Met Éireann

Annual Report 2005

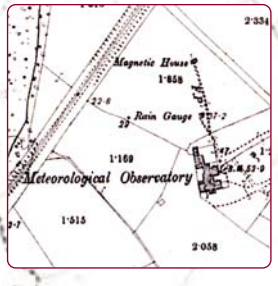
c. 1910

2005

Valentia Observatory

The cover shows Westwood House, the principal building at Valentia Observatory, as it appeared c. 1910 and in 2005 after extensive refurbishment works had been completed.

The background detail is reproduced from an Ordnance Survey map dated 1897.



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Foreword

Probably the outstanding feature of Met Éireann's activities in 2005 was the ever-increasing demand on the organisation to deliver additional services – whether developing new forecast products, implementing extensions to the basic infrastructure, or any one of a host of other tasks. It gives me great satisfaction to record that throughout the year Met Éireann maintained all routine operations while at the same time making significant progress across a range of these new undertakings.

Changes to the manner in which meteorological services are provided to civil aviation required that Met Éireann implement a certified quality management system for its Aviation Services Division – a goal achieved in September, when the Division was awarded ISO 9001:2000 certification. In the Instrumentation and IT areas there were particular demands arising from the deployment of automatic weather stations and the enhancement of computer systems. Met Éireann's response to the growing public awareness of climate change and its likely consequences was underscored by the publication of a major report on future Irish climate conditions for the period 2021–2060. And while looking to the future we were also careful to protect our heritage, as evidenced by the completion of a major refurbishment project at Valentia Observatory.

The pattern of increasing service requirements evident in 2005 will undoubtedly continue in the coming years. Already Met Éireann has started planning for the full automation of its weather station network, designed to extend the range of surface weather observations and in due course make additional staff available for support and development activities. Also, a fundamental review has been initiated of current methods for producing weather forecasts and delivering them

to end-users. It is clear that in this area too, increased automation will be key if Met Éireann is to meet escalating demands for high-quality weather services. In parallel with these developments a major redesign of Met Éireann's web site is underway, reflecting the Internet's increasing importance in disseminating weather information.

Coping with the fast-changing environment which now faces Met Éireann, and indeed all European National Meteorological Services, will present a major challenge. I have every confidence that, as in 2005, we will successfully adapt our capabilities to meet evolving demands and continue to deliver a first-class service to all our clients.

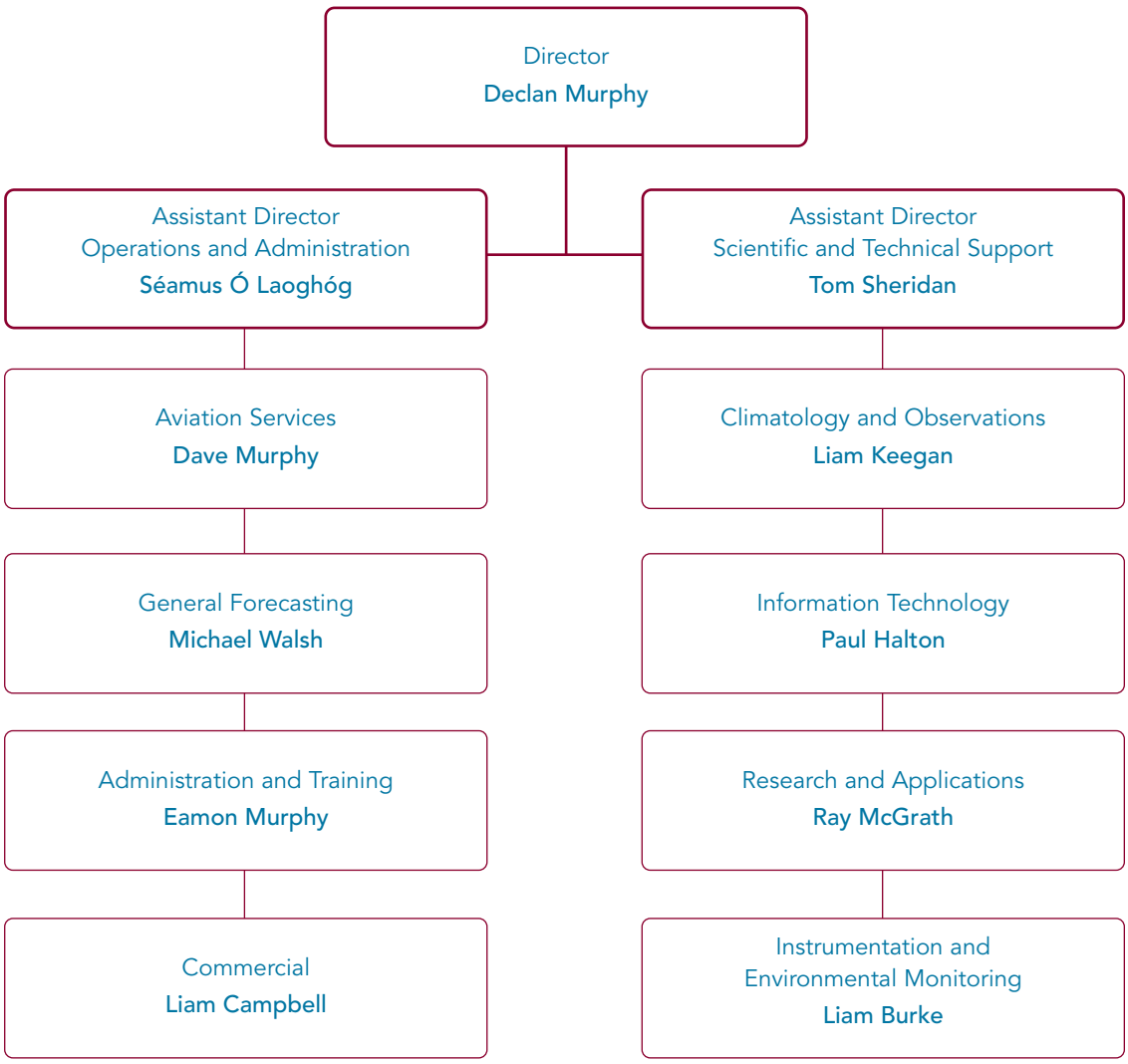
Declan Murphy
Director

July 2006

Mission Statement

Our Mission is to monitor, analyse and predict Ireland's weather and climate, and to provide a range of high quality meteorological and related information to our customers.

Organisational Structure of Met Éireann (December 2005)



Refurbishment of Westwood House

Valentia Island and Cahirciveen, Co. Kerry have a long association with meteorology, stretching back to 1860 when Admiral FitzRoy (famous for captaining HMS Beagle with Charles Darwin on board) set up a telegraphic weather reporting station on the Island. This was followed in 1868 by Valentia Observatory, which was established on the Island by the British Board of Trade and continued in operation there until transferred to Cahirciveen in March 1892. The principal building at Cahirciveen was Westwood House, a Victorian family home built in 1866 by Captain Needham, the local agent for Trinity College Dublin which had major land holdings in the area.

Westwood House
in the early years of the 20th century.

The Irish Meteorological Service (Met Éireann) was established in 1936 and took over responsibility for the Observatory in 1937. While some refurbishment work was carried out in the 1950s, by the end of last century the house and its outbuildings, paths, entrances and approach roads were all in need of extensive repair and restoration.

In February 2000 the Property Maintenance Section, Office of Public Works (OPW), was invited to assess the overall condition of the Observatory

Westwood House in 2005
following completion of restoration works.

with a view to having the facilities and buildings modernized and refurbished. The first phase of the project began in October 2002, with the conversion of some old workshops to laboratories, office space and an archive room. Later, all pathways on the site were kerbed and resurfaced, approach roads were widened and a new entrance was provided.

Refurbishment work on Westwood House itself commenced in November 2003. The roof was replaced and the chimneys, which were removed in the 1950s, were restored. All windows, doors and wooden surrounds were repaired or replaced. The electrical, data and communications systems were completely rewired and the heating and

plumbing systems redesigned. Internally and externally the house was completely redecorated in a style consistent with its status as a listed building.

In carrying out the refurbishment project a careful balance had to be maintained. On the one hand it was essential to preserve the integrity of the house's many fine architectural features and to give due respect to its historical past. But it was also necessary to cater for the present and future demands of a working Observatory. In the event OPW met the challenge with great skill and expertise – the house was restored to the highest standards, while providing for present and future operational needs. Today the Observatory carries out routine surface weather and upper-air meteorological measurements, as well as a wide range of programmes including ozone monitoring, geomagnetics, seismology, solar radiation and environmental monitoring. The Observatory participates in the WMO's Global Atmosphere Watch programme, designed to make reliable, comprehensive observations of the chemical composition and selected physical characteristics of the atmosphere on global and regional scales.

On October 21st 2005 Batt O'Keeffe T.D., Minister of State at the Department of the Environment, Heritage and Local Government, unveiled a plaque at Westwood House to commemorate the completion of the refurbishment project. In his address he warmly congratulated the OPW on the excellent quality of their restoration work, and recalled the important meteorological heritage that began on Valentia Island in the 1860s and which had made Valentia Observatory an internationally-important scientific site.
The distinguished attendance included John O'Donoghue T.D., Minister for Arts, Sport and Tourism, and representatives of OPW, the contractors and of many scientific bodies that co-operate with the Observatory in its monitoring programmes.

Batt O'Keeffe T.D., Minister of State at the Department of the Environment, Heritage and Local Government, unveiling the plaque at Westwood House watched by John O'Donoghue T.D., Minister for Arts, Sport and Tourism (left), Paul O'Donoghue (Member of Kerry County Council) and Declan Murphy (Director, Met Éireann).

ISO 9001:2000 Certification

The European Union's Single European Sky regulations, due to be implemented in 2006, aim to make air transport in Europe more efficient and cost effective. They will also have major implications for providers of meteorological services to civil aviation – for example, Met Éireann will in future be required to apply to a government-appointed Regulator for a licence to provide such services. Among the license conditions is a requirement that Met Éireann's Aviation Services Division should operate a certified quality management system (QMS).

What is a quality management system? In the past quality management systems were often perceived as irrelevant bureaucratic accretions to business. They had a reputation primarily as form-filling exercises to facilitate control by management. While there may have been a certain validity to this perception, in reality good and well-implemented quality management systems enable an organisation to conform to the old axiom – *if you can't measure it, you can't manage it.* And if you can't manage it, then fulfilling customer requirements will only happen by accident.

It is the customer that is at the start, finish and heart of any modern QMS. An organisation will not exist without customers and the essential business of any organisation is to meet customer needs.

Having clearly identified customer requirements, it is then necessary to organise the business processes to deliver those requirements. It is essential to monitor and measure processes and outputs to ensure that they meet the set performance standards. Of course, continuous and effective contact with customers, including the identification of new requirements, is essential to any good QMS. It is only through such a procedure that management can develop and implement continual business improvement.

Implementation of the QMS in the Aviation Services Division was facilitated by its long tradition in servicing the meteorological needs of aviation. The essential elements of a QMS were already in place because of the pre-existing strong focus on safety and the customer. Nonetheless, these elements had to be pulled together in the formal implementation of the QMS and this proved to be a complex and time-consuming task.

The International Civil Aviation Organisation (ICAO) recommends that QMS systems established for aviation services should be in conformity with the International Standards Organisation (ISO) 9000 series of quality assurance standards. In compliance with this recommendation Met Éireann established a Project Team to implement the ISO 9001:2000 QMS in its Aviation Services Division. The myriad tasks undertaken by the Project Team included:

- identifying clearly the core and support processes of the Division, the external supports and their key elements

- ensuring that customer consultation procedures were formalised and implemented

- identifying and documenting the key Quality Procedures required, such as Document Control, Record Control, Internal Audit, Corrective Action and Customer Complaints

- setting clear and attainable performance metrics for processes and outputs and developing automated systems for measurement of performance

- setting the basis for service level agreements with other Met Éireann Divisions and outside agencies

- recommending internal auditors and setting internal audit schedules

- outlining a procedure for management review of the QMS

The Project Team comprised a wide cross-section of staff from Aviation Services Division working with an external Consultant. But it would be fair to say that all staff of the Division contributed to the Project's successful outcome, as well as Senior Management and staff from other Met Éireann Divisions.

Met Éireann obtained the ISO 9001:2000 quality management certificate for its Aviation Services Division in September 2005. The formal presentation of the certificate was performed by Michael Ahern T.D. (Minister for Trade and Commerce, Dept. of Enterprise, Trade and Employment) at a ceremony in Dublin Castle in October.

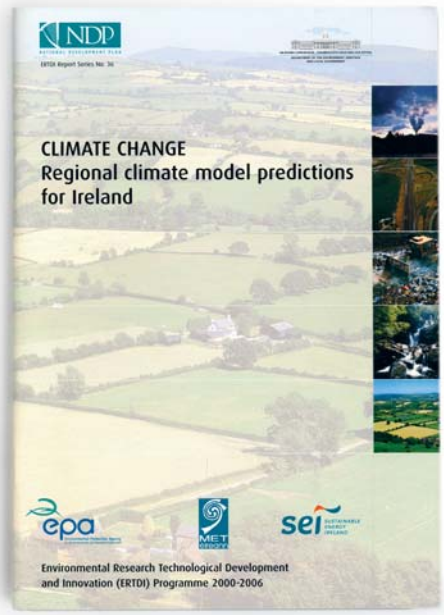
Presentation of ISO 9001:2000 Certificate to Aviation Services Division. From left: Pearse Coyle (Met Éireann), John O'Flanagan (Met Éireann), Declan Murphy (Director, Met Éireann), Michael Ahern T.D. (Minister for Trade and Commerce, Dept. of Enterprise, Trade and Employment), Paraic Carrigan (ISO Project Manager, Met Éireann), Dave Murphy (Head of Aviation Services Division, Met Éireann), and Brian Doyle (Met Éireann).

Launch of C4I Report

The Community Climate Change Consortium for Ireland (C4I) Project was established in 2003 to consolidate and intensify the national effort in climate change research. The leading partners in the Project are Met Éireann and University College Dublin. Funding is provided by the Environmental Protection Agency and Sustainable Energy Ireland (under the National Development Plan), the Higher Education Authority (under the Programme for Research in Third Level Institutions), and by Met Éireann itself.

In 2005 C4I completed a major analysis of future Irish climate conditions for the period 2021–2060, based on outputs from a new regional climate modelling facility located in Met Éireann. The Report of this work – 'Climate Change: Regional Climate Model Predictions for Ireland' was launched by Dick Roche T.D., Minister for the Environment, Heritage and Local Government, in the Custom House, Dublin on June 2nd 2005.

The Report details the first results in an ambitious programme to improve our understanding of climate change and its implications for Ireland. In the 2021–2060 period projected temperature changes show a general warming with mean monthly temperatures increasing typically between 1.25°C and 1.5°C. For precipitation, the most significant changes occur in the months of June and December; June values show a decrease of about 10% compared with the current climate, noticeably in the southern half of the country; December values show increases ranging between 10% in the south-east and 25% in the north-west.



Minister Roche congratulated all involved in producing the Report, and offered his full support to the C4I project as an important new resource in the national study of climate change.

At the launch of the C4I Report – Declan Murphy (Director, Met Éireann), Dr. Mary Kelly (Director General of the Environmental Protection Agency), Dick Roche T.D. (Minister for the Environment, Heritage and Local Government) and David Taylor (Chief Executive Officer, Sustainable Energy Ireland).

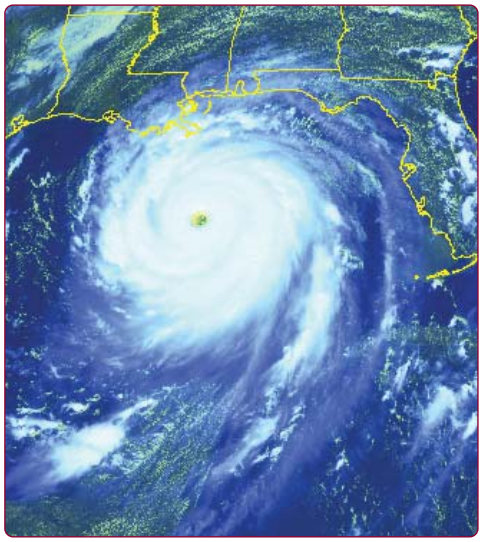
Weather Review 2005

Global Weather

The World Meteorological Organisation (WMO) estimates that the global mean surface temperature in 2005 was +0.48°C above the 1961-1990 annual average of 14°C. This makes 2005 the second warmest year on record - 1998 remains the warmest year, when surface temperatures averaged +0.54°C above the same 30-year mean. Since the start of the 20th century, global average surface temperature has risen between 0.6°C and 0.7°C.

The 2005 Atlantic Hurricane season brought an unprecedented 26 named tropical storms that caused devastating losses across Central America, the Caribbean and the United States. Seven storms including four hurricanes made landfall in the USA. Hurricane Katrina was the deadliest hurricane to affect the United States since 1928. The storm killed at least 1,300 people, mostly in the southern states of Louisiana and Mississippi and produced widespread devastation along the central US Gulf coast.

In Europe rainfall extremes impacted on eastern and western parts of the continent in different ways. Western Europe suffered multi-month drought conditions throughout July, August and September. In the period October 2004 to June 2005 rainfall was less than half the normal in areas of the United Kingdom, France, Spain and Portugal. In France, western parts were most acutely affected. Neighbouring Spain and Portugal experienced the worst drought conditions since the late 1940s and the dry conditions caused extensive wildfires. By contrast, persistent heavy rains during the period May-August led to destructive flooding in eastern Europe, particularly in Romania, Bulgaria and Hungary, causing damage to property, infrastructure and agriculture. Torrential rainfall in mid-August also flooded



False-colour image of Hurricane Katrina in the Gulf of Mexico at 18.00 UTC on August 28th.

sections of Switzerland, Austria, southern Germany and the Czech Republic.

In 2005 the size of the Antarctic ozone hole was well above the 1995-2004 average. Based on satellite observations it ranked as the third largest ever recorded, after 2000 and 2003. Significant ozone depletion was also evident in the Arctic - during the spring of 2005, in large portions of the Arctic region, average values of total ozone were 30-45 per cent lower than comparable values during the early 1980s.

The decline in Arctic sea-ice intensified in 2005, dropping well below average for the fourth successive year. By the end of September - typically the month with the least sea-ice extent - it was about 20 per cent less than the 1979-2004 average, the lowest observed since satellite records became available in 1979. The main causes for the 2005 decline were warmer-than-average Arctic temperatures and an early arrival of the sea-ice melt season.

Irish Weather Measurements 2005

County/ Station	RAINFALL (mm)				TEMPERATURE (°C)				SUNSHINE (HOURS)				NO. OF DAYS WITH:						
	Total	% of average	Most in a day		Mean	diff. from average	Extremes		Daily mean	% of average	Most in a day		Rain (>0.1mm)	Snow	Air frost	Hail	Thunder	Fog	Gale gusts
			amount	date(s)			Highest	Lowest			amount	date(s)							
CO. CLARE																			
Shannon Airport	914.2	99	40.0	7 Jan	11.0	+0.9	28.0	-2.8	3.60	103	15.3	27 Jun	219	5	20	12	5	25	51
CO. CORK																			
Cork Airport	1191.7	100	66.3	24 Jul	10.3	+0.9	26.2	-2.2	3.81	100	15.5	27 Jun	208	9	9	4	2	113	69
CO. DONEGAL																			
Malin Head	1086.1	102	30.2	11 Feb	10.4	+1.1	23.4	-0.8	3.30	97	14.5	13 May	229	10	3	40	1	8	140
CO. DUBLIN																			
Dublin Airport	683.1	n/a	32.6	28 Jul	10.2	n/a	24.8	-3.4	3.77	97	15.6	11 Jul	192	14	32	19	7	32	68
Casement Aerodrome	624.2	88	31.4	28 Jul	10.4	+1.1	27.3	-5.6	3.55	98	15.5	11 Jul	181	16	42	18	8	19	75
CO. KERRY																			
Valentia Observatory	1500.1	105	52.0	2 Dec	11.5	+1.1	26.2	-1.2	3.53	104	15.2	11 Jun	235	4	5	19	3	15	91
CO. KILKENNY																			
Kilkenny	757.9	92	35.8	21 Mar	10.5	+1.2	29.2	-5.1	3.75	107	15.4	27 Jun	193	n/a	41	n/a	n/a	n/a	33
CO. MAYO																			
Belmullet	1220.1	107	31.7	2 Dec	11.1	+1.5	24.5	-1.1	3.48	99	14.8	6 Jun	255	12	7	40	5	15	113
Connaught Airport	1205.6	n/a	39.2	25 May	9.1	n/a	25.9	-3.4	3.10	n/a	14.5	14 May	278	18	25	13	2	155	79
CO. MONAGHAN																			
Clones	852.7	92	27.2	24 Oct	10.0	+1.2	28.6	-4.6	3.24	102	14.1	14 May	211	n/a	21	n/a	n/a	n/a	39
CO. OFFALY																			
Birr	789.0	98	44.9	7 Jan	10.5	+1.2	28.4	-4.7	3.14	94	14.8	11 Jun	214	n/a	37	n/a	n/a	n/a	28
CO. WESTMEATH																			
Mullingar II	866.7	93	36.6	7 Jan	9.9	+1.1	27.2	-4.4	3.68	105	15.0	11 Jul	216	n/a	41	n/a	n/a	n/a	23
CO. WEXFORD																			
Rosslare	853.5	97	51.6	24 Jul	11.2	+1.1	22.5	0.0	4.43	102	15.6	11 Jul	183	8	0	12	4	27	107

Weather in Ireland

Ireland's weather in 2005 was warmer and drier than normal in most places, with near-average sunshine amounts.

Mean air temperatures for the year were around 1°C above the 1961-1990 average. Mean temperature values for May and November were near normal, but were above average for every other month and were particularly high relative to normal for January, March, June and October. The hottest weather of the year occurred during the first half of July, especially between the 10th and 12th, when maxima reached over 25°C in most places; a number of stations measured their highest maxima since 1995 on these days. The lowest air and ground temperatures of the year were recorded during a spell of exceptionally cold weather in early March.

Annual rainfall totals were below normal except at Atlantic coastal stations. Although totals in the Dublin area were around 10% below normal, at no station was it as dry as in the exceptionally dry year of 2001. February, March and December were the driest months compared to the average, while both April and May were wet. July and October brought some very heavy falls in the east and south; over 50mm was measured near southern coasts on July 24th and another 100mm fell in the same area in the 4-day period between October 17th and 20th. The number of wetdays (days with 1mm or more rainfall) measured during the year was below normal generally; there were between 125 and 160 wetdays recorded in Leinster, and over 180 in Connaught and west Munster.

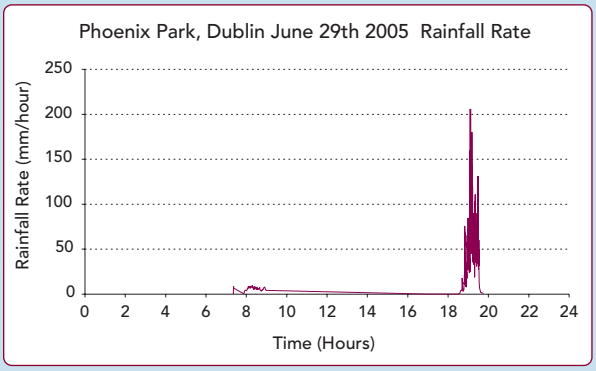
Annual sunshine totals were close to or a little below normal generally. March, June and July were relatively dull, while totals for May, August and particularly November were above normal. More than 15 hours of sunshine were recorded over most of Munster and Leinster on both June 27th and July 11th.

Rainfall Intensity

In recent years, Met Éireann has deployed a number of automatic weather stations, referred to as the TUCSON network. These stations can measure and report weather parameters on timescales significantly shorter than had been possible before. For example rainfall amounts, measured by a pair of 'tipping bucket' rain recorders, are reported each time 0.1mm has fallen. It is therefore possible to analyse very heavy rainfall events which take place over short timescales in much more detail than before.

In analysing intensity of rainfall meteorologists often use the concept of 'return periods'. The return period is defined as the average number of years within which a rainfall event of a certain magnitude is expected to be equalled or exceeded. For example, the 100 year return period amount for daily rainfall at Phoenix Park, Dublin is 91mm – i.e., daily rainfall totals of 91mm are likely to occur on average once every 100 years. For hourly rainfall the 100 year return period amount is 35mm.

A very heavy rainfall event in Dublin on the evening of June 29th 2005 provided an interesting example of the measurement capability of the new automatic weather stations. The TUCSON station in Phoenix Park recorded the following measurements:



1. The daily rainfall total was over 54mm.
2. There was more than 45mm in less than an hour.
3. The 100 year return period rainfall amount was exceeded for the periods 15 minutes, 30 minutes, 1 hour and 2 hours.
4. The rainfall rate briefly reached 205 mm/hour.

Bearing in mind that tipping bucket rain gauges tend to under-report in heavy rain, the above figures were probably exceeded in reality.

Summer 2005 and the Poulter Index

The Poulter Index combines measurements of mean temperature, total rainfall and total sunshine during the months of June, July and August as a means of quantifying summer weather at a given location - the higher the index, the 'better' the summer weather.

In 2005, all the summer months were warmer than normal, in many places resulting in the warmest summer overall since the record-breaking year of 1995. Rainfall totals were below normal almost everywhere, with only around three quarters of the normal amounts in parts of the midlands and east. Sunshine totals were below normal at most stations.

Figure 1 shows the variation of the Poulter Index from 1965-2005 averaged over four locations – Phoenix Park (Co. Dublin), Valentia (Co. Kerry), Malin Head (Co. Donegal) and Birr (Co. Offaly).

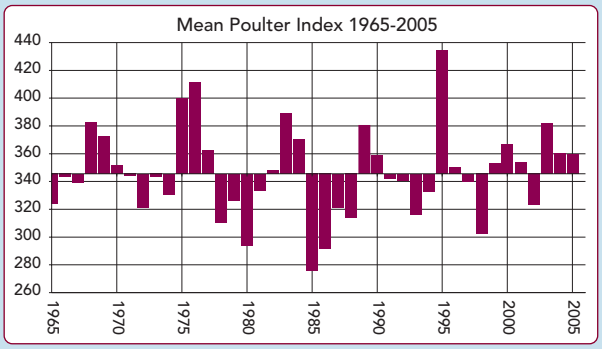


Figure 1

As would be expected, the summer of 1995 shows the highest Index value for the period. For 2005, the Index values recorded for Phoenix Park and Valentia were in the top 10% of values over the series dating back more than a century; Malin Head was slightly better than average while Birr was a little below normal due to its relatively low sunshine total. Overall the combined average Poulter Index indicates a somewhat better-than-average summer in 2005.

Strategic Management – Delivering Met Éireann's High-Level Goals

Progress in Achieving High-Level Goals

Met Éireann's Strategy Statement lists ten High-Level Goals which together describe the organisation's key objectives and strategies. Progress in achieving these Goals during 2005 is detailed below.

HIGH-LEVEL GOAL 1:

To make available to the general public of Ireland an excellent service of high quality general weather forecasts, warnings of hazardous weather and other information helpful in the prevention or mitigation of environmental disasters.

General Forecasting Division

The General Forecasting Division (GFD) supplies a wide range of forecast services and weather warnings through the Central Analysis and Forecast Office (CAFO) and the RTÉ Weather Office. Customers include the general public, Government and semi-state bodies, local authorities, the media and a range of business and commercial interests.

During 2005 the volume of routine forecasts issued by the Division was similar to previous years. A total of 398 gale warnings and 355 small craft warnings were issued, along with additional specific warnings of particular weather conditions (see Table). From January 20th the Division used metric wind speed units (km/hr) for all land based forecasts and warnings.

Specific Warnings	Number
Frost / Low Temperature	16
Rain	63
Snow	17
Thunder	141
Wind	165
Blight Conditions	80

Customised weather services were delivered to energy utilities, the building industry and several other business and commercial interests.
In collaboration with the National Roads Authority, winter road maintenance forecasts for over 50 sites were provided to local authorities nationwide. A new SMS-based facility to alert local authority engineers to any changes in forecast conditions was introduced.

The Telephone Consultancy Service (which provides direct customer access to the operational weather forecasters) continued to prove popular with many industrial and commercial clients. There was strong demand for Met Éireann's premium-rate telephone weather services, which were enhanced through the addition of a Farming Analysis linking weather conditions to specific farming activities.

Throughout the year the Division provided updates for Met Éireann's web site several times daily. Forecasts of pollen count and sunburn index were issued during the spring and summer months. The forecast service for Inland Lakes, introduced as a pilot project in 2004, continued in 2005 following very positive feedback from end-users.

Recent years have seen a number of severe flooding events in the Dublin area, and in response Dublin City Council initiated a project to develop a Coastal Flood Warning System.
A system named TRITON was implemented by the Council and an evaluation period began in winter 2005. General Forecasting Division monitored the output from the system, especially at times of spring tides, and intervened to modify wind/wave predictions and surge forecasts as necessary. Following the evaluation period the overall performance of the system, and the impact of GFD's interventions, will be assessed.

Numerical Weather Prediction

Research and Applications Division continued the development of Met Éireann's High-Resolution Limited Area Model (HIRLAM), with a particular focus on lateral boundary conditions.

HIRLAM, which began in 1985, is a cooperative project between the National Meteorological Services of the Nordic countries, Spain, the Netherlands and Ireland. Throughout 2005 the HIRLAM model ran four times daily on Met Éireann's computer systems and the output formed the principal basis for short-range forecasting (up to 48 hrs ahead). The Wave Forecast Model (WAM) which forecasts sea conditions such as wave height, swell height etc. ran twice daily in tandem with the HIRLAM model.

Both the HIRLAM and WAM systems were ported to a Linux cluster in 2004. During 2005 work continued on resolving a number of cluster-related hardware and software issues, however a full implementation of the operational forecast models was still outstanding at the end of the year.

For forecasts in the range 3 to 7 days ahead, Met Éireann relies mainly on guidance provided by the European Centre for Medium-Range Weather Forecasts (ECMWF). Throughout 2005 the numerical model at ECMWF underwent relatively minor changes which nonetheless led to some useful improvements in rainfall and cloud cover forecasts. Plans were well advanced for the implementation of a new model cycle early in 2006 which will see major enhancements to both horizontal and vertical resolution, leading to more accurate forecast guidance.

During 2005 Met Éireann engaged an INTRA student to develop an improved graphical editor for use in preparing the winter road maintenance forecasts for the National Roads Authority. (INTRA – INtegrated TRAining – is a scheme which enables 3rd-level students to take up paid work-placements in an area relevant to their particular field of study).

HIGH-LEVEL GOAL 2:

To fulfil the State's obligations to provide meteorological services to aviation and to influence future developments in this area in order to achieve the best long-term result for the State and for the aviation sector.

The Aviation Services Division (ASD) provides services to civil, military and general aviation, in accordance with ICAO standards and recommendations and national procedures. It comprises the Central Aviation Office at Shannon Airport, at which the Head of the Division is based, together with the Meteorological Offices at Dublin, Cork and Knock Airports and at Casement Aerodrome. Aviation Services Division is the focal point for liaison between Met Éireann and the Irish Aviation Authority, the airport authorities, and the various international agencies insofar as their activities are concerned with aviation meteorology.

All routine operations continued as normal throughout the year. Terminal Aerodrome Forecasts (TAFs) were issued for Shannon, Dublin, Cork and Knock Airports and for Casement Aerodrome. Local Aerodrome Warnings were provided for these sites and also for a number of regional airports. A total of 121 SIGMET warnings were issued for the Shannon Flight Information Region, while 234 forecasts were provided to assist Search and Rescue operations. Self-briefing facilities were made available to pilots at Dublin, Cork, Shannon and Knock Airports.

The European Union's Single European Sky (SES) policy aims to make air transport within Europe more efficient and cost effective. SES seeks to rationalise the management of European airspace, reducing the present multiplicity of Flight Information Regions (FIRs) and perhaps ultimately creating a single unified airspace in Europe. SES also regulates the provision of services to aviation, including meteorological services.

The impact of SES on Met Éireann, which is currently the designated provider of meteorological services to civil aviation in Ireland, will be significant. In order to obtain a license to continue providing such services Met Éireann will be required to comply with a number of conditions – for example, it will be necessary for the Aviation Services Division to implement certified quality assurance procedures. In this regard the ASD achieved a major milestone in September 2005 when it received certification under the ISO 9001:2000 Quality Management System.

HIGH-LEVEL GOAL 3:

To provide a comprehensive range of climate services to all sectors based on a high quality, up-to-date national climate archive, and, in collaboration with other centres of expertise, provide an authoritative voice on future climate trends in Ireland.

Throughout 2005 the Climatology and Observations Division continued its main tasks of maintaining the National Climate Database, managing the observational station networks and operating the Climate Enquiries Office.

The Climate Enquiries Office received approximately 4,200 telephone enquiries and 2,300 requests by email/fax/letter for climatological information or reports. More than 300 meteorologist reports were provided for legal/insurance cases and expert witnesses attended in court as required.

The Monthly Weather Summary was produced promptly after the end of each month, giving a preliminary assessment of the month's weather. The Monthly Weather Bulletin subsequently provided a more comprehensive description of weather conditions with commentary on significant events, both in Ireland and worldwide.

The Division continued to maintain and collect data from almost 600 climatological and rainfall stations, assisted by co-operating agencies and private individuals. These data, along with data from Met Éireann's own stations, were quality-controlled and made available in the climatological database. Over one third of the stations in the observing networks were visited by Met Éireann inspectors during 2005. Alternative sites were sought for some stations where nearby building activity was considered a threat to the validity and representativeness of the measurements.

A new computer was acquired to host climatological data processing and quality control functions. This will provide increased capacity to cope with the larger volumes of data now available from automatic weather stations. The time-consuming task of migration to the new machine was underway at the end of the year.

HIGH-LEVEL GOAL 4:
To maintain a high level of expertise and involvement in specialised areas such as agricultural, environmental and marine meteorology and to use this expertise to provide forecast guidance and decision support.

Agricultural and Environmental Unit

During 2005 the Unit maintained its collaboration with a wide range of agricultural and environmental groups. In partnership with Teagasc (the Irish Agriculture and Food Development Authority) and University College Dublin, work continued on the development of a decision support system for nitrogen/slurry spreading (Met Éireann provided ECMWF ensemble forecast fields for this project and advised on their interpretation and use).

The Agricultural and Environmental Unit supported Met Éireann's very successful attendance at the National Ploughing Championships at Mogeely, Co. Cork.

Met Éireann staff
at the National Ploughing Championships.

The National Ploughing Championships have become a major annual event in the Irish agricultural calendar, and provide an important venue for Met Éireann to promote its services and meet with one of its most important user groups.

Marine Unit

During 2005 the Marine Unit handled routine sea and shipping-related meteorological inquiries and oversaw the operation of Met Éireann's Wave Forecast Model (WAM).

Met Éireann's network of moored buoys was completed in 2004 with the deployment of the 5th buoy south of Wexford. The first of these buoys (M1), positioned west of the Aran Islands in 2000, has been incorporated into the EUMETNET Composite Observing System (EUCOS), and during the year there were ongoing discussions as to its optimum location. As a result M1 may be relocated to a new position in 2006.

