WeatherNet Limited

Kingsland House 21 Hinton Road Bournemouth BH1 2DE
Telephone 01202 296396 Facsimile 01202 314064

LEGAL WEATHER REPORT
CLIENT: XX XXXX XXXXX
LOCATION: Hockley Heath, West Midlands (B94)
DATE: 1st January 2009

LEGAL METEOROLOGICAL REPORT PREPARED BY

Dr Richard J. Wild
WeatherNet Ltd
Kingsland House
21 Hinton Road
Bournemouth
Dorset BH1 2DE

Telephone: (01202) 411122
Fax: (01202) 314064
Mobile: (07967) 561549
Email: rick@weathernet.co.uk
Website: www.weathernet.co.uk

LEGAL METEOROLOGICAL REPORT PREPARED FOR AND INSTRUCTED BY

XXXXX XXXXX
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XXX XXX

Telephone: XXXXX XXXXXX
Fax: XXXXX XXXXXX
Mobile: XXXXX XXXXXX
Email: XXXXX.XXXXX@XXXXXXXXXX.XXX
Website: XXX.XXXXXXXX.XXX

Your Reference: XXX/XXX/XXXXX/XX
Slipping Incident in Hockley Heath, West Midlands (B94) on the 1st January 2009
My Reference: XXXX (XX)
Date: 16th November 2010
"Bond Solon trained in the aspects of report writing"

Legal Report Front Cover

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Appendices

METEOROLOGICAL REPORT FOR POSTCODE AREA B94 HOCKLEY HEATH, WEST MIDLANDS FOR THE PERIOD OF 1ST JANUARY 2009 (CLIENT: XXXX XXXXX)

1. Introduction

1.01 The writer

I am Dr Richard John Wild. I am the Weather Services Commercial Manager and Forensic/Senior Meteorologist at WeatherNet Ltd. My specialist field is in forensic meteorology. My qualifications include a BSc (Hons) in Geography (2:1) (obtained June 1994) and a PhD investigating the spatial and temporal analysis of heavy snowfalls across Great Britain between the years 1861-1999 (obtained July 2005). WeatherNet Ltd is a private weather consultant and is solely responsible for the conclusions and opinion expressed in this report. WeatherNet Ltd is an Authorised Data user by agreement with the Meteorological Office, Exeter and its own private meteorological network across the United Kingdom.

1.02 Summary background of the case

I have been asked to provide a detailed meteorological report, giving an expert opinion based on the meteorological facts as to the most likely meteorological conditions in the above area on the date and time indicated. This meteorological report complies with civil and criminal procedures.

1.03 Report prepared for	XXXXXX XXXX Solicitors
1.04 Your reference	XXX/XXX/XXXXX/XX
1.05 My reference	XXXX (XX)
1.06 Place of incident	Hockley Heath, West Midlands (B94)
1.07 Date of incident	1st January 2009
1.08 Time of incident	00:45

1.09 Summary of my conclusions

This meteorological report will show that in my professional opinion, that on the balance of probability that air temperatures across the area had been below freezing point which would have resulted in an air frost to be evident over that time period which would have resulted in some icy patches, particularly in untreated areas.

1.10 The parties involved

I have prepared this meteorological report for and on behalf of XXXXXX XXXX Solicitors.

1.11 Technical terms and explanations

If any technical terms are used within this meteorological report, then the explanatory notes section should be consulted in the appendices for further details.

2. The meteorological issues addressed and a statement of instructions

I have prepared this meteorological report for and on behalf of XXXXXX XXXX Solicitors, contained in their correspondence and instructions dated the 15th November 2010. The purpose of this meteorological report is to give an expert opinion based on the meteorological facts as to the most likely meteorological conditions in the above area on the date and time indicated. The meteorological issues addressed included examining meteorological data from professional meteorological stations, synoptic meteorological charts, lightning maps, amateur meteorological stations and rainfall radar imagery. This meteorological report complies with civil and criminal procedures. This meteorological report has been produced without the benefit of a site visit or investigation to clarify some of the opinions expressed. This meteorological report has been prepared for, with the full recognition that it may be presented in court as evidence. It is also accepted that this report may be submitted by another expert to the court, separate to or form part of a report.

3. My investigation of the facts

3.01 Details of meteorological stations utilised

To establish what meteorological conditions occurred around the surrounding area of the time of the incident, I investigated which were the closest meteorological stations that were operating at the time. The closest meteorological station to the incident, at which hourly weather data was available to me, was Coleshill (9 miles to the north-east). The closest meteorological stations within 20 miles of the incident, at which daily weather data was available to me, was Birmingham Airport (8 miles to the north-east), Coleshill (10 miles to the north-east), Bromsgrove (11 miles to the west), Bablake AWS (13 miles to the north-east), Coventry Airport (13 miles to the east), Pershore (17 miles to the south-west) and Rugby (20 miles to the east). This hourly and daily meteorological data (manned and automatic weather stations) should prove to be representative of the incident area (see-enclosed sheets in the appendices).

3.02 Details of rainfall stations utilised

To establish what precipitation conditions occurred around the surrounding area of the time of the incident, I investigated which were the closest rainfall stations that were operating at the time. The closest rainfall stations to the incident, at which daily rainfall data was available to me, were Henley-In-Arden P Sta No 2 (3 miles to the south) and Solihull: Tudor Grange (4 miles to the north). These daily rainfall stations (manned and automatic rainfall stations) should prove to be representative of the incident area (see-enclosed sheets in the appendices).

3.03 Meteorological reports/documents enclosed

Hourly meteorological report from Coleshill (see enclosed sheets in the appendices)
Daily meteorological report from Birmingham Airport, Coleshill, Bromsgrove, Bablake AWS and Coventry Airport, Pershