Lower Reservoir at Bohernabreena (495 ft. (150.9m) O.D.), the river falls 1,978 ft. (602.9m) over 5.9 miles (9.5km), i.e., a sharp average gradient of 1/15. From the spillway crest at the Lower Reservoir to the estuary the fall is only 495 ft. (151m) in 10.3 miles (17.5km), i.e., a much gentler average gradient of 1/115. The lower 10 miles (16km) of the river contains 13 weirs of varying height, which tend to curtail to some extent the quick channel velocities one would expect from the average channel gradient.

Downstream of the weir at Ballsbridge (about 1 mile(1.6km) upstream from the outfall) the river is tidal.

The Dodder has 3 major tributaries flowing southwards from the Dublin mountains into the river. They are:-

1. The Dundrum River - draining 2,600 acres (10.5km<sup>2</sup>) and joining the main channel upstream of Milltown.
2. The Little Dargle River, draining 2,920 acres (11.8km<sup>2</sup>), joining the main channel upstream of Orwell Bridge.
3. The Owendoher River, draining 5,230 acres (21.2km<sup>2</sup>), and joining the main channel in the Rathfarnham area.

The Tallaght stream is the only other significant tributary of the Dodder. This flows in a westward direction from the mountains through Tallaght and joins the main stream in the Firhouse area.

In 1883 a reservoir system (2 reservoirs) was constructed in a steep-sided valley approximately 5 miles (8km) from the river source (see section 3.2 for description of the reservoir system).

The flow in the River Dodder is monitored at two points on the river, viz.,

1. At Bohernabreena Reservoirs records are kept of reservoir levels, by-pass channel flow, spillway flow, pipe flow, rainfall, etc.
2. At Orwell Bridge a level recorder has been in operation for almost 40 years. Detailed records of flows at this point have been kept and they form a very important basis for the analysis of the storm in section 5.

### 3.2 Bohernabreena Reservoirs

The reservoir system at Bohernabreena was constructed in 1883 to serve as a water supply to the city of Dublin.

It consists of 2 reservoirs:-

(a) The Upper Reservoir has a surface area of 57 acres (23 ha) and a capacity of 343 million gallons. Its catchment area is some 1715 acres (6.95km<sup>2</sup>) of mountain terrain, principally of metamorphic and silurian formation. The waters from this catchment are clear and suitable for drinking with minimum levels of treatment. Water is drawn from this Upper Reservoir at the rate of 6 m.g.d (million gallons per day)

(b) The Lower Reservoir has a surface area of 30 acres (12.1 ha) and a storage capacity of 110 million gallons. Its catchment area is 5200 acres (21.04 km<sup>2</sup>) and produces a light brown-coloured run-off from the peat covered granite uplands. This drains to the lower reservoir via a by-pass canal running alongside the upper reservoir although in recent years these waters have sometimes been diverted into the Upper Reservoir to maintain the water supply during periods of low rainfall.

Recorders are in position in both reservoirs and in the by-pass canal enabling a comprehensive picture to be obtained about reservoir levels flows over spillways etc. Further information on the reservoir system can be obtained in the report "Feasibility of Reservoir Control at Bohernabreena on the Dodder River", produced in 1978 by the Main Drainage Department.

### 3.3 History of River Flooding

As stated previously the river has a long history of flooding back to the time when records began. The table below lists, in tentative order of severity, the most significant floods on the River Dodder. The 1905 flood is generally accepted as being the largest recorded with an estimated maximum flow at Orwell of 7000 cu secs (more conservative estimates put 6000 cu secs), and a maximum flow of 3500/4200 cu secs at the lower reservoir spillway, which is the exit spillway for all flows from the upper catchment. Records from Bohernabreena indicate that the water ran 4ft over the lower spillway with 24" (600 mm) and 27" (675 mm) scour pipes, which by-pass the spillway, both open.

Rainfall data received from the Meteorological Office and from the Journal Royal Meteorological Society indicates that just less than 6 inches rain fell in a 24 - hour period of which 2.02 inches fell in 3 hours. This flood caused considerable damage in Bohernabreena sweeping away part of the by-pass canal and Castlekelly Bridge.

The 1931 flood, with an estimated maximum of 5400 cu secs at Orwell, caused a similar amount of damage. Considerable development of the catchment had taken place by this time, thereby exacerbating the effects of the flood. No rainfall records are available at Bohernabreena due to gauge malfunction and the severity of the rainfall does not appear to be as great as 1905. Both the 1905 and 1931 floods, unlike the present flood, were preceded by a period of drought.

#### LIST OF HIGHEST RANKED FLOODS PRIOR TO 1986

DATE	BOHERNABREENA FLOW (cu secs)	ORWELL FLOW (cusecs)
25th August, 1986	3200	7600/9000
25 August 1905	3500/4200	7000 (?)
3 September 1931	(?)	5400
27 October 1880	(?)	(?)
19 October 1891	3400	(?)
17 November 1965	2300	4900
19 December 1958	2000	4100
23 November 1898	(?)	(?)
12 August 1946	2800	3100
2 November 1968	(?)	3000
26 August 1912	2300	(?)
10 November 1901	(?)	(?)
11 November 1915	(?)	(?)
16 October 1886	1700	(?)
3 September 1883	(?)	(?)
25 September 1957	1475	2610
29 December 1956	1065	2580

#### 4 Flooding of 25th/26th August 1986

##### 4.1 Flood Plain (Drawing No 1761 - 2 to 5)

The flood plain of the river from downstream of Rathfarnham Bridge to Ringsend is shown on a small scale sketch overleaf. More detailed records of the flood plain may be found on the 3 No. 1:2500 scale maps (Nos. 1761.2-4) in the Book of Drawings. From the available records it is reasonable to suggest that this flood plain spread over a larger area of the city than previously was the case. This is particularly true of the Ballsbridge and Sandymount areas referred to in Section 4.5 below.

The river has been divided into the following 5 sections to enable the reader to quickly locate any area of interest. The same 5 are used both in the book of Photographs and in the Cost Estimates in Sections 6 and 7:-

1. Rathfarnham Bridge to Classons Bridge (adjacent to Dropping Well Public House).
2. Classons Bridge to Clonskeagh Bridge.
3. Clonskeagh Bridge to Donnybrook Bridge.
4. Donnybrook Bridge to Ballsbridge.
5. Ballsbridge to Ringsend.

At the end of each section a sketch is given showing the location and extent of the flood plain. The results of the survey of property owners is also given for each section. Further information on the flooding on a street to street basis is given in Appendix A.

#### 4.2 Rathfarnham Bridge to Classons's Bridge (drawing Nos. 1761-6 to 8

##### 4.2.1. Lower Dodder Road and Dodder Park Road

The first major area of flooding occurred along Lower Dodder Road and Dodder Park Road and resulted from:

- (a) Breach of the river wall on Lower Dodder Road downstream of Rathfarnham Bridge and immediately upstream of the weir. The water flowed out mainly through a set of relief holes in the top of the wall.
- (b) Blockage of the pedestrian footbridge along Lower Dodder Road. Fallen trees and other debris were washed away by the flood and badly damaged and blocked the bridge. The waters poured out onto the roadway for a short period.
- (c) Flood waters from the Golf Club Stream and the Little Dargle River flowed overground adjacent to Young's Caravan Park, flowed through the Park and across Dodder Park Road.
- (d) Water flowed down the steep hill from the Braemor Road direction and joined the waters from (c). This combined flow caused a wall to collapse at the rear of no 92 Lower Dodder Road and as a consequence flood waters entered the rear of Nos. 77 - 92 Lower Dodder Road. Much of the water from (c) and (d) poured onto Lower Dodder Road. The flooding in this area stretched along Lower Dodder Road to a point some 20 metres south of Waldron's Bridge. It did not cross over the Bridge.

##### 4.2.2. Orwell Gardens (Drawings Nos. 1761-6)

The main measurement gauge for the river is located 25 metres upstream of Orwell Bridge, also called Waldron's Bridge. The gauge house was badly flooded and the recording chart did not function for in excess of a twelve hour period during the storm. However, the results of observations of levels by various people and records from an Foras Forbartha have enabled a reasonably accurate flow curve to be drawn (see Section 5).

SECTION 4.2. RESULTS OF INTERVIEWS WITH PROPERTY OWNERS.

NAME	ADDRESS	TIME OF FLOODING	TIME OF PEAK FLOODING	PAST HISTORY OF FLOODING	VISUAL SURVEY
	39 Lr. Dodder Rd.	12.30 a.m.	1.30 a.m.	1963	No road flooding.
	50 Lr. Dodder Rd.	10.30 p.m.	1.00 a.m.	1958 Garden flooded.	Water lapping in front garden.
	60 Lr. Dodder Road	12.00 midnight	1.00 a.m.	1958 reached gale	Reached pavement.
	68 Lr. Dodder Road	8.30 p.m.	1.30 a.m.	—	Water below floor vent level
	80 Lr. Dodder Road	10.00 p.m.	1.15 a.m.	—	3" over floor level
	86 Lr. Dodder Road	5.00 @ back	1.00 a.m.	—	Through back door 12.00 midnight. 3" in house.
	92 Lr. Dodder Road	10.00 p.m.	—	not in 34 years.	Whole house flooded.

SECTION 4.2. RESULTS OF INTERVIEWS WITH PROPERTY OWNERS.

NAME	ADDRESS	TIME OF FLOODING	TIME OF PEAK FLOODING	PAST HISTORY OF FLOODING	VISUAL SURVEY
	10 River Bank, D.P. Road	10.00 p.m.	1.00	new apartment	12" water
	22 River Bank, D.P. Road	8.30 p.m.	—	—	Water flowing from Caravan Park, 16" total
	50 Orwell Gardens	8.30 p.m.	11.30 p.m.	1964 & previously	23" water.
	52 Orwell Gardens			1964 not as bad	23" water - filled from road & side wall.
	1 Dartry Cottages			not since early 1900's	18" water from gate at side of house.
	4 Dartry Cottages				36" in front room. From back of house.

SECTION 4.2. RESULTS OF INTERVIEWS WITH PROPERTY OWNERS.

NAME	ADDRESS	TIME OF FLOODING	TIME OF PEAK FLOODING	PAST HISTORY OF FLOODING	VISUAL SURVEY
Norths Ltd.	Dartry	_____	_____	_____	17" above floor level. See photographs.
Clearys	The Dropping Well Pub	7p.m.	2 a.m.		Basement filled to ceiling. Also in front door.

4.3 RESULTS OF INTERVIEWS WITH PROPERTY OWNERS

NAME	ADDRESS	TIME OF FLOODING	TIME OF PEAK FLOODING	PAST HISTORY OF FLOODING	VISUAL SURVEY
_____	5 Strand Terrace	9.30	House evacuated	_____	0.8 m water in front room
_____	7 Strand Terrace	9.30	evacuated at midnight from roof	New Tenants	0.95 m water in the kitchen, water poured in from river.
Apartments	Opposite St. Annes School on south bank	_____	_____	_____	No flooding of Apartments. Car Park was flooded to a depth of 100 mm
O' Sheas Pub	Clonskeagh Road	11. p.m.	12.30 a.m.	_____	Water came from low point on river wall and not from bridge area.

The water overtopped the eastern grass bank and concrete wall some 10 metres downstream of Waldrons Bridge. The wall was in fact overtopped at its highest section and this is possibly due to:

- (a) Debris immediately downstream
- (b) Wave action from underneath the Bridge along the gently contoured bank

Although this wall and bank were only overtopped by a few inches, garages backing onto the river paths, some 12 houses and quite a large area were flooded as the water flowed down Doddervale Lane and into Orwell Gardens via a pathway leading from the footbridge. This footbridge was damaged and blocked but the consensus of local opinion is that the new wall, constructed in the 1960's by Dublin Corporation after previous flooding, was not breached. Neither did the floodwaters enter Orwell Gardens via it's main entrance adjacent to Orwell Bridge. It should be further pointed out that the level of flooding in Orwell Gardens was minimal in comparison to earlier floods and this is entirely due to the construction of the new wall.

#### 4.2.3 Dodder Park to Classons Bridge.

It was always intended that Murphy Park would become part of the flood plain during fairly large floods in order to protect Orwell Gardens and this proved to be the case on this occasion. The flood waters tore up large sections of Dodder Park Soccer Ground, having knocked a 40 metre section of block wall on the northern bank upstream of the footbridge referred to previously. Dartry Cottages were badly flooded as were the basement premises at Norths (Ireland) Ltd. Thereafter the river split into two streams; one part following the natural course and the other heading across the river channel to an open field. The two streams rejoined just upstream of the South Hill Weir.

The whole area in the vicinity of the Dropping Well Public House and Classons Bridge experienced extensive flooding as shown on the accompanying sketch. The South Hill Weir was totally drowned and a downstream wall swept away. The water depth on Milltown Road was 1.075 metres while the Public House was flooded to a depth of 1.5 metres.

#### 4.3 Classons Bridge to Clonskeagh Bridge.

The very wide flood plain in the vicinity of Classons Bridge encompassed the cottages at Strand Terrace, opposite St. Annes Secondary School. Much of the linear park and high level walkway was covered to a depth of 3 feet and the flood waters caused the collapse of a masonry wall some 10 metres downstream of Strand Terrace and 20 metres from the south bank of the river.

The flood plain widened considerably upstream of Clonskeagh Bridge as water poured down towards O'Sheas pub which lies to the north of the river at a low level. Some 30" of water was recorded inside this property at about 12.30 a.m. On the south bank the flood plain spread some 10 metres from the normal channel and considerable erosion of banks occurred in this stretch of river (see also section 6). The water did not flow onto the road at the bridge.

#### 4.4. Clonskeagh Bridge to Donnybrook Bridge.

The property of Smurfits Ltd., lies on the northern bank of the river and, on the 25th August 1986, had little protection against even quite minor floods. Apparently their premises has frequently suffered from flooding in the past but in this case a water height of 2.7 metres on the river bank caused considerable damage to paper stocks, machinery and to the computer. Subsequent to this flood a new reinforced concrete wall has been erected adjacent to the bank and repair work carried out to the weir by the firm.

The river was contained within the high walls on Beech Hill Road until it reached Vergemount Weir. There it overflowed its southern bank flooding 2 small cottages on Beech Hill Road before returning to its natural course downstream of the weir. The water did not enter onto Beaver Row at this point but via an open railing upstream of the partially blocked pedestrian bridge. The houses on Beaver Row were not flooded - the waters reached the bottom steps of the front doors.

One of the worst hit areas was Simmonscourt Terrace, where many of the houses are of single storey design. About 2 feet (600mm) of water was recorded at 2.30 a.m. in many of the lower properties (this is approximately 0.775 m. above path level). A large block wall at the end of the cul-de-sac stopped the floodwaters from escaping and a considerable amount of damage was caused. Many of the residents had almost all of their belongings destroyed. It was reported that some flooding did occur previously in 1963; in 1965 sandbagging of the high level entrance road kept the waters at bay.

The C.I.E. Bus Depot was also flooded although most of the damage was caused in the main depot which has a sunken floor 1.25 m. below ground floor level. Water entered both from the main front door and from a door adjacent to Simmonscourt Terrace.

One of the areas where the flooding was not widely publicised was on the northern bank, upstream of Donnybrook Bridge. Here the waters overflowed upstream of the pedestrian footbridge flooding Brook Lodge, on Brookvale Road. The back gardens of Nos. 4, 6 and 8 Eglinton Road were flooded. However, as the wall level on the northern bank is higher than the railing level on the southern side, most of the flood volume poured into the Beaver Row and Simmonscourt Terrace area. The water level was 300 mm. above the crown of the bridge at one stage during the night.

#### 4.5 Donnybrook Bridge to Ballsbridge.

##### 4.5.1. General.

The river in this area was the source of much of the flooding in the Dodder Basin. The main outlet was a stretch of wall and bank at the rear of Anglesea Road, just downstream of the bridge at Donnybrook. This was the source of flooding in Anglesea Road, Simmonscourt Road, Merrion Road, Ballsbridge Avenue, Beattys Avenue (partially), Serpentine Avenue, Sandymount Avenue, Sydenham Road, Wilfield Road, Wilfield Park, Gilford Park, Gilford Drive, Gilford Road, Serpentine Terrace, in all an area

of some 140 acres. Huge volumes of water poured out into this area and it was estimated that at the peak of the storm that well in excess of 500 cubic feet per second (15 m<sup>3</sup>/sec) flowed down Anglesea Road alone.

#### 4.5.2. Anglesea Road to Sandymount

Downstream of Donnybrook Bridge, shortly after 9 p.m., walls at the rear of Nos. 131 - 125 Anglesea Road and in particular Nos. 125 - 107 Anglesea Road were overtopped. Water also escaped over a low section of embankment at the rear of Somerset. Huge volumes of water flowed down the laneway at the rear of these houses, flooding the Licenced Vintners Association Grounds and Brookfield Apartments. The basements of the houses along this stretch of Anglesea Road were badly flooded, the water entering from the rear.

The main stream knocked a wall and entered the Hazeldene Apartment Complex (the apartments were not flooded). A further wall collapse allowed the waters to pour into Merrion Cricket Club. Large amounts of water flowed onto Anglesea Road via the Hazeldene Complex and Merrion Cricket Club's entrances. The main flow knocked the river wall to the rear of "Dunluce" and "Somerset" before re-entering the river proper again. It appears that the large earthen embankment was not overtopped.

On the opposite bank the waters had poured into Donnybrook Rugby Ground, completely covering the main pitch, before re-entering the river channel close to the north east corner of the "second" pitch.

The water on Anglesea Road split at the Church of Ireland and flowed down Anglesea Road and Simmonscourt Road. The R.D.S. was almost completely covered, the water entering from both Anglesea Road and Simmonscourt Road. The depth and flow of water on Anglesea Road was very high and this was the main source of flooding in the Ballsbridge Avenue, Allied Irish Banks Centre and Irish Hospitals Trust area. It was also the main source of flooding down Serpentine Avenue, where it inundated basements and ground floors. The Pembroke Hockey Club acted as a reservoir for the area and it appears the Dart Line was not significantly breached on Serpentine Avenue.

The flow on Simmonscourt Road caused minor flooding to the Simmonscourt Grounds before splitting at Merrion Road. Water flowed to Serpentine Avenue where it joined the Lower Anglesea Road stream while the major flow continued down Sandymount Avenue, across the DART line. Thereafter, it caused extensive flooding in the Gilford, Wilfield Area of Sandymount, the flood waters advancing as far as Monkstown Rugby Club Grounds, where the main pitch was completely covered.

In Ballsbridge some of the floodwaters pouring down Anglesea Road crossed the main road and entered Beatties Avenue. At the peak of the storm in this area the flood waters just about entered the doorway of Paddy Cullens Pub (the basements in this area were flooded). For a period water overtopped the bridge and flowed across into Beatties Avenue.

SECTION 4.4 RESULTS OF INTERVIEWS WITH PROPERTY OWNERS

NAME	ADDRESS	TIME OF FLOODING	TIME OF PEAK FLOODING	PAST HISTORY OF FLOODING	VISUAL SURVEY
Smurfits Limited	Clonskeagh Road	8 p.m.	evacuated at 10 p.m.	Minor flooding contained by sandbags	Widespread damage 600 mm water at front
Business premises	105/113 Clonskeagh Rd.	_____	_____	_____	Minimum 450 mm water in basement.
B.P. Garage	Clonskeagh Road	_____	_____	_____	No flooding in garage Bank swept away.
_____	1 Beech Hill Road	10 p.m.	evacuated midnight	Never like this	1 m high outside front door.
_____	2 Beech Hill Road	9.45 p.m.	ditto	Never flooded before	Water 18 blocks high on back wall.
_____	10 Beaver Row	_____	_____	None	No house flooding. Water to small step level.

S ECTION 4 R L T S N T E I N S H P I R T Y T T I E R S

NAME	ADDRESS	TIME OF FLOODING	TIME OF PEAK FLOODING	PAST HISTORY OF FLOODING	VISUAL SURVEY
	1 Simmonscourt Terrace	Midnight	Subsided at 3. a.m.	Last flooded in 1963	Water mark 600 mm on front bedroom wallpaper.
	5 Simmonscourt Terrace	Midnight	_____	Threatened only	0.875 m outside.
	9 Simmonscourt Terrace	Midnight	2.30 a.m.	_____	600 mm water in house
	14 Simmonscourt Tce.	ditto	2.30 a.m.	_____	Last house in lane Watermark 0.775m above path level.
C.I.E. Depot	Beaver Row	_____	_____	_____	Sunken floor flooded to a depth of 450 mm
Lacy	Brookvale Road	_____	_____	_____	Water up to the back path only.

SECTION 4.4 RESULT OF INTERVIEWS WITH PROPERTY OWNERS.

NAME	ADDRESS	TIME OF FLOODING	TIME OF PEAK FLOODING	PAST HISTORY OF FLOODING	VISUAL SURVEY
Brook House	Dunbar, Brookvale Rd	8 p.m.	4 a.m.	_____	Up to back step level only.
	Brook Lodge	8 p.m.	4 a.m.	_____	Ground floor and gardens flooded.
	4 Eglinton Road	8,30 p.m.	_____	_____	2" mud in gardens. 1 m water above path.
	Eglinton Road	9.30 p.m.	2.45 a.m.		Water up to 600 mm deep in basement.

Section 4.5 Results of interviews with property owners.

NAME	ADDRESS	TIME OF FLOODING	TIME OF PEAK FLOODING	PAST HISTORY OF FLOODING	VISUAL SURVEY
	99 Anglesea Road	on holidays	—	—	900mm. in kitchen
	101 Anglesea Road	11.30 p.m.	to bed at 1 a.m.	—	Clear by 8 a.m. except for debris.
	109 Anglesea Road	12.30 a.m. in garden	1.30 a.m.	—	845mm. in basement. Sudden rise up to 12.30 a.m.
	113 Anglesea Road	10.30 p.m.	12.00 - 4 a.m.	10 years in house	Water over back wall. 810mm. in front room.
	119 Anglesea Road	—	—	1931 storm comparable	815mm. in 1931, 1445m in 1986: garage marks
	131 Anglesea Road	Prior to 9 p.m.	—	—	1120mm. on back wall. Subsided next morning

Section 4.5. Results of interviews with property owners.

NAME	ADDRESS	TIME OF FLOODING	TIME OF PEAK FLOODING	PAST HISTORY OF FLOODING	VISUAL SURVEY
	Brookfield Apts. Anglesea Road	—	Water gone at 4.00 a.m.	—	1125mm watermark in apartment.
	19 "Somerset", Anglesea Road	—	—	—	1550mm watermark in house. Rear wall knocked.
	21 "Dunluce", Anglesea Road	12.00 - 12.30	2.00 - 3.00 a.m		1675mm watermark in house.
	9 Serpentine Avenue	1.45 a.m.	2.30 house saturated		950mm watermark in lounge.
	Sydenham Court Apts. Sydenham Road.				750mm watermark.

Section 4.5. Results of interviews with property owners.

NAME	ADDRESS	TIME OF FLOODING	TIME OF PEAK FLOODING	PAST HISTORY OF FLOODING	VISUAL SURVEY
	Bankcentre, Merrion Road	1.00 water coming into basement	2.30 - 3.00 water over whole complex		Whole site flooded to 125mm, two blocks suffered water damage. 600mm in Stationery office @ rear of complex.
	Merrion Road	—	—		450mm over whole site.
	1B Sandymount Avenue	7.00 a.m.	3.30 a.m.	—	810mm water
	174 Pembroke Road	12.30 nothing coming over Ballsbridge 2.00 a.m. water coming through Ballistrades on Bridge and going down Merrion Road. 750mm of water on Anglesea Road.			

## SECTION 4.5 RESULT OF INTERVIEWS WITH PROPERTY OWNERS.

NAME	ADDRESS	TIME OF FLOODING	TIME OF PEAK FLOODING	PAST HISTORY OF FLOODING	VISUAL SURVEY
	50 Wilfield Road	_____	_____	_____	Did not go into house garden flooded.
	82 Wilfield Road	3.00 a.m.	5.00 a.m.	40 Years Plus	$\frac{1}{2}$ " below door. Over vent level.
	21 Wilfield Park	_____	_____	1963 Bad local	Vents under wooden floor filled with water.
	30 Wilfield Park	_____	4.30 a.m.	No memory	Water reached lip of door.
	23 Gilford Park	2.00 a.m.	3.30 a.m.	Never previous	Carpets destroyed, 1 ft. water in garden
	28 Gilford Park	12 0' Clock on road	3.30 a.m.	No History	Converted garage flooded.

SECTION 4.5. RESULT OF INTERVIEWS WITH PROPERTY OWNERS.

NAME	ADDRESS	TIME OF FLOODING	TIME OF PEAK FLOODING	PAST HISTORY OF FLOODING	VISUAL SURVEY
	40 Gilford Road	—	5.00 a.m.	—	1" of water. Came in front door first.
	46 Gilford Road	—	6.00 a.m.	None.	Front & back garden inundated.
	2 Gilford Drive	—	—	1963 Local	4" water in kitchen. Carpets destroyed.
	8 Wilfield Drive	4.00 a.m.	4.00 a.m.	no history	Front garden and 1" in garage. Water from front and back.

#### 4.6 Ballsbridge to Ringsend.

Debris gathered underneath the Rathmines and Pembroke sewer crossing downstream of Ballsbridge. This appears to have aided the erosion of a large section of the eastern bank wall which collapsed into the river. Waters which had previously been overtopping the wall, poured into the single storey cottages in Beatties Avenue, Dodder View Cottages, Herbert Cottages as far as Ballsbridge Avenue. It was in this area that the greatest collective hardship was suffered: many of the residents lived in single storey houses, some were elderly while a large number seemed to have had no household insurance. It was to this area that the greatest concentration of Dublin Corporation Personnel were assigned after the storm to attempt to bring some measure of relief to the victims.

On the western bank, the Swastika Laundry and the G. & T. Crampton Ltd. yards were flooded as the existing flood walls were overtopped. A limited amount of damage was caused on this side.

Immediately upstream of the DART bridge waters overtopped the eastern bank and flowed into the rear of the Irish Hospitals Trust grounds. This overflow was probably caused by debris gathered on the low bridge. The waters escaped on to the eastern bank walkway by means of the large drainage opes at the base of the river wall. Further downstream flooding of houses on Lansdowne Road and of Marian College on the opposite side of the river was recorded. Although the eastern bank is higher in this area the gathering of debris on New Bridge caused waters to pour out and enter the school buildings.

SECTION 4.6. - RESULTS OF INTERVIEWS WITH PROPERTY OWNERS

<u>NAME</u>	<u>ADDRESS</u>	<u>TIME OF FIRST FLOODING</u>	<u>TIME OF PEAK FLOODING</u>	<u>PAST HISTORY OF FLOODING</u>	<u>VISUAL SURVEY</u>
	No. 6 Dodder View Cottages	9.00 p.m. water coming over wall on Beatty's Avenue. 11.30 Homes evacuated.  12.10 - 1.00 a.m. Wall on Beatty's Ave. collapse.			1025mm Water mark
G.T. Crampton	Shelbourne Rd.	-	-	-	600mm in Yard
Swastika Laundry	60 Shelbourne Road			1963 Boiler House Flooded.	3/4 of Factory floor flood to 150

## 5. ANALYSIS OF FLOODING

### 5.1 General

The flood of 1986, as well as causing unprecedented damage to the catchment, yielded a mass of data which bears little or any comparison to that recorded previously. This has made the task of the analyst particularly difficult as most of the existing reference data has had to be significantly revised. The time constraints governing the production of this report have decreed that only a partial analysis of the storm has been possible to-date. In presenting this report, one is then faced with the dilemma of stating only conclusions of which one is absolutely certain or of also including in the report certain results which may be slightly amended by further analysis. Analysis into various aspects of the storm is continuing.

### 5.2 Rainfall

Much relevant data and observations on the rainfall of the 25th and 26th August 1986 is contained in a report prepared by the Meteorological Service. The reader is referred to the report which should be read in full.

From this report, and from our own investigations, the more notable features of the rainfall may be summarised as follows:-

- a) The Summer of 1986, prior to the storm, was both wet and cool. Ground moisture contents were high at the end of August.
- b) The rainfall was caused by an off-shoot from 'Hurricane Charlie' which passed over the country between 6 p.m. on Monday, 25th August and midnight on the same date.
- c) Very high 24 hour rainfalls were recorded in the Dublin/Wicklow area. In many places, these exceeded the previously highest recorded levels. In the upper Dodder Catchment, approximately 7 inches fell from 9 a.m. on Monday to 9 a.m. on Tuesday, 26th August, which exceeded even the massive rainfall of 6" in 1905 and more than doubled that recorded during the 1965 flood. This represents 200% of average total monthly rainfall for the month of August. The 24 hour rainfalls in the lower catchment are similar to previous recorded highs and represents 130% of the monthly average.
- d) The storm is notable because of the absence of any recorded extreme rainfalls over short durations, as shown in Table 3 in the Appendix B.
- e) North-easterly winds of mean hourly speed 25-30 knots gusted to 54 knots during the 12 hour period beginning at 1 p.m. on the Monday. Trees were in full leaf at the time of the storm.
- f) The rainfall patterns of the storms of 1905 and 1986 are similar to a limited degree. The 1905 storm resulted in a more intense concentration of rainfall. (2.02 " in 3 hours compared to 1.8" in 1986 , both figures at Bohernabreena) Both storms were caused by a depression following a course along the south-coast, the Irish sea and into Wales.

- g) We have also examined the hourly rainfall figures for Bohernabreena, which are not included in the Meteorological Report. It will be noted that the gauge malfunctioned at a crucial stage of the storm between 5 p.m. and midnight. However, by interpolation of the 24 hour rainfalls in the area and by examination of the hourly rainfall patterns at other stations we have estimated that the maximum hourly rainfall at Bohernabreena was 15.5 mm.

### 5.3 River Flows

#### 5.3.1. Gauge Records

Flows in the River Dodder are measured at Bohernabreena and at Orwell while new flow measurement stations have been operating on the Rivers Owendoher and Slang for the last few years. On the day of the storm the Orwell Gauge operated successfully only until noon of the 25th. However, the level of water was observed at various times during the evening and it was possible to measure accurately the peak flow from a clear high water mark inside the gauge house (33.03 mod). In addition, water levels were noted on the following day by personnel from An Foras Forbartha who also measured the flow in the river at that time. Accordingly, it has been possible to construct with reasonable accuracy the Orwell hydrograph and this is shown in Fig. 1 overleaf.

The charts for flows over the upper and lower spillways and in the by-pass channel are similarly reproduced in Figs. 2, 3 and 4. The waters from the catchment flowed 3 feet over the lower spillway. No record of flow is available from the Owendoher and Slang Rivers.

#### 5.3.2. Interpretation of Gauge Flows

The gauge at Orwell has been in operation since 1948 and for analysis purposes reliable figures are available since 1952. This gauge was calibrated by the Corporation in the 1950's and again calibrated by An Foras Forbartha between 1979 and 1986 (with the new bridge downstream).

We have combined the 2 sets of data, which we found to be consistent and produced a new rating curve for Orwell Bridge Gauging Station. This is given in Fig. 5.

As can be seen, none of the flows used to calibrate the gauge ever approach the magnitude of the peak. However, if we extend the straight-line curve and the measured maximum level of 108.36 ft. (30.03 m.), we arrive at a flow in the order of 9000 cusecs (254.8 m<sup>3</sup>/sec.). As stated below, this result must be treated with extreme caution.

The maximum flow at Bohernabreena, calculated using the rating curve developed by Binnie & Partners in 1975, is 3,150 cusecs. This compares with an estimated 3,500/4,200 cusecs for 1905.

Debris marks measured in the aftermath of the storm suggest a maximum flow in the Owendoher River of 750 cusecs. Further investigations will be necessary to confirm this and we are presently treating this figure with caution.