Met Éireann continued its involvement in the EU-funded PRISM project, aimed at developing computer models to simulate the impact of increased storminess on the coastlines of the Irish Sea. A range of output data from the numerical weather forecast model (HIRLAM) was made available to the project, which is developing practical web-based tools suitable for use in planning and management decisions.

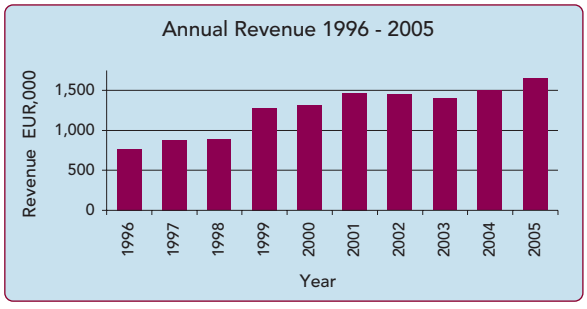
Community Climate Change Consortium for Ireland Project

During 2005 ongoing work by the Community Climate Change Consortium for Ireland (C4I) Project focused on quantifying the error or uncertainty in current climate change projections. The C4I Project also contributed to flooding studies, and results from C4I were used to assess the risk of future flooding in some river catchment areas. Work began on evaluating the impact of climate change on storm surge frequency in coastal areas.

HIGH-LEVEL GOAL 5:

To undertake commercial meteorological activity in a way that is consistent with competition law and with Met Éireann's other mandates so as to reduce overall costs to the exchequer.

As in previous years Met Éireann's principal revenue-earning activities included premium-rate weather forecasts, services to TV and other media, provision of climatological data and reports, and supply of severe weather forecasts (including winter road maintenance) to the National Roads Authority and to local authorities. While the market for commercial meteorological services remained very competitive, overall revenues showed a 10% increase on 2004 levels.



Customer service was improved through the implementation of a new Customer Relationship Management (CRM) software system. The system provides instant access to key customer information, prioritises activities and tracks all customer-related communications. Operated in tandem with enhancements to Met Éireann's accounting procedures, the CRM system enabled customer requirements to be managed with improved timeliness and efficiency.

Throughout 2005 the Commercial Division maintained on-going liaison with all major customer groups and business partners. Marketing and promotional activities included attendance at a number of shows and exhibitions, most notably the Dublin Boat Show in February and the National Ploughing Championships in September.

At the Dublin Boat Show - Pat the Cope Gallagher T.D., Marine Minister at the Department of Communications, Marine and Natural Resources, and Denis Fitzgerald (Met Éireann).

HIGH-LEVEL GOAL 6:

In association with Met Éireann's overall meteorological functions, carry out an appropriate and relevant set of environmental monitoring and geophysical programmes.

Valentia Observatory

A new ground station was installed at the Observatory in December 2005 for the upper air programme, measuring the vertical profile of meteorological elements four times a day. This unit is capable of determining wind speeds and directions using the Global Positioning System (GPS).

Measurements of ozone and ultra-violet radiation levels continued throughout 2005. The Observatory participated in national and international atmospheric chemistry, geomagnetic, seismological and phenological programmes. The second half of the national repeat station geomagnetic survey was completed.

The Observatory is a regional station in the Global Atmosphere Watch (GAW) programme of WMO. On the initiative of the Environmental Protection Agency, a review of the GAW programmes in Ireland was carried out in August by Dr Leonard Barrie, Chief of the Environment Division, WMO, and Dr Keith Puckett, Director of the Air Quality Research Branch, Environment Canada. The review validated the current programmes and recommended additional monitoring activities. Met Éireann, in co-operation with the National University of Ireland, Galway and the Atmospheric Research Station at Mace Head, Co. Galway, is currently working to implement some of these recommendations.

Laboratory

Analysis of the chemical composition of air and precipitation samples from selected synoptic stations continued in 2005, facilitated by the installation of new equipment which significantly expanded overall capacity. In association with the Environmental Protection Agency, samples were also analysed from four locations in a project to monitor air quality and acidification linked to trans-boundary pollution. Some initial planning was completed on further extending the range of the atmospheric chemistry programmes.

HIGH-LEVEL GOAL 7:

Maintain and enhance a technical infrastructure for Met Éireann that supports the production of its outputs.

Instrumentation

Synoptic Network

The Met Éireann network of synoptic weather stations, at which hourly observations of weather conditions are made, comprises a mix of manned and automatic sites. A full programme of observations, 24 hours a day, was maintained throughout the year at all stations.

Two additional automatic weather stations (AWS) were installed in 2005 in the unified climatological and synoptic observations network (TUCSON). These were located at Newport Furnace, Co. Mayo, and Markree Castle, Co. Sligo. This brings the number of TUCSON AWSs in operation to twelve.

The Met Éireann observing networks are supported by essential calibration, maintenance and repair programmes. A major refurbishment of

Met Éireann staff participating in a Mast Climbing Training Course in March.

the workshops and offices in the Instruments Unit was completed in early 2005.

Meteorological Radar and Satellite Receiving Systems

As in previous years Met Éireann operated two networked weather surveillance radars, located at Dublin and Shannon Airports, and also maintained ground station facilities for the reception of data from meteorological satellites.

Information and Communications Technology

During 2005 the IT Division supported and enhanced the ever-widening range of Met Éireann's computer systems and applications. Efforts were made to address shortages in staff resources through the recruitment of temporary contractors. New 24-hour rostering arrangements for IT Operations staff were implemented in April.

ECMWF and EUMETSAT

ECPDS (ECMWF Product Distribution System) is a general purpose data transmission system developed and deployed at ECMWF to deliver meteorological products to Member States. This new system was implemented by Met Éireann in April with no interruption to routine operations. In August the computers supporting the data transmission system were replaced with faster Linux machines having much greater disk capacity.

Mr. Vesa Karhila of ECMWF visited Dublin and assisted Met Éireann staff with the installation of the Magics/Metview graphical system in June.

Data from EUMETSAT's MSG satellites is in operational use in the forecast offices. Upgrades to the data reception and processing software were completed in July. Additional guidance material from the Nowcasting Satellite Application Facility was made available to the operational forecasters in March.

EUMETSAT data is received at Met Éireann via EUMETCast, a multi-service dissemination system based on standard Digital Video Broadcast (DVB) technology. In addition to receiving EUMETSAT services, from the end of August EUMETCast was used in test mode for the reception of some non-satellite weather observations and forecasts. The outcome of these tests is currently being evaluated.

Networks

Early in April 2005 a new WAN link was successfully installed in Valentia Observatory. This enabled the staff at the Observatory to have direct access to Met Éireann's Intranet, Internet and e-mail services. A second WAN link was installed in Knock Airport, enabling the transmission of WAFS charts to be replaced by direct printing over the network.

Office Systems

Recently-acquired servers supporting desktop users continued to work reliably throughout 2005. IT Helpdesk staff moved the personal e-mail archives for each user from their desktop PC to the central servers. Additional software systems were deployed to enhance security reporting facilities and to automatically disseminate anti-virus updates to all desktop clients.

A tender for the supply of 50 replacement PCs was issued in September and the new machines were delivered in late November. Throughout 2005 the IT Helpdesk and IT Operations staff continued to manage, support and improve e-mail security – the volume of e-mail messages now being handled is around 100,000 per month.

TUCSON

Support and development of TUCSON applications was given high priority in 2005 but was constrained by staff promotions and redeployment. At present observation data are collected on an hourly basis from twelve TUCSON AWS stations. When a new observation report is received it undergoes real-time quality control, and pseudo-SYNOP reports are produced for assimilation into the Numerical Weather Prediction systems.

Among the many other tasks addressed by IT Division in 2005 were on-going work to replace the existing VAX Cluster, taking a lead role in further development of Met Éireann's web site, supporting the C4I Project and developing facilities to replace T4-FAX charts. The workload involved in routine support of established systems was also very significant.

HIGH-LEVEL GOAL 8:

To position Met Éireann so as to make the most effective contribution to the achievement of Government objectives in the general environmental area.

Automation of Observing Network

Towards the end of 2004 Met Éireann initiated a debate on the future of the synoptic network of observing stations. This was prompted in part by the increasing impact of automation on what had heretofore been a predominantly manual operation. Increased use of automatic weather stations was considered a key factor in achieving maximum efficiency and the most effective deployment of staff resources.

In 2005 the debate continued with further refinement of implementation plans and wide-ranging consultation with staff. A Steering Group was established to monitor and coordinate progress and to ensure momentum was maintained. Proposals were formulated to address the human resource concerns which would arise from the planned developments, and to take account of the additional workload falling on the technical Divisions. By the end of the year good progress had been made across a broad range of issues and detailed assessment of some specific sites for new automatic stations was in hand.