# WATER LEVEL RECORDER

## ORWELL BRIDGE

25<sup>th</sup>-27<sup>th</sup> August 1986

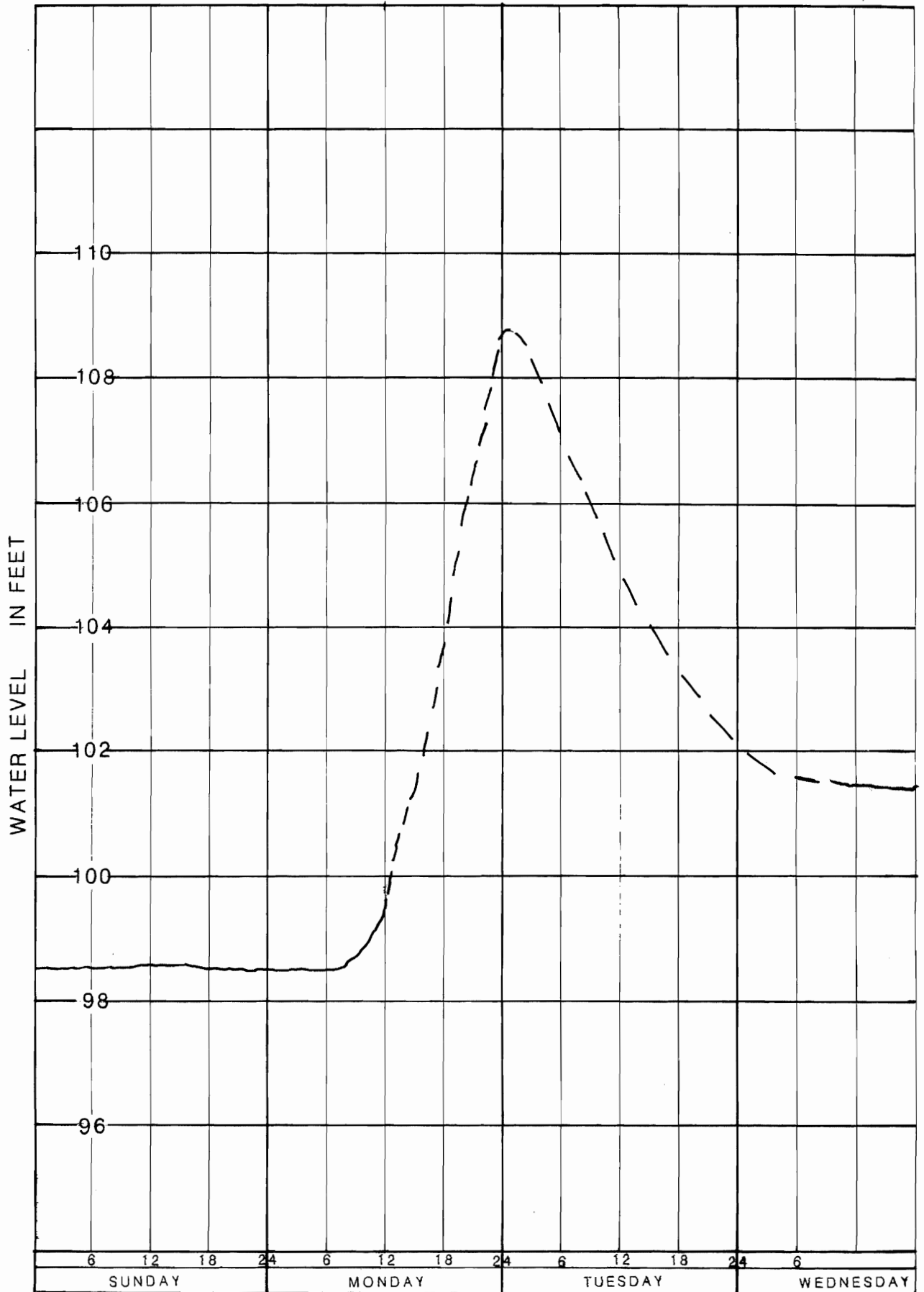
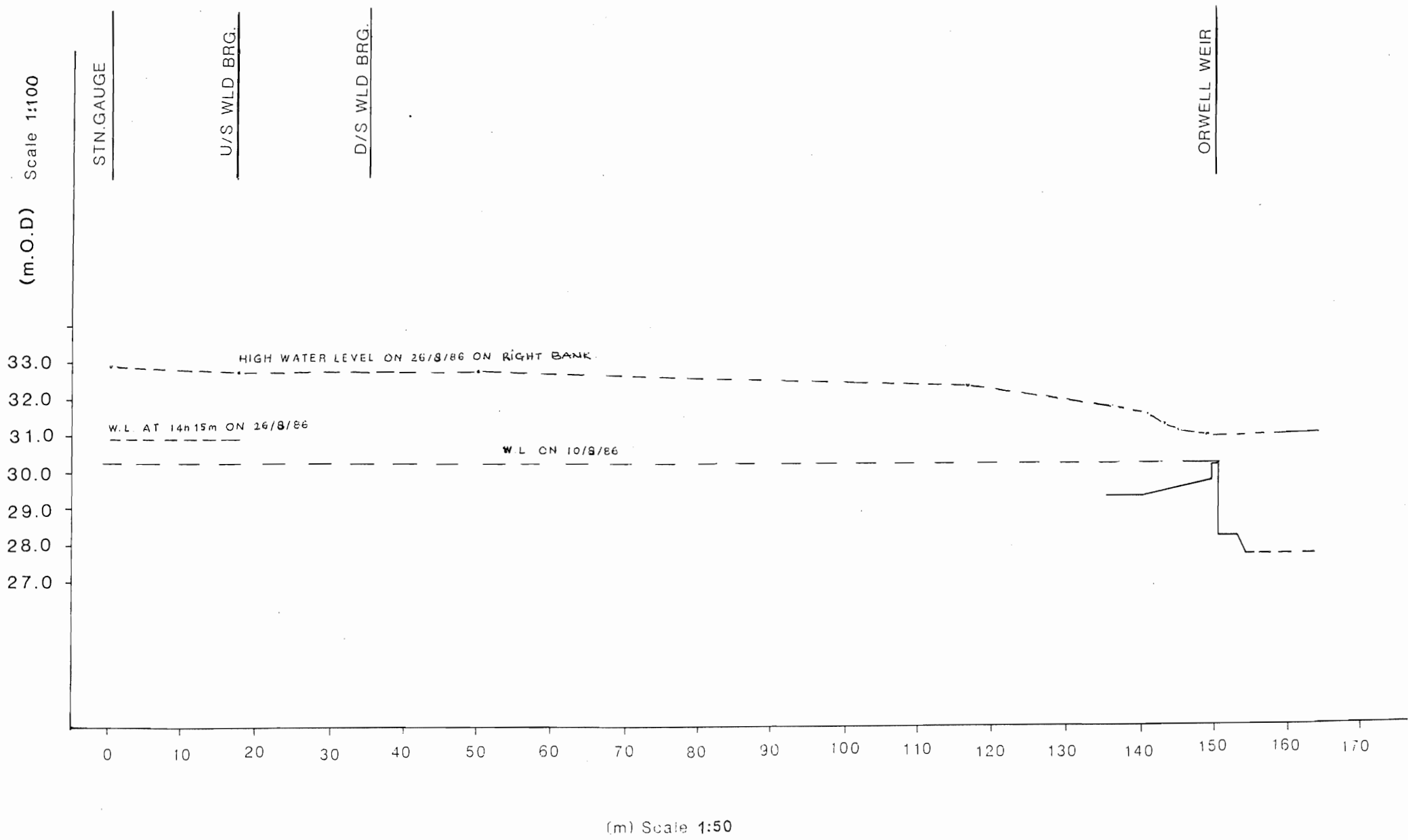


Fig. 1



LONGITUDINAL SECTION OF RIVER DODDER AT WALDRON'S BRIDGE

# WATER LEVEL RECORDER

## BOHERNABREENA UPPER RESERVOIR

25<sup>th</sup> 27<sup>th</sup> August 1986

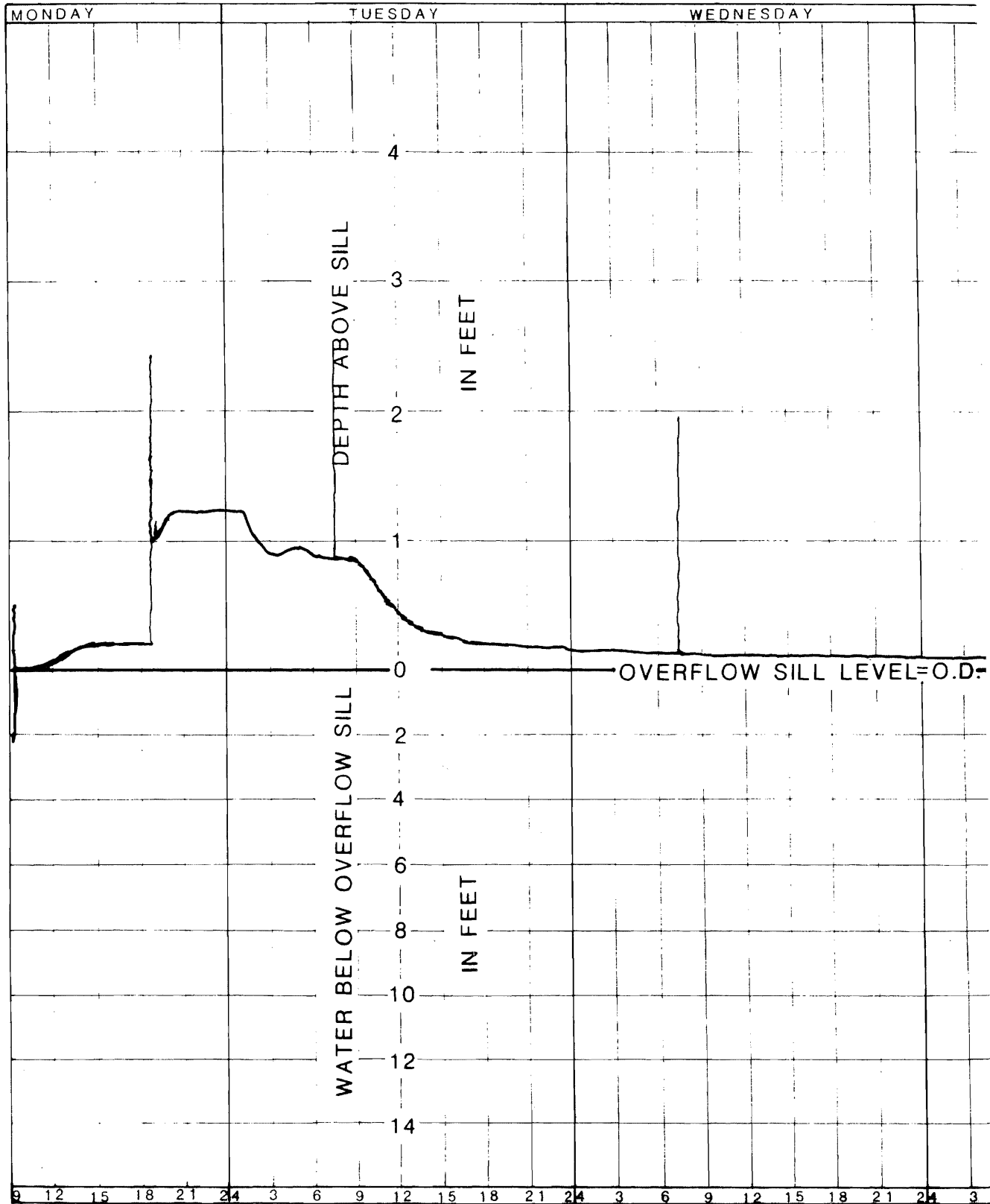


Fig. 2

# BY-PASS CHANNEL AT BOHERNABREENA

25<sup>th</sup>-27<sup>th</sup> August 1986

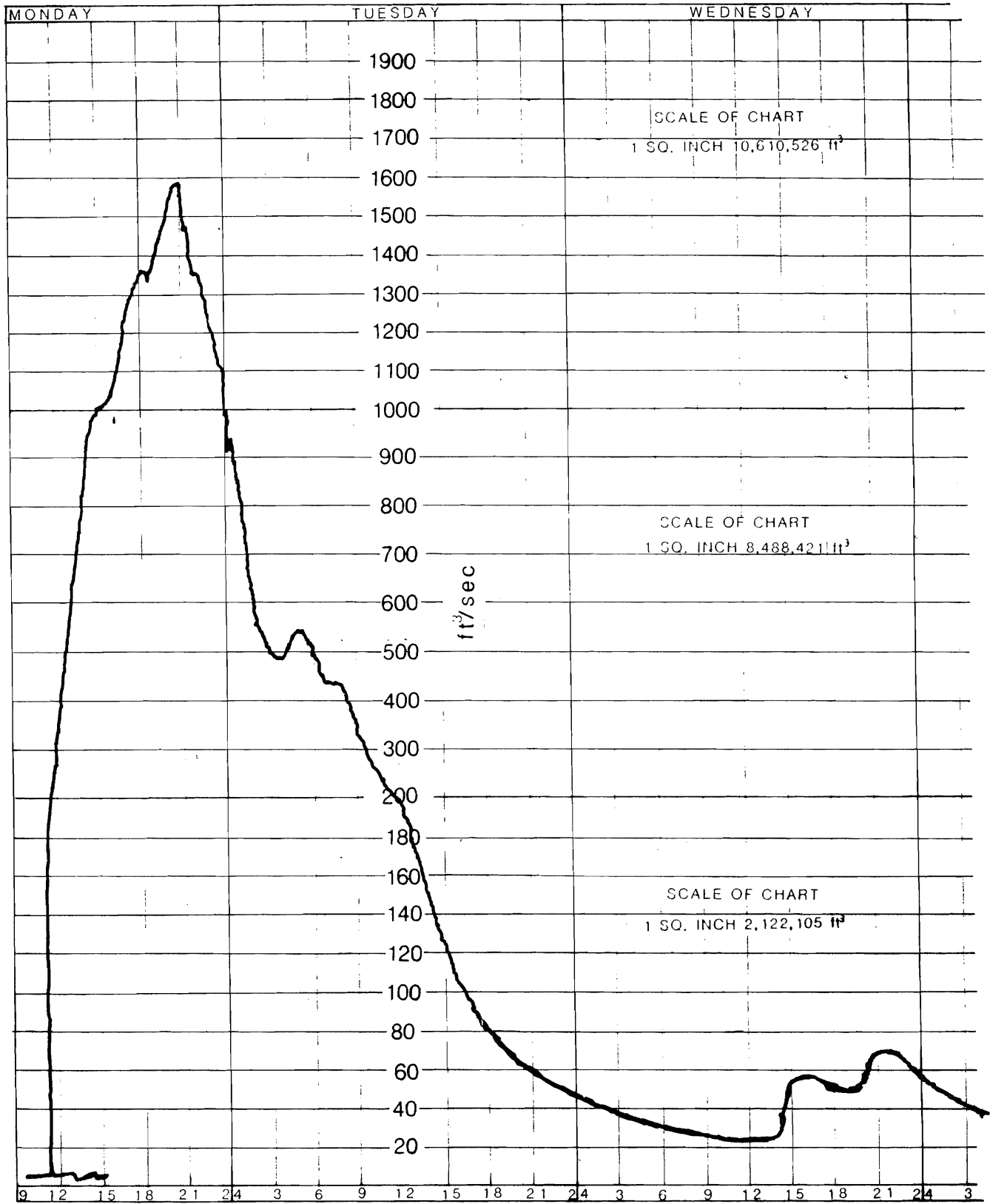


Fig. 3

**WATER LEVEL RECORDER**  
**BOHERNABREENA LOWER RESERVOIR**

**25<sup>th</sup>-27<sup>th</sup> August 1986**

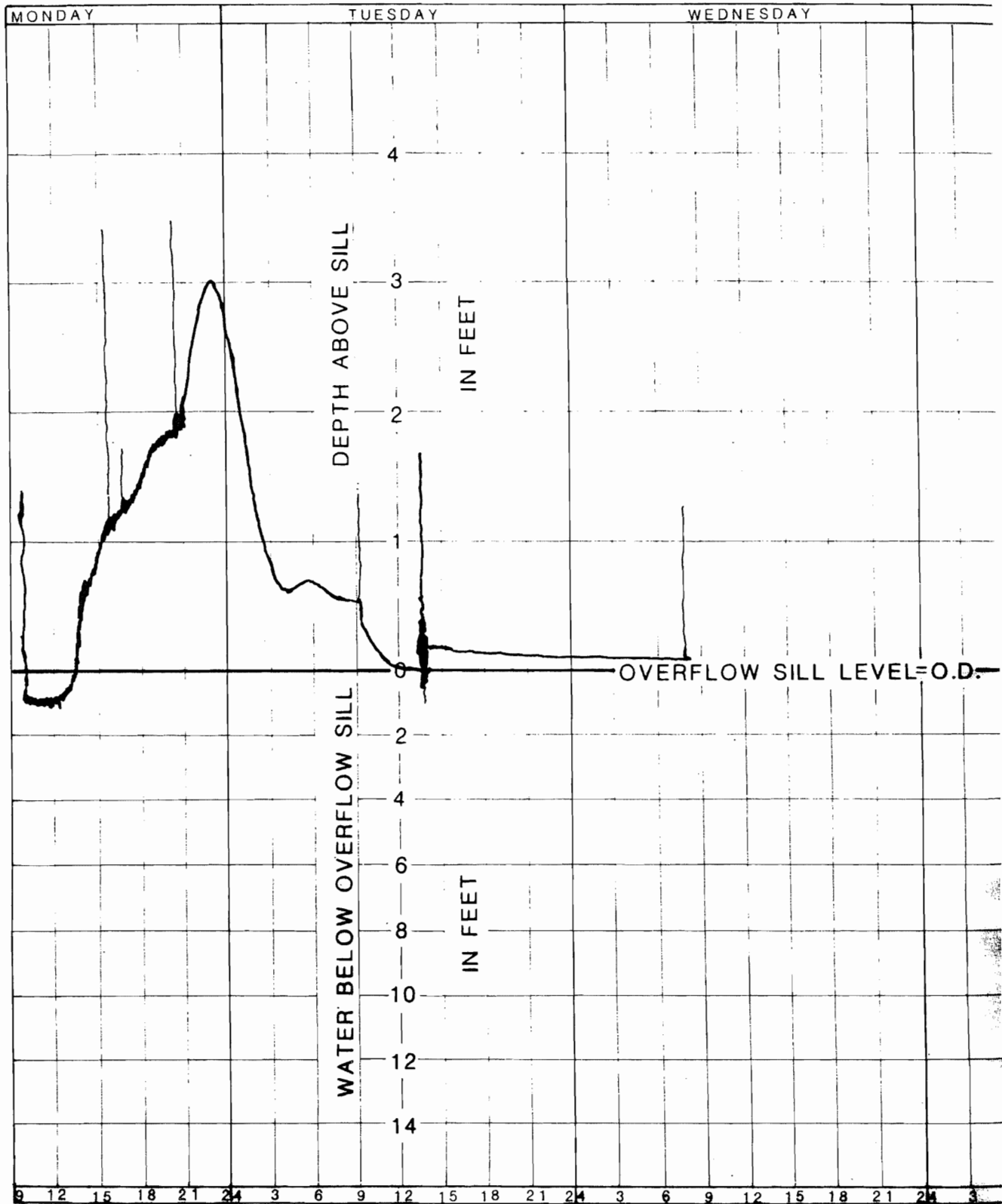


Fig. 4

# RIVER DODDER

## RATING CURVE FOR ORWELL BRIDGE LEVEL RECORDER

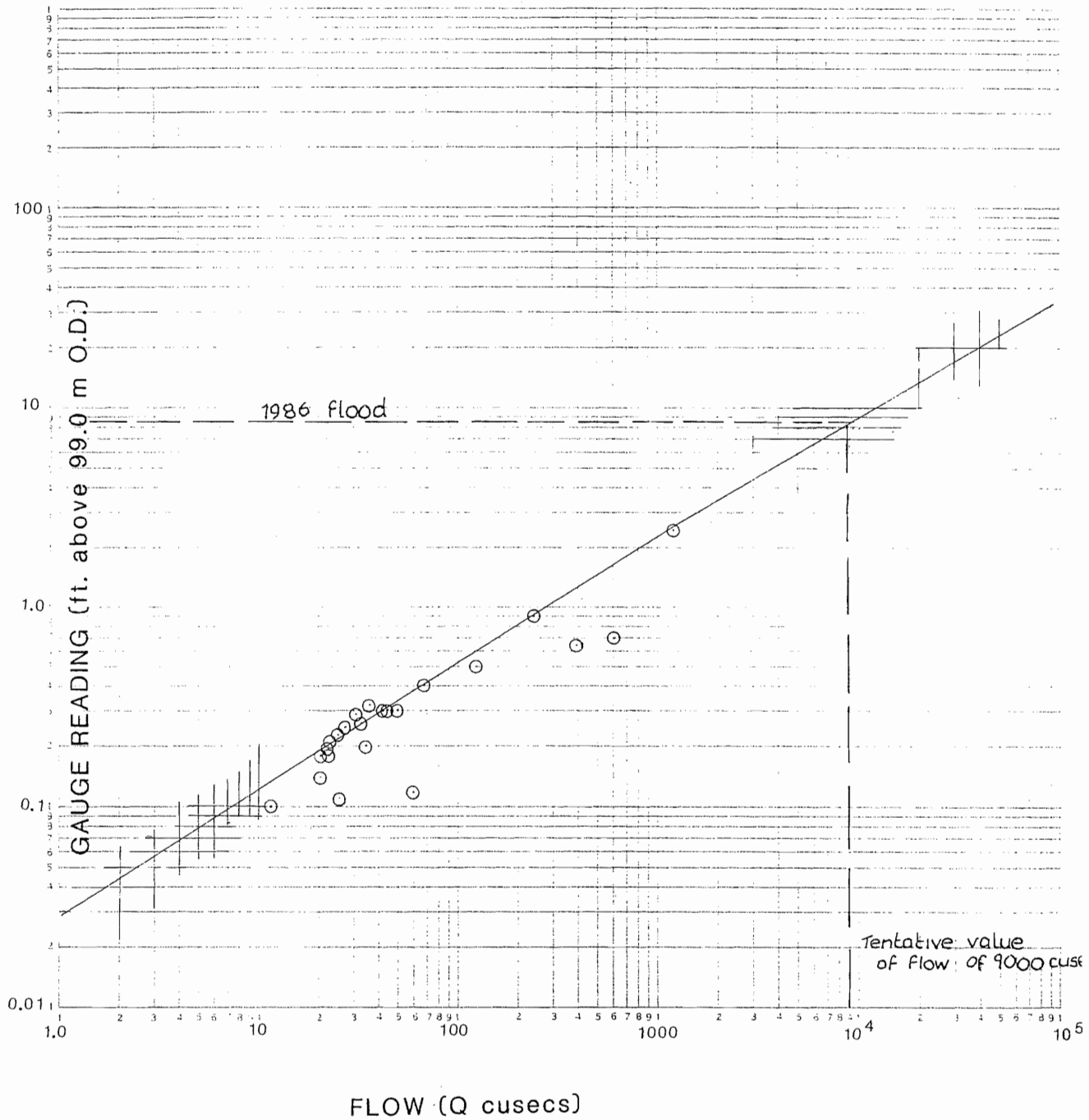


Fig. 5

© Data from An Foras Forbartha

### 5.3.3. Other Estimates of Flow

The flow at Orwell was checked by 2 other means:-

- a) Applying Mannings Formula to the large flow measured at 2.15 p.m. on Tuesday, 26th, calculating a value of Mannings 'n' for this particular section and applying this to the measured storm topwater level, a flow of 8,600 cusecs has been calculated.
- b) Applying a range of weir formulae, making due allowance for drowning of the weir and for the by-passing of the weir by a certain segment of flow. The flow is estimated at 8,500 cusecs (240 m<sup>3</sup>/sec.)

### 5.3.4. Application of Flood Studies Report

The "Flood Studies Report", published in 1975, involved the employment of considerable resources and expertise in the field of rainfall and flood analysis in order to set out procedures for flood estimation. There are two main approaches recommended in the report; the statistical approach and the unit hydrograph approach. The former approach has been used extensively in our studies. However, as many of our areas of research are not yet complete it was deemed prudent to set out below only a short summary of the work to-date.

The most immediate task was to update the frequency curve (flow versus return period) for the Orwell Station. The method used is the extreme value Type 1 (EV1) or Gumbel distribution which is described in detail in Chapter 2, Volume 1 of the Flood Studies Report. The annual maxima for Orwell from 1952 to the present were analysed and a frequency curve drawn. The curve can be represented mathematically by

$$Q_t = u + \alpha \left( \frac{1 - e^{-ky_t}}{K} \right)$$

where  $Q_t$  = Peak flood flow

$u$  = Location parameter

$\alpha$  = scale parameter

$K$  = Shape parameter

$Y_t$  = is the reduced variate corresponding to  $T$ , return period i.e.

$$Y_t = -1n \left( -1n \left( \frac{T-1}{T} \right) \right)$$

The frequency curve is shown in Fig. 6 and differs only slightly from the previous frequency curves produced in the 1978 report entitled "Feasibility of Reservoir Control at Bohernabreena on the Dodder River." The frequency curve used for analysis of the flows at Bohernabreena is that given in the 1975 'Binnie Report'.