National Effort to Forecast Flooding

Ireland has suffered a number of major flood events during the last decade, and current climate change research indicates that this problem is likely to persist and perhaps worsen in the future. Met Éireann is involved in a number of initiatives to help minimise the risk to life and property.

Flood estimation in Ireland has generally been undertaken using the methodologies and data provided in the Flood Studies Report, the outcome of an extensive UK – Irish research programme dating from the early 1970s. For some years past Met Éireann has participated in the Flood Studies Update project to revise this Report. An initial task, involving extraction of relevant data from the historical rainfall record, was completed during 2005, and an expert on contract to Met Éireann began a second task of analysing records of extreme rainfall events.

Met Éireann also provided data and reports for the Flood Hazard Mapping project – a programme to systematically map areas of the country prone to flooding and to disseminate this information via the Internet. Flood Hazard Maps present in a graphical format the areas of land or property that have historically been flooded, or that are considered to be at risk from flooding. The maps can display a range of parameters and different types of information such as flows, water levels, depths etc.

HIGH-LEVEL GOAL 9:

Actively seek collaboration with UK and other European meteorological services in order to improve the effectiveness of Met Éireann and to pursue Government objectives in relation to the British-Irish Agreement.

Throughout 2005 Met Éireann maintained its active involvement in the work of several international organisations including the World Meteorological Organisation, the International Civil Aviation Organisation, the European Centre for Medium-Range Weather Forecasts, the European Organisation for the Exploitation of Meteorological Satellites, the European Co-operation in Meteorology grouping and the European Meteorological Network. Met Éireann also continued its participation in HIRLAM, a co-operative project in Numerical Weather Prediction between the Nordic countries, Spain, the Netherlands and Ireland.

The European Co-operation in Meteorology grouping (ECOMET) was established in 1995 in response to the development of commercial meteorological activities in Europe. Its primary objectives are to preserve the free and unrestricted exchange of meteorological information between the European National Meteorological Services, and to ensure the widest availability of basic meteorological data and products for commercial applications.

Declan Murphy (Director, Met Éireann) and René Hoenson (Chief Executive, ECOMET) at the ECOMET General Assembly meeting in Dublin.

The ECOMET General Assembly meets twice yearly and in July 2005 held its 20th meeting in Dublin, attended by delegates from most Member States.

The HIRLAM project held its annual All Staff Meeting in Dublin in March. The meeting considered several important issues concerning the HIRLAM model itself, working methods within the project and future plans for collaboration with ALADIN, the numerical forecasting model of Météo-France (the National Meteorological Service of France). The meeting also considered an Evaluation of the HIRLAM project which had been compiled earlier in the year by an international group of experts.

In February a staff group from the Northern Ireland Branch of the UK Met Office, led by Mr. Graeme Leitch (Principal Met Officer), visited Met Éireann as part of the on-going contacts between the two organisations.

HIGH-LEVEL GOAL 10:

To utilise the Civil Service modernisation programme in all its aspects to improve the efficiency of Met Éireann and to develop the potential of its staff.

Administration

Capital expenditure in 2005 was below expectations mainly due to a slowdown in project implementation which in turn resulted from a shortage of staff resources. The full allocation for salaries was not utilised due to unavoidable delays in filling vacancies which arose during the year.

In the absence of a new Administrative Budget agreement between Met Éireann and the parent Department of the Environment, Heritage and Local Government, it was agreed that the guidelines and procedures as outlined in earlier agreements would continue to apply for 2006 and possibly 2007.

The implementation of the new Management Information Framework (MIF) system was further progressed in 2005. At the end of the year financial reports for Divisional Managers became available and progress had been made in updating Met Éireann's Asset Register.

Met Éireann staff at the Partnership Council meeting in Cork.

During 2005 one staff member resigned and there were eleven retirements. The Assistant Director, Scientific and Technical Support post was filled by Mr. Tom Sheridan. There were four appointments to the Meteorologist grade and one to a Temporary Contract Meteorologist post; three to the Meteorological Officer grade and one Services Officer was appointed. Three staff members were on career breaks at various stages during the year. At the end of 2005 there were the equivalent of 225.5 staff posts filled in Met Éireann (taking into account work sharing etc.).

Preparation of the updated Met Éireann Strategy Statement was well advanced with publication expected in the first quarter of 2006.

Partnership

The Partnership Council held eight meetings during 2005, two of which were arranged in conjunction with visits by the Council to Met Éireann's synoptic stations at Casement Aerodrome (Baldonnel) and Cork Airport.

The Partnership Council made important contributions to Met Éireann's Human Resources Strategy 2005-2007, which was published in March. The Strategy acknowledges the central role of staff in achieving Met Éireann's goals, and analyses the principal HR initiatives which will be undertaken in the coming years. The overall aim of the Strategy is to enhance the service delivered to customers through ensuring that all staff have a fulfilling and rewarding role within the organisation.

In recent years Government Departments have become more focused on staff health and safety matters. Risk assessments have been undertaken, competencies reviewed and the role of safety representatives clarified. In line with these developments the Partnership Council considered a number of health and safety-related issues during the year, including first-aid training and office cleaning/maintenance. Among the specific issues addressed were improvements to the fire alarm system and monitoring of temperature/ humidity levels at the Met Éireann offices in Glasnevin.

The Partnership Council also monitored the operation of the Performance Management and Development System (PMDS), considered arrangements for staff availing of Teleworking, and reviewed Met Éireann's Business Plan 2005. In November, under the auspices of the Council, a very successful social event was organised to mark the contribution of Met Éireann staff members who had completed 25 years service with the organisation. At its meetings in July and November the Merit Awards Group (a subgroup of Partnership) approved awards for two teams and nine individuals, benefiting a total of twelve staff members.

Staff Training and Development

During 2005 locally-organised courses/training events were attended by 105 staff, while an additional 24 staff attended training courses abroad. Eleven staff members availed of the Refund of 3rd Level Fees scheme and a further six received pre-payment for 2005/2006 fees.

Under an Agreement between Met Éireann and University College Dublin, two full-time places (or equivalent) on the M.Sc. Degree course in Meteorology are made available each year to Met Éireann staff. In 2005 this provision was availed of by four staff members who enrolled for the course on a part-time basis. Two additional staff attended full-time with support from the Refund of 3rd Level Fees scheme.

Initial training was provided in-house for three newly-recruited Meteorological Officers. In-house training was also provided for 150 staff in the areas of PMDS (Upward Feedback, Integration with Human Resource Management Procedures), the Official Languages Act 2003, Equality/ Diversity and Quality Customer Service.

An initial draft of a Training and Development Strategy for Met Éireann was reviewed by the Management Committee. A revised draft will be considered by the Partnership Council and the Strategy is expected to be finalised early in 2006.

Library & Information Services

Two issues of Met Éireann's staff magazine *Splanc* were produced during the year. In collaboration with staff from the General Forecasting Division, good progress was made in developing new educational and training material for primary-level schools. The librarian continued to act as content manager for Met Éireann's website, co-ordinating the implementation of routine changes and upgrades.

Young Scientist and Technology Exhibition

In 2005 Met Éireann sponsored a Special Award at the Esat BT Young Scientist and Technology Exhibition for the best project with Irish weather or climate as its central theme. Students from Scariff Community College - Seán Corry, Shane Moroney and José Ramire - won the Award for their project 'Atmospheric ion counting as an aid to meteorology'.

Students from Scariff Community College receiving their award from Evelyn Cusack (Met Éireann).

Appendix I – Forecast Accuracy

Verification of Public Weather Forecasts

During 2005 Met Éireann continued the routine verification of predicted daily maximum temperature, minimum temperature and rainfall at four sites (Dublin, Cork, Birr and Belmullet), based on the RTÉ 1 radio forecasts at 7.55 am.

Figures 1 and 2 show the mean annual Root Mean Square (RMS) errors for the maximum and minimum temperature forecasts for the years 2001 - 2005 (the smaller the RMS error, the better the forecast). Figure 3 shows the mean annual verification of rainfall amount by means of Hanssen and Kuipers' Score – this has a value of 1 for a perfect forecast, and zero for a random forecast, i.e. one lacking any skill. The Figures also show corresponding mean annual scores for persistence.

For 2005, the mean Root Mean Square (RMS) error for the maximum temperature forecast is about 1.5°C, and about 1.9°C for the minimum temperature. For rainfall, the average value of the Hanssen and Kuipers' Score is 0.44. All these scores are similar to the corresponding values for 2001-2004.

An indication of the quality of the forecasts can be got by comparing the forecast scores with the values that would be obtained for a 'standard' forecast. Persistence is a commonly-used standard for verification purposes - i.e., a forecast that assumes that tomorrow's weather will be the same as today's. Figures 1 - 3 show that, as would be expected, the annual forecast scores for the years 2001-2005 are in all cases much better than the persistence scores.