5.3.5. Analysis of Flows:

As can be seen from the previous section, flows of the order of 9000 cusecs have been calculated for Orwell (equivalent to 10,350 cusecs for the whole catchment to Ringsend). The catchment area is 113.3 Km<sup>2</sup> and the maximum estimated rainfall was 12 mm./hr. If we assume that all of the peak rainfalls coincide at Orwell, not unreasonable in view of the long extended rainfall peak, this flow is equivalent to an overall impermeability for the catchment of 67%. This is compared to the other calculated impermeabilities as follows:-

	Max. Hourly Rainfall mm/hr.	Area Km <sup>2</sup>	Max.Flow m <sup>3</sup> /sec.	Imper-meability %
Bohernabreena Catchment	16.5	27.99	89.2	69
Owendoher Catchment	10.0	21.17	21.0	35.8
Orwell, Flow No. 1	12.0	113.3	254.8	67.0
Orwell, Flow No. 2	12.0	113.3	215.0	57.0

During Monday, 25th August, very heavy rain fell during the day onto an already wet catchment. The 69% impermeability factor for the Bohernabreena Catchment is in line with that calculated for previous similar storms. However, the impermeability of 67% suggested for the total is extremely high and must be treated with caution.

Flow No. 2 at Orwell is derived by first calculating the return period from the Bohernabreena curve, using the 1975 Binnie Report (viz. 160 years), and applying this to the new frequency curve for Orwell given in Fig. 6. The impermeability factor for this flow - 57% - seems to be more reasonable.

Among the reasons which cast doubt on the high flow of 9000 cusecs (254 m<sup>3</sup>/sec.) are:-

- a) The value of 'C' used in the weir formula was based on calibrations using very low flows (<1500 cusecs).
- b) The extreme turbulence in the flow, particularly in the area of the new bridge, may have had the effect of reducing the flow. This may mean that the extrapolation of the rating curve in Fig. 5 should be modified leading to a lower flow and shorter return period.
- c) The Flood Studies Report urges that an extreme value distribution should be fitted for return period up to 2N where N is the number of years of record, in our case, 34 years.
- d) The accuracy of using Mannings Formula for rough turbulent flows will need to be further checked.
- e) We have not presented in this report any attempt at modification of the Mannings 'N' value to reflect the considerable growth of vegetation, particularly at the higher levels of the channel.
- f) The flows of 1905 and 1986 at Bohernabreena roughly reflect the differences in peak rainfalls. At Orwell, however, a flow of 9000 cusecs greatly exceeds the estimated 1905 flow of 7000 cusecs although rainfalls in the lower catchment (excluding Bohernabreena) are roughly similar.
- g) A large amount of development has taken place in the catchment since the start of the century. It is doubtful whether this has had a significant effect because of the saturation of the catchment.

- h) Further analysis of the flows in the Owendoher must also be carried out as our investigations into previous floods indicate a typical ratio of 20% between Owendoher and Orwell flows. The ratio of the catchment areas is 18%. This could prove crucial in the correct estimation of the 1986 flood.
- i) Enormous amounts of rubble were washed down by the storm. A careful survey of the changes in cross-section and gradient is necessary to accurately apply any of the open channel flow formulae.
- j) The effect of debris gathering on bridges may have been to exaggerate the apparent water flows by creating artificially high top water levels.

#### 5.3.6. Summary of Results

The estimated peak flow at Bohernabreena was 3,200 cusecs (90.65 m<sup>3</sup>/sec.) while the peak flow estimates for Orwell Bridge vary from 7,600 cusecs (215 m<sup>3</sup>/sec.) to 9000 cusecs (254 m<sup>3</sup>/sec.). Those latter figures are greatly in excess of any flows measured since records began and have estimated return periods of 160 years and 460 years respectively.

A considerable volume of further investigation remains to be done in order to confirm the numerous calculations, analyses and conclusions which have been carried out since the storm.

#### 5.3.7. Future Analysis

- a) Further investigations using the statistical method of analysis and using other means of flow measurement for the river are necessary to identify the maximum river flow.
- b) Incorporation of the recommendations of the Flood Studies Report to develop a model for the river and its catchment. Considerable volumes of records, both of rainfall and of the resulting river flows, have been collected in the Drainage Development Division and could form the basis for a very accurate model. This model could then be used to:-
  - i) Accurately assess the 1986 storm;
  - ii) Examine the storms which have previously caused damage in the catchment;
  - iii) Predict the reaction of the catchment to any future rainfall pattern. It would be thus possible to accurately assess the likelihood of a storm of any magnitude or return period. Such results are crucial to the meaningful carrying out of a cost-benefit analysis for permanent remedial works as discussed in Section 7.
  - iv) Calculate very accurately the "probable maximum flood" and the return period for certain other very large floods for use in the ongoing monitoring of the reservoirs at Bohernabreena ('Floods and Reservoir Safety - An Engineering Guide', ICE, 1978).
  - v) Develop "sub-models" : rainfall/runoff, channel routing, reservoir routing.
  - vi) Optimise the use of the reservoirs as a means of control on high river flows.

- vii) Enable an effective flood warning for certain types of storms to be given to the public.

8. Summary

1. The flooding of the 25th/26th August 1986 resulted from the highest flows ever recorded on the River Dodder. It is estimated that the flood has a return period of approximately 350 years, and that the maximum flow was between 7600 and 9000 cusecs. at Orwell Bridge Gauging Station.
2. Extensive flooding was caused in the Dodder catchment. A total of 315 residential and 25 commercial properties were damaged within the Corporation area.
3. A clean-up operation began immediately, both in the houses and along the river. The estimated cost of outstanding immediate remedial work required on the river is £1,281,000.00 (inclusive of repair work at Bohernabreena).
4. The cost of altering the existing channel to carry a storm of this magnitude would be in excess of £100 million. Such a scheme would be unacceptable on aesthetic and economic grounds. A preliminary list of isolated stretches of the river, where permanent remedial works might be carried out, are discussed in the report.

R I V E R D O D D E R - 1 9 8 6 F L O O D I N G

A P P E N D I X A

D E T A I L S O F F L O O D I N G O N A S T R E E T T O S T R E E T B A S I S

## A P P E N D I X A

### DETAILED DESCRIPTION OF FLOODING ON A STREET TO STREET BASIS

#### 1. Rathfarnham Bridge to Classons Bridge

##### 1.1. Dodder Road Lower

Water breached the river wall opposite No. 21. It flooded the front gardens as far as 76. It did not go above vent level until this point, i.e. up to 75 mm. in depth at house wall. From no. 77 to 92, both front and back gardens and houses were flooded.

<u>House No.</u>	<u>Level in House</u>	<u>Gardens</u>
80	75 mm.	600 mm.
85	50 mm.	"
86	75 mm.	"
87	75 mm.	"
88	175 mm.	"
92	50 mm. (house higher than others)	"

E.S.B. station was also flooded to a depth of 100mm. Peak flow estimated at 1.a.m.

##### 1.2. Dodder Park

Riverbank Apartments.

The car park was flooded to a depth of 600 mm. - 750 mm.

<u>Apartment</u>	<u>Level</u>
10	300 mm
12	240 mm
22	400 mm
23	250 (upper floor - stair only)

The road was flooded to a depth of 900 mm.

Peak flow estimated at 1.am.

##### 1.3. Orwell Gardens

Water flowed down Dodder Vale and up a side lane to the roundabout in the middle of Orwell Gardens. Water flooded the front gardens of no. 41 - 62 and the houses nos. 44 - 56. The water reached 575 mm. in no. 52, 375 mm. in no. 31 (the two end houses worst affected) and 525 mm. in no. 50.

Peak flow estimated at 11.30 but the accuracy of these claims will have to be verified.

##### 1.4. Milltown Road

Milltown Road, at the junction with Lr. Churchtown Road was flooded to a depth of just over 1 metre. The Dropping Well pub was the only premises flooded in this area when river water entered the basement of the pub at 7 pm.

Time of peak flooding - 2 am.

### 1.5. Dartry Cottages

Dartry Cottages, from houses no. 1 - 6, was flooded to a depth of 0.9 m. on the night of the storm. The flooding was caused by the Dodder River sweeping away a wall just upstream of the pedestrian bridge connecting the park and Orwell Gardens. The water rushed through the park and into the back of the cottages. The flood waters also entered the basement premises of North (Ireland) Ltd. (situated opposite the cottages), resulting in a depth of water of 0.45 m.

## 2. Classons Bridge - Clonskeagh Bridge

### 2.1. Strand Terrace

Strand Terrace is a group of cottages situated off Milltown Road, opposite St. Anne's School. These four cottages were flooded to a depth of approximately 1 metre when the Dodder flowed over the bank in front of the cottages at 9 pm.

### 2.2. Clonskeagh Road

The roadway of Clonskeagh Road was not flooded. The flooding occurred in O'Shea's Public House at the Clonskeagh Bridge. The river overflowed at about 11 pm. covering the car park and the public lounges with water to a depth of 0.45m.

Smurfits premises, which back directly onto the river, first experienced flooding at 8 pm. Flood waters continued to rise to a depth of 0.6 m - 3.0 m. and the area was evacuated.

The basement premises of 105 - 113 Clonskeagh Road were flooded to a depth of 0.45 m.

Time of peak flooding - 12 am. approximately.

## 3. Clonskeagh Bridge - Donnybrook Bridge

### 3.1. Beech Hill Road

The two cottages, no. 1 and no. 2 Beech Hill road were flooded to a depth of 1.1 m. outside the houses. The roadway was not flooded.

### 3.2. Beaver Row

The roadway of Beaver Row was flooded to a depth of 50 mm. at the most. The sub-floors of the C.I.E. Depot were flooded to a depth of 0.3 - 0.45 m.

### 3.3 Simonscourt Terrace

The fifteen houses of Simonscourt Terrace were flooded to a depth of 0.9 m. when water flowed down the road from just up stream of the pedestrian bridge of the Dodder.

Time of peak flooding - 3.30 am.

### 3.4. Brookvale Road

The roadway of Brookvale Road was flooded up to the junction with Eglinton Road. The ground floor of Brook Lodge was flooded, being lower than all the other premises.

Time of peak flooding - 4 am.

### 3.5. Eglinton Road

The roadway of Eglinton Road was not flooded. The rear gardens of no. 4, no. 6 and no. 8 Eglinton Road were flooded to a depth of 1.1 m.

The basement car park of Brook House (situated on the corner of Eglinton Road and Donnybrook Road) was flooded to a depth of 0.6 m.

Time of peak flooding - 3 am.

## 4. Donnybrook - Ballsbridge

### 4.1. Anglesea Road

The river rose above the retaining wall between 10 and 11 o'clock on the rear laneway behind no 131 to 107 Anglesea Road. The volume of water was so great that it flooded the basements of the above house nos and also flowed down the laneway in the direction of Anglesea House (Licensed Vintners). The flow went through this property, knocked down a boundary wall with Haseldene Apartments, knocked another boundary wall between Haseldene and Merrion Cricket Club and spread itself over the whole area of the club. In addition to the latter flow, water continued to flow past the entrance to Anglesea House and down the laneway at the rear of house nos 95 to 79 on Anglesea Road. All property backing onto this laneway suffered basement flooding. On reaching the end of the laneway, the water burst through the rear garage of No 79 Anglesea Road and flowed into the Brookfield Apartment Complex. It was at this stage that water started to flow onto Anglesea Road itself, where it flowed north towards the Church of Ireland at the junction with Simmonscourt Road. house nos 73 to no 1 were inundated by water flowing in from the road proper and also from water lodged in the Cricket Club. This built up and eventually (witness states around 12.30 pm approx.) the water burst through northern boundary of the Club and flooded "no 19 Somerset, no 21 Dunluce" to a depth of 1.55 m and nos 51 to 23 Anglesea road. House nos 1 to 17 were inundated by water flowing in from the road itself. The river wall (5') was destabilised and knocked down over a 30 m length at the rear of Somerset, no 19 Anglesea Road.

The Church of Ireland was inundated to a level of 1.03 m of water on Simmonscourt Road. the depth of flow was estimated to be 2½' deep at one time.

### 4.2. Simmonscourt Road

The water entered the Royal Dublin Society Showgrounds by three gates on the Simmonscourt Road and by one gate on Anglesea Road. The whole complex was completely covered up to a max. of 1½' in some places. At 7 o'clock in the morning the gate on the Anglesea Road side was dry (as it is higher than the surrounding ground.) Merrion Road was still under water and the people walking were allowed use the tarmacadam in front fo the main entrance to the R.D.S. Definite evidence of water in flow from Simmonscourt Road was observed.in the R.D.S.

### 4.3. Merrion Road

This road was flooded by water flowing down Anglesea Road, water coming over the parapet wall on Ballsbridge itself and from water coming down Simmonscourt Road, it was estimated that at one time the height of water on Merrion Road

was over a foot deep. The Hospital Sweepstakes Complex and blocks A and B in A.I.B. bank centre were inundated by water flowing in from Merrion Road.

#### 4.4. Serpentine Avenue

Was inundated by water flowing in from Merrion Road. Every house basement was flooded to an average depth of 0.95 m. The railway line seemed to act as a barrier and stopped the water from progressing into Sandymount. Pembroke Hockey Club bore the brunt of the volume of water, it came in through its main entrance off Serpentine Avenue, through Serpentine Terrace where it knocked over the boundary wall and through Sydenham Road where it knocked a wall at the rear of Sydenham Court Apartment Complex backing onto the Hockey Pitch. At the highest point in the field a water level of 0.875 m was recorded.

#### 4.5. Sydenham Road

Water flowed down this road from Merrion Road, inundated house nos 1 - 10 and went into Sydenham Court Apartments, where it flooded the ground floors of the 2 blocks (B apartments) knocked the boundary wall with Pembroke hockey club and flowed into the club grounds.

Peak flow estimated at 4 am for below areas.

#### 4.6. Wilfield Road

Water flowed into Wilfield Road after crossing Dart line at Sandymount Avenue. The road was flooded to a depth of 150mm along the full length to Monkstown Rugby club. The front gardens of 2 to 52 (evens only) were flooded but the water did not reach the houses. From 54 to 78, both front and back gardens were flooded including several "sun parlours" at the rear of the houses. From 80 to 106, just the front and back gardens flooded. The odd number houses on the other side of Wilfield Road only suffered slight flooding (half the front garden).

#### 4.7. Wilfield Park

Water flowed into Wilfield Park from Sandymount Avenue and Wilfield Road. Houses 2, 4, 16, 18 and 20 escaped completely. All other houses had up to half the front garden flooded except the following: 32, 34, 36, 38, 6 which had the house flooded to a depth from 25 mm to 125 mm.

#### 4.8. Gilford Park

Water flowed into Gilford Park from Wilfield Park and out into Gilford Drive and Gilford Park. All houses had their front gardens flooded up to step level. No 28, 30, 32, 34, 36, 38 and 40 had converted garages and kitchens flooded to a depth of 25 mm. No 23, 25, 27 and 29 were flooded to a depth of 100 mm.

#### 4.9. Gilford Drive

Water flowed into Gilford Drive from Gilford Park. Odd number houses had their front gardens half flooded. The evens were similar except for no 2 and 4 which had 100 mm of water in house and 200 mm in garage. The back gardens of 2 and 4 were also flooded.

#### 4.10. Gilford Road

Water flowed into Gilford Road from Gilford Park and Drive. Front gardens flooded in 5, 7, 9, 50, 48, 38 and 36. Front garden and 25mm in house 40, 42 and 44. Convent at No.34 - basement flooded to 600mm, which had to be pumped.

No other damage.

#### 4.11. Serpentine Terrace

Water flowed in off Serpentine Avenue, inundated all the houses on the Terrace, knocked a wall at the end of the Terrace and flowed into Pembroke Hockey Club grounds.

### 5. Ballsbridge - Ringsend

#### 5.1. Ballsbridge Avenue

Water flowed from Merrion Road down Ballsbridge Avenue, flooded all the cottages Nos.1 - 18, and went in through the rear entrance of the Hospital Sweepstakes, around the back of this building and into A.I.B. Stationery Department, which was under 2 ft. of water.

#### 5.2. Beatty's Avenue/Dodder View/Herbert Cottages

The river rose above the bank wall at around 9.00 p.m. Monday night, the area was evacuated at 11.30 p.m., and by 12.00 the river wall on Beatty's Avenue had collapsed. The water level was recorded at 3'7" in house No.6 Dodder View. It is possible that this area was hit both by water flowing down Ballsbridge Avenue from Anglesea Road and by water coming over the river bank wall on Beatty's Avenue.

#### 5.3. Estate Cottages

The water rose above the river bank and came through the railings on to the road. It progressed to the junction with Shelbourne Road, where it turned right. No house was affected on Estate Cottages. Nos. 45 and 47 Shelbourne Road, being situated on the junction, suffered a few inches of water. The main stream went down Shelbourne Road towards Lansdowne Road. It remained on the road and later formed a pond upstream of the junction with Lansdowne Road.

#### 5.4. Shelbourne Road

See Estate Cottages. Also, and Swastika Laundry suffered damage at the rear of their premises backing on to the river. In the case of their rear yard was flooded to a depth of 0.60m, while Swastika suffered flooding (0.150m) over three-quarters of their factory floor and in their boilerhouse.

#### 5.5. Lansdowne Road

House Nos. 65 to 73 suffered damage from water entering the properties at the rear, over the river bank.

Peak flow is estimated at 4 a.m. for these areas.

RIVER DODDER - 1986 FLOODING

APPENDIX B

METEOROLOGICAL SERVICE REPORT

STORM OF 25th/26th AUGUST 1986 WHICH CAUSED FLOODING IN  
THE DARGLE CATCHMENT (BRAY) AND DODDER CATCHMENT (DUBLIN)

METEOROLOGICAL SERVICE, DUBLIN

PREFACE

There are at least ten rainfall stations located in the Dodder and Dargle catchments where rainfall is measured on a daily basis. These rainfall stations are operated by voluntary observers and their cooperation and dedication make this report possible. There are three rate of rainfall recorders also in the vicinity which provide more detail on the event:

1. A photocopy of the rainfall chart at Casement Aerodrome is included.
2. The rainrecorder at Glenasmole suffered minor damage at the height of the storm and part of the record was destroyed. Nonetheless, a useful indication of the 6 hour and 12 hour rainfall can be determined and these are given on Table 1.
3. The rainrecorder at Simmonscourt, Ballsbridge was flooded and the record lost.

Introduction

Cool broken weather characterised the weather of the summer of 1986. Thunderstorms 27th/29th of June caused flooding chiefly in the Shannon basin. July did not provide any notable spell of dry wather and soil moisture remained high. During August the country was affected by a series of unusually vigorous weather systems. There was heavy rain on the 1st, and the storm of the 5th/6th caused flooding in Kerry and West Cork. This report deals with the second severe storm of the month which caused flooding in the heavily populated Dublin city and Bray areas on 25th/26th.

Synoptic Situation

On Monday morning 25th August 1986 an offshoot depression from hurricane 'Charlie' situated to the southwest of Ireland was moving northeastwards and deepening. By 18 hours its centre, now 984 mb, lay to the southwest of Youghal. At midnight it had moved to just off St. Davids Head in Wales and had a central pressure of 980 mb. By 6 hours it lay to the south of Liverpool.

The satellite photograph (Fig.1) shows the approach of the storm. Fig.2 shows the synoptic weather chart at four by six hour intervals from 12 hours on 25th to 6 hours on 26th.

Rainfall Distribution

Fig.3 gives the 24 hour rainfall totals ending 09 hours 26th. 150 mm to 200 mm of rain were recorded in the Dargle and upper Dodder catchments. At the

Phoenix Park, Dublin the 24 hour rainfall total of 85 mm was the highest daily fall since 1905. 75 to 100 mm of rain was recorded over a large part of Dublin/Wicklow in the 24 hour period. Parts of Wexford and the extreme south had similar 24 hour rainfall totals. Roches Point recorded 84.4 mm in a 24 hour period which is comparable to the highest 24 hour rainfall amount (85 mm) on record at the station. However as the heavy rain in the south commenced earlier, part of the rainfall total for stations in the south is recorded for the 24 hour period ending 9 hours 25th. To compare rainfall associated with the storm in the east and along the south coast Fig.4 was drawn showing the 48 hour rainfall total ending 09 hours 26th. Kilcoole, Co.Wicklow was remarkable among the lowland stations recording some 200 mm of rain. At Kippure (750 metres) an estimated rainfall total of at least 250 mm and perhaps as high as 285 mm was reported for the duration of the storm.

#### Dargle and Dodder catchments

Table 1 looks at the rainfall totals recorded in the lower and upper catchment of the Dargle on the date of the storm and extreme rain events which occurred during the last 20 years.

A notable rainfall occurred in 1965. At Glenasmole 1 day rainfall totals on that occasion were only about half the daily rainfall in the recent storm. A feature of the 1965 event was the heavy rainfall on three consecutive days, and the rainfall totals over these three consecutive days are comparable to the record 1 day rainfalls of the storm. Another notable rainfall affected the catchment on 1st of November 1968 when over 100 mm of rain was reported at Glenasmole.

Table 2 gives the 1 day rainfall for stations in the lower Dodder catchment. Values for Glenasmole in the upper catchment are given on Table 1.

#### Intensity of the Rainfall

One feature of the storm is there are no recorded extreme rainfalls over short durations (15 minutes to 6 hours). Heavy short duration rainfalls are usually associated with thunderstorm activity. However the event becomes notable for the rainfall totals which were recorded in durations 6 to 24 hours.

Table 3 gives maximum rainfall amounts for durations 15 minutes to 24 hours at specified locations. Maximum falls at each of these stations for their periods of record are also included.

The 24 hour rainfall totals of 89.4 mm at Casement Aerodrome and 65.5 mm at Dublin Airport exceed the previous highest recorded values at these locations. The rainfall total of 41.5 mm in 6 hours and 66.2 mm in 12 hours at Casement Aerodrome also surpass its extreme values for these durations. Fig.5 shows the rainfall chart at Casement Aerodrome which typifies the configuration of the rainfall where flooding occurred. Moderate to heavy rain persisted for most the 24 hour period. The highest 6 hour duration total occurred between 16 hours and 22 hours, and the highest 12 hour duration total commenced at around 13 hours. Each siphon on the chart denotes 5 mm of rain.

#### Wind Driven Rain

During the periods of highest rainfall intensity (the 12 hour period commencing at 13 hours) northeasterly winds of mean hourly speed 25-30 knots gusted to 54 knots. Along the coast mean winds reached gale force 8 or strong gale force 9.

#### The Storm of 1905

The rainfall patterns of the storms of 25th August 1905 and 1986 are remarkably similar. Both were caused by a depression which followed a track along the south coast, up into the Irish Sea and into Wales. In 1905 serious flooding occurred in Bray and elsewhere.

Table 4 compares 1 day rainfall totals for the 1986 and 1905 storms.

#### Summary

The storm of 25th/26th August was exceptional for many reasons:

1. Exceptional 1 day rainfall totals were recorded at a number of locations. Return Periods for this rainfall in the Dodder and Dargle catchments are in the region 50 to 100 years, and at least 100 years at Glenasmole (Logue, 1975 and Flood Studies 1975).
2. The rainfall was accompanied by strong to gale force winds. August is the month with lowest mean wind speeds on average.
3. The storm followed a number of other active weather systems which affected Ireland and gave high rainfalls earlier in the month.
4. Drying conditions were poor during the summer and the soil moisture was near field capacity.
5. Trees were in full leaf and crops were mature and vulnerable to strong winds.