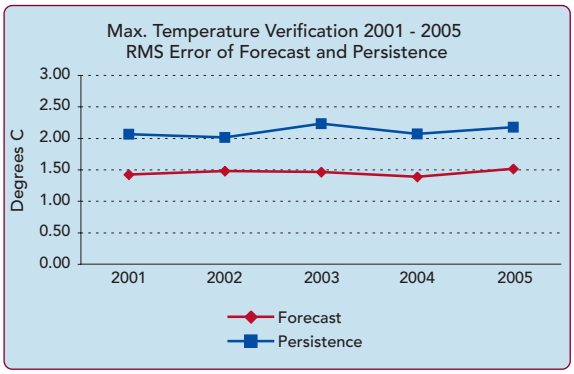


Figure 1

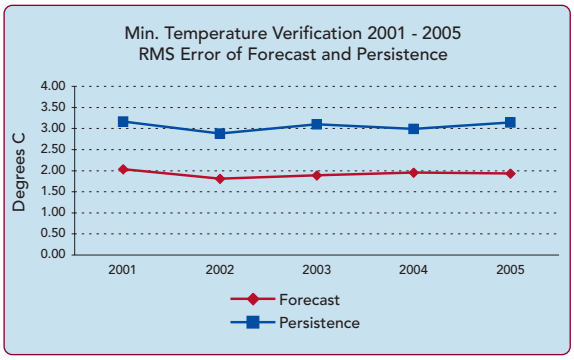


Figure 2

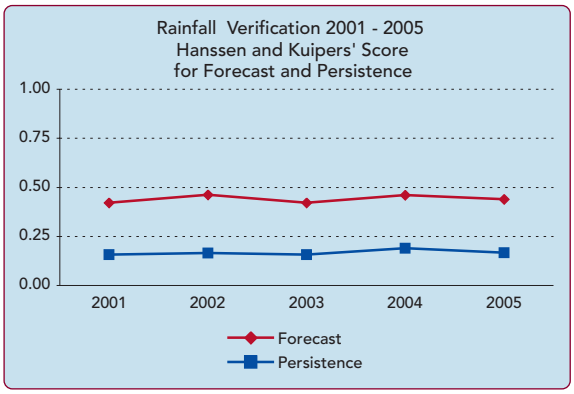


Figure 3

Numerical Weather Prediction

The evolution of the annual verification scores for the HIRLAM forecasts of 2-Metre Temperature and 10-Metre Wind Speed, from 2000 to 2005, is shown in Figures 4 and 5.

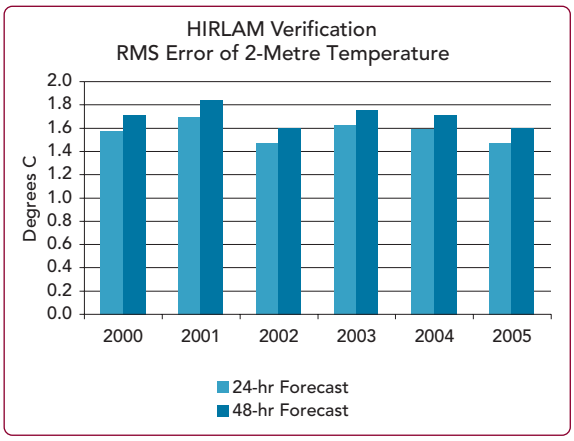


Figure 4

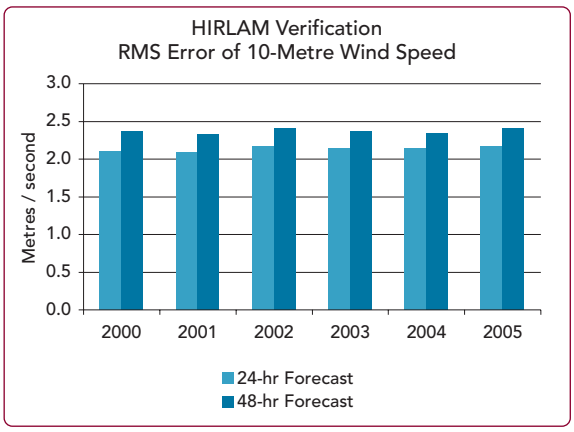


Figure 5

Figure 4 gives the Root Mean Square error scores of forecast 2-Metre Temperature for 24 hrs and 48 hrs, verified against actual temperature reports from the network of Irish observing stations. Both scores show a small improvement in 2005 RMS error compared with corresponding values for 2004.

Figure 5 shows the Root Mean Square error scores of forecast 10-Metre Wind Speed for 24 hrs and 48 hrs. For the 24 hrs forecast the 2005 RMS error is the same as in 2004, while for the 48 hrs forecast the 2005 RMS error is slightly greater.

Road Surface Temperature

Forecasts of road conditions are provided under contract to the National Roads Authority. Verification of the Road Surface Temperature (RST) minimum forecasts was carried out during the winter 2004/2005 season for the so-called critical nights (nights on which RSTs less than 5°C were observed) for all available sites. Table 1 shows the Hanssen and Kuipers' Score and the RMS Error for the 2004/2005 forecasts, along with the corresponding values for the winter seasons 2003/2004 and 2002/2003.

	Hanssen and Kuipers' Score	RMS Error
2004-2005	0.66	1.6°C
2003-2004	0.70	1.5°C
2002-2003	0.68	1.6°C

Table 1

For 2004/2005 both the Hanssen and Kuipers' Score and the RMS Error show a small disimprovement compared to the 2003/2004 values. However both scores have been quite stable over the past three winter seasons.

Air Temperature Forecasts

Early morning forecasts of maximum and minimum temperatures for Dublin and Cork, for the current day and the subsequent two days, are issued by General Forecasting Division. These forecasts are subsequently verified against observations at Dublin and Cork Airports. Figure 6 shows the annual RMS error scores for Dublin for the period 2001-2005 (Max1 = max. temperature on current day, Max2 = max. temperature on following day etc). Figure 7 shows the corresponding RMS error scores for Cork.

Generally speaking the 2005 RMS scores are comparable with those of 2004, with perhaps some evidence of a slight disimprovement in the minimum temperature scores for Cork.

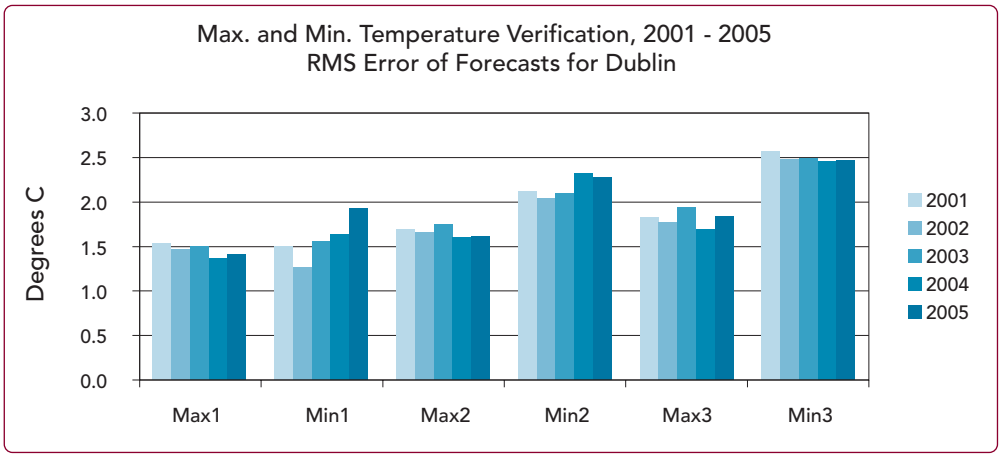


Figure 6

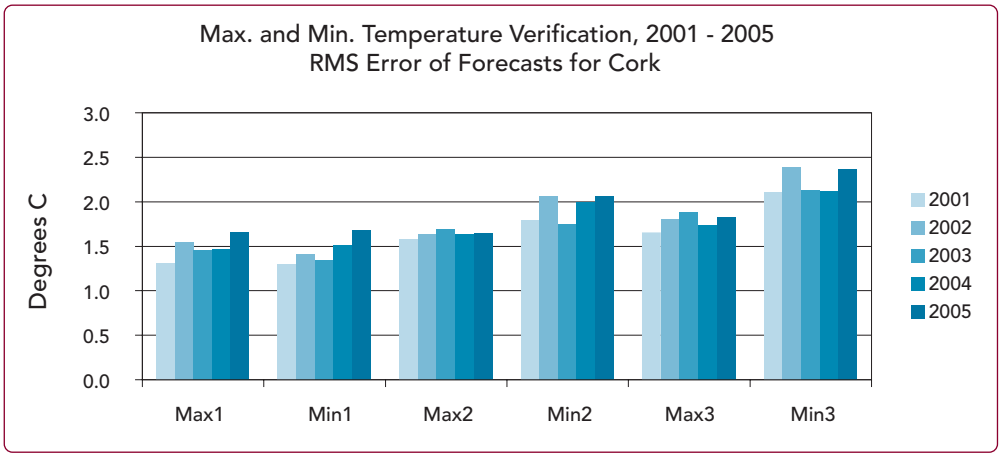


Figure 7

Appendix II – Publications

Fitzgerald, D.L. 2005: Analysis of extreme rainfall using the log logistic distribution. Stochastic Environmental Research and Risk Assessment (SERRA), 19, 4, 249-257.

Fleming, G. *et al.* 2005: Guidelines on weather broadcasting and the use of radio for the delivery of weather information. World Meteorological Organisation (WMO) Technical Document no. 1278, 54pp.

McDonald, A. 2005: Transparent lateral boundary conditions for baroclinic waves: a study of two elementary systems of equations. Tellus 57A, 171-182.

McDonald, A. 2005: Transparent lateral boundary conditions for systems of equations which support barotropic, baroclinic, and potential vorticity waves. HIRLAM Technical Report 64, 38pp.

McDonald, A. 2005: Progress report on transparent lateral boundary conditions. HIRLAM Newsletter 49, 124-128.

McGrath, R., Nishimura, E., Nolan, P., Semmler, T., Sweeney, C. and Wang, S. 2005: Climate Change: Regional Climate Model Predictions for Ireland. Environmental Protection Agency Report prepared by the Community Climate Change Consortium for Ireland, 45pp.

Schulte, R.P.O., Diamond, J., Finkele, K., Holden, N.M. and Brereton, A.J. 2005: Predicting the Soil Moisture Conditions of Irish Grasslands. Irish Journal of Agricultural and Food Research 44,1, 95-110.

Appendix III – Met Éireann Finances

The figures presented below are approximate and for information only. They do not form part of the official annual accounts of Met Éireann.

Income and Expenditure 2005/2004

	2005 €,000	2004 €,000	2005 €,000	2004 €,000
Salaries and Related Expenses (A1)			14,387	13,992
Other Operating Expenses			2,705	2,506
Capital Expenditure			602	611
Contributions to International Organisations			2,945	2,979
Total			**20,639**	**20,088**
Receipts from Eurocontrol (Route Charges)	7,833	7,261		
Receipts from Commercial & Cost Recovery Activities	1,651	1,501		
Total Receipts	**9,484**	**8,762**		
Net Cost of Operations			**11,155**	**11,326**

Some details of above

A1			
Salaries		13,533	13,333
Overtime		568	489
Payment to Observers		114	109
Other Allowances		172	61
A2 (Travel & Subsistence)		238	201
A3 (Training/Merit Awards/Cleaning etc.)		506	385
A4 (Communications & Post)		265	223
A5 (Computing Capital)		250	376
A5 (Computing Non-Capital)		564	536
A5 (Instrumentation Capital)		352	235
A5 (Instrumentation Non-Capital)		588	507
A6 (Maintenance/Energy)		525	604
A7 (Consultancy)		19	50
		17,694	**17,109**

Some details of commercial/cost recovery receipts

Aviation	6	13
Climatological Information	181	172
General Forecasting	1,440	1,237
Miscellaneous	24	79
	1,651	**1,501**

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e-mail: climate.enquiries@met.ie

Commercial Division

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Fax: +353-1-806 4247
e-mail: marketing@met.ie

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Fax: +353-21-431 7405

Met Éireann Connaught Airport

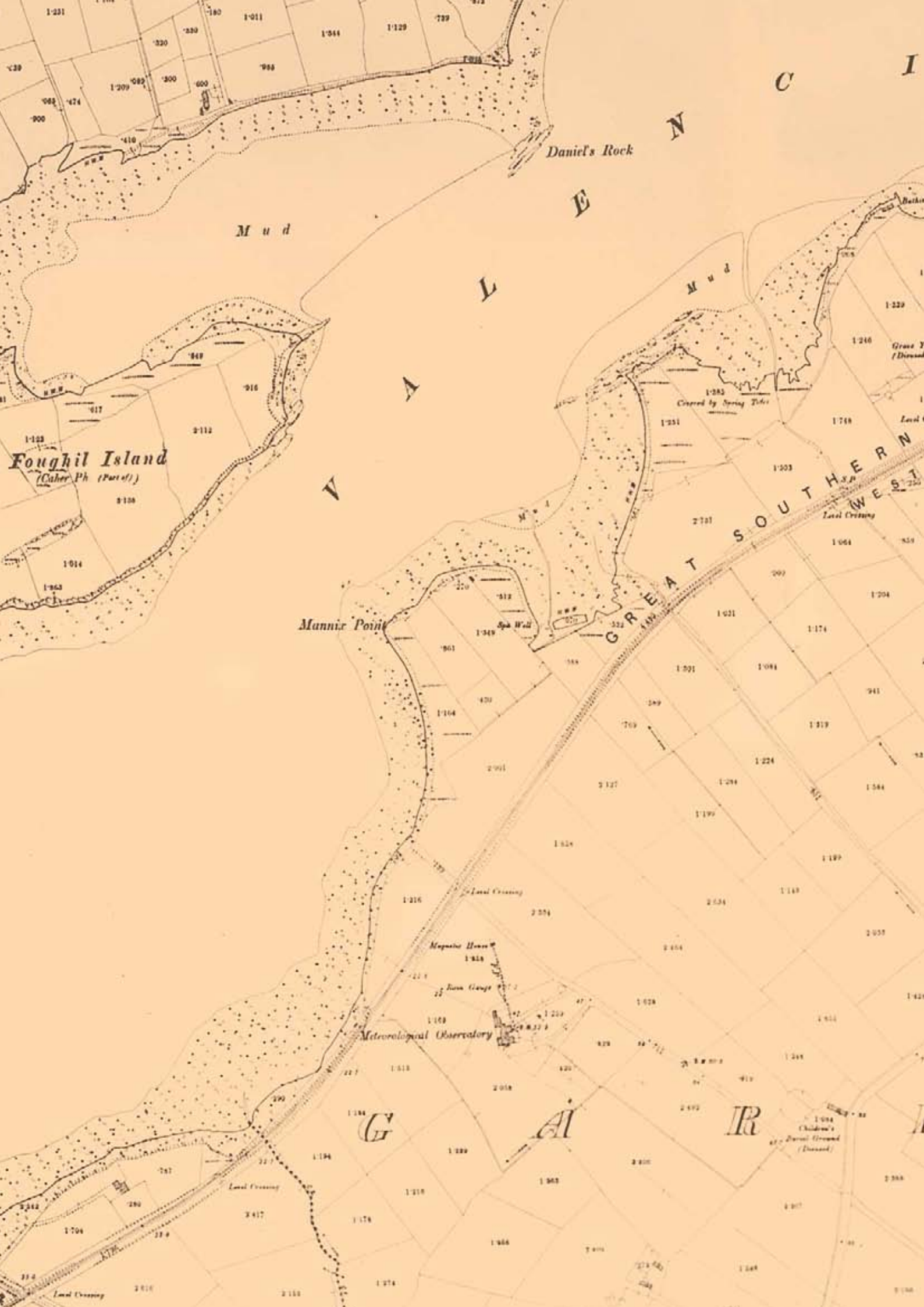
Knock
Co. Mayo
Tel: +353-94-936 7368
Fax: +353-94-936 7390

Glossary

ALADIN	Limited-area Numerical Weather Prediction model of Météo-France
AWS	Automatic Weather Station
C4I	Community Climate Change Consortium for Ireland
CAFO	Central Analysis and Forecast Office
CRM	Customer Relationship Management
ECMWF	European Centre for Medium-Range Weather Forecasts
ECOMET	European Co-operation in Meteorology
ECPDS	ECMWF Product Distribution System
EUCOS	EUMETNET Composite Observing System
EUMETCast	EUMETSAT data dissemination system
EUMETNET	Network of European Meteorological Services
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FIR	Flight Information Region
GAW	Global Atmosphere Watch
HIRLAM	High-Resolution Limited Area Model
ICAO	International Civil Aviation Organisation
INTRA	Integrated Training (3rd-level work experience programme)
ISO	International Organization for Standardization
MSG	Meteosat Second Generation
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
OPW	Office of Public Works
PRISM	Predictive Irish Sea Models
PMDS	Performance Management and Development System
QMS	Quality Management System
RMS Error	Root Mean Square Error
RST	Road Surface Temperature
SAF	Satellite Application Facility
SES	Single European Sky
SIGMET	Information on occurrence of specified aviation weather phenomena
SMS	Short Message Service
SYNOP	WMO Code for Surface Synoptic Observations
TAF	Terminal Aerodrome Forecast
TUCSON	The Unified Climate and Synoptic Observation Network
WAFS	World Area Forecast System
WAM	Wave Forecast Model
WAN	Wide Area Network
WMO	World Meteorological Organisation

Acknowledgements and photo credits

EUMETSAT
NOAA
National Library of Ireland
Met Éireann Staff


Daniel's Rock
Mud
Foughil Island
(Caher Ph (Part of))
Mannix Point
Spa Well
Meteorological Observatory
Magnetic House
Rain Gauge
Level Crossing
Covered by Spring Tides
GREAT SOUTHERN & WESTERN
VALENCIA
GARRE