#### References

- Flood Studies      Extreme Rainfall in Ireland  
                         Meteorological Service, Dublin.  
                         Meteorological Studies, Volume 2  
                         National Environment Research Centre,  
                         London.



FIG. 1  
STORM APPROACHING IRELAND  
SUNDAY 24TH AUGUST



1 DAY RAINFALL

(09 hours 25th to 09 hours 26th August 1986)

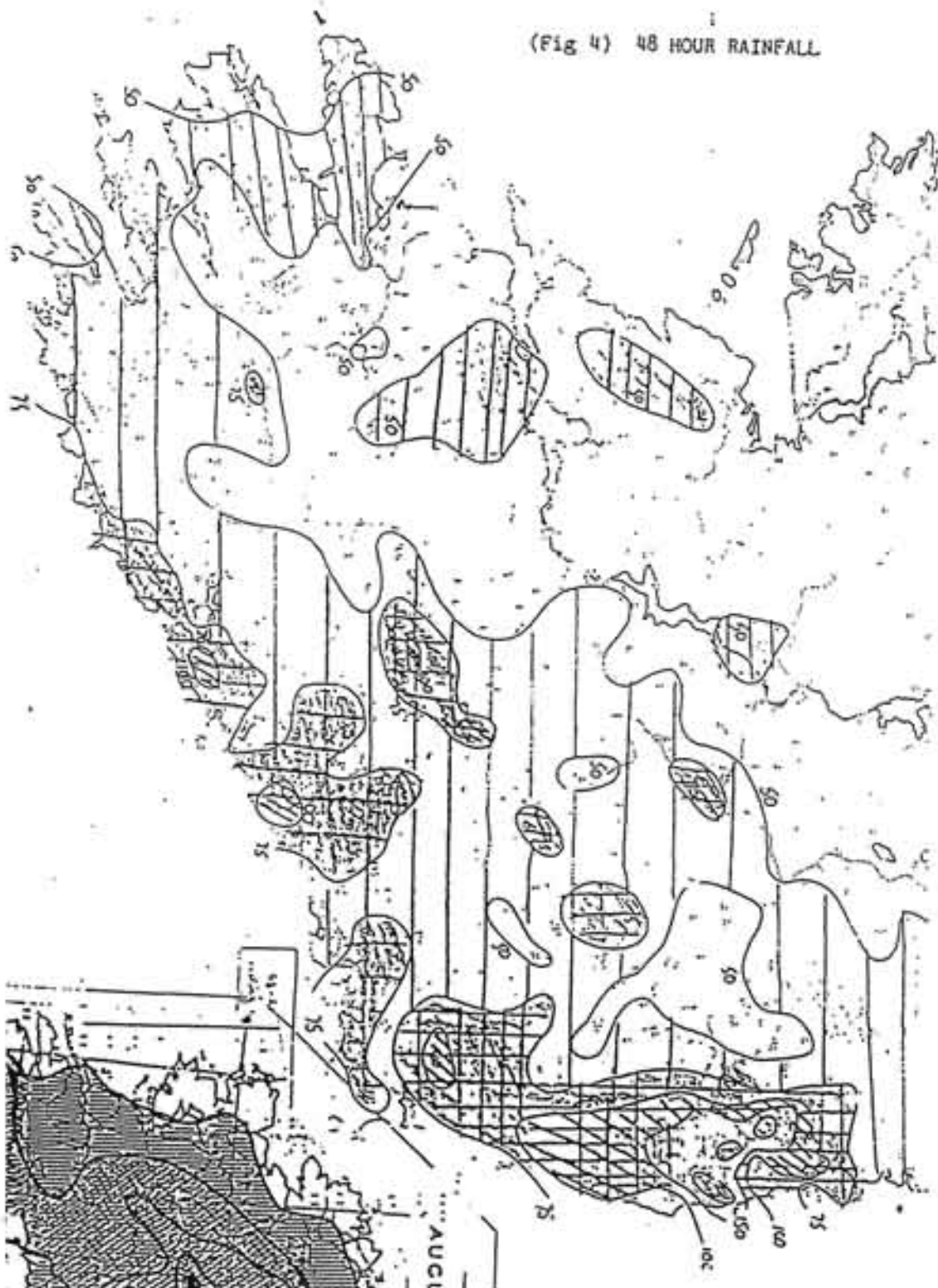


FIG. 3

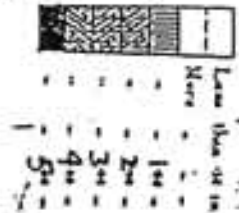
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(Fig 4) 48 HOUR RAINFALL

25°/26" AUGUST 1986



AUGUST 24TH-26TH, 1986



1" = 250 M.

Table 1

1-DAY RAINFALL AMOUNTS (MILLIMETRES) IN THE DARGLE RIVER CATCHMENT AREA

STATION	HEIGHT (METRES)	1 DAY	1 DAY	3 DAY	Highest 1-day Rainfall in the period ( ).
		09 hours 25/8/86 to 09 hours 26/8/86	09 hours 17/11/65 to 09 hours 18/11/65	09 hours 16/11/65 to 09 hours 19/11/65	
Glenasmole (Superintendents Lodge)	(152)	182.5	77.7	162.8	104.8 (1965-1985)
Glenasmole (Castlokelly)	(183)	190.2	94.5	186.5	100.5 (1965-1985)
Kilmolin (Enniskerry)	(274)	90.2	NA	NA	51.0 (1976-1985)
Broy (Gardo Station)	(17)	86.0	24.8	48.7	(incomplete record)
Broy (Avoca Avenue)	(30)	57.9	NA	NA	48.6 (1978-1985)
Ballyedmonduff	(171)	118.1	NA	NA	63.4 (1968-1985)
Glenasmole (D.C.W.W.)	(158)	165.3	79.2	165.1	106.4 (1965-1985)

Rainfall amounts for 6 hrs. 12hrs and 24 hrs estimated from rainfall chart at Glenasmole (D.C.W.W.)

24 hours : 09 hours 25/8/1986 - 09 hours 26/8/1986 = 165.3 millimetres.  
 12 hours : 12 noon 25/8/1986 - Midnight = 130 millimetres  
 6 hours : 18 hours 25/8/1986 - Midnight = 85 millimetres

(Highest fall prior to 1986 106.4 mm, records from 1941).

Table 2

1 DAY RAINFALL AMOUNTS (MILLIMETRES) IN THE LOWER DODDER CATCHMENT AREA

	25/8/'86	Highest 1 day rainfall in a period
Milltown Golf Club Dublin	95.0	Not Available
St Columba College Rathfarnham	86.0	63.0 (1973-1985)
Eallyboden, Dublin	100.1	59.7 (1967-1985 incomplete record)

Table 3

MAXIMUM FALLS IN SPECIFIED TIMES AT SYNOPTIC STATIONS IN THE WORST HIT AREAS

DURING THE STORM 25TH/26TH AUGUST 1986

STATION	15 MINS	30 MINS	60 MINS	2 HRS	3 HRS	4 HRS	6 HRS	12 HRS	24 HRS	
(Highest Recorded) Cosement Aerodrome			(22.8) 9.3	(26.4) 17.0	(27.3) 22.5	(29.5) 29.1	(33.7) 41.5	(52.5) 66.2	(56.8) 89.4	Records from 1959
(Highest Recorded) Dublin Airport			(27.0) 7.1	(41.0) 10.7	(42.9) 15.7	(45.6) 19.4	(50.3) 27.4	(53.2) 46.6	(57.4) 65.5	Records from 1940
(Highest Recorded) Kilkenny		(31.6) 5.3	(37.9) 7.4	(56.7) 12.6	(62.5) 16.9	(64.7) 19.9	(65.7) 25.2	(66.4) 45.2	(66.4) 50.6	Records from 1958
(Highest Recorded) Roches Point	(13.8) 6.6	(17.2) 10.1	(23.7) 15.3	(28.5) 23.3	(34.6) 28.6	(40.6) 34.0	(52.9) 47.3	(73.1) 80.5	(85.0) 84.4	Records from 1956
(Highest Recorded) Rosslare			(33.0) 7.0	(49.5) 13.6	(53.2) 18.6	(57.2) 24.8	(60.8) 33.7	(79.9) 50.0	(81.5) 57.2	Records from 1957
(Highest Recorded) Cork Airport		(15.8) 5.2	(22.7) 10.5	(41.2) 19.4	(52.5) 27.6	(58.2) 30.5	(66.4) 39.2	(75.5) 55.0	(93.3) 64.9	Records from 1963

Fig 5

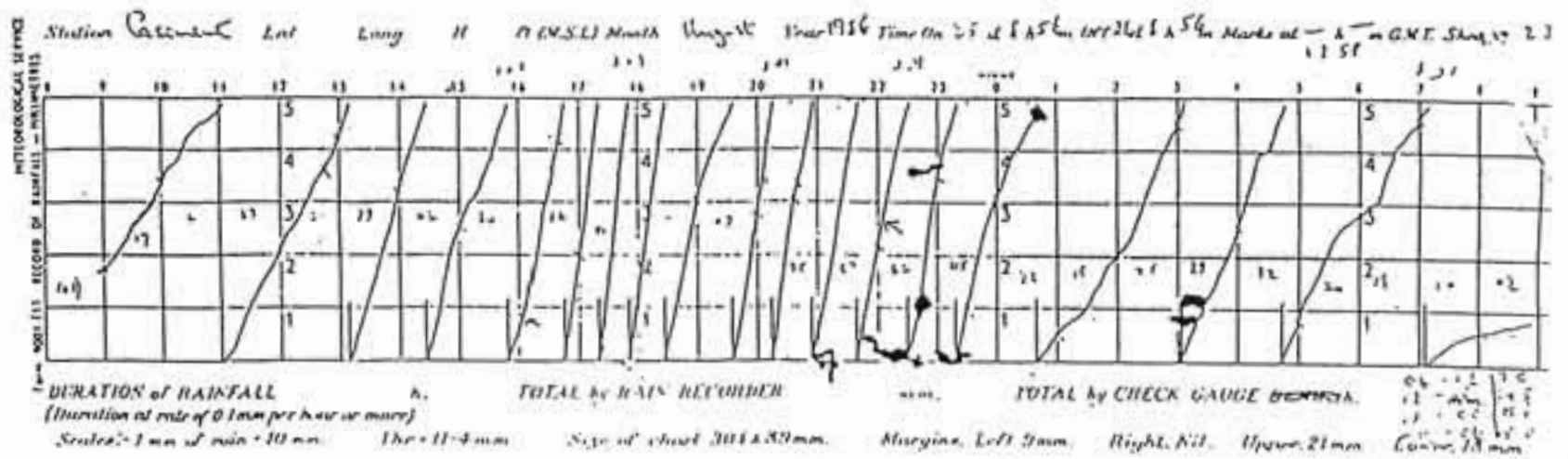


Table 4

COMPARISONS BETWEEN RAINFALL AMOUNTS AT SPECIFIED LOCATION 1905/1986

<u>LOCATION</u> *	<u>1986</u>	<u>1905</u>
Glenasmole	165.3	145.3
Bray	86.0	113.0
Dunlaoghaire (Harbour yard)	77.5	80.5
Dunlaoghaire (Peoples park)	67.7	79.5
Phoenix Park	85.1	85.1
Stillorgan	89.0	81.8
Glasnevin (Botanic Gardens)	73.5	90.9

\* Actual site of raingauge may not be identical on both occasions  
 e.g. : Bray (Passaroe in 1905 and at Garda Station in 1986).  
 Amounts in millimetres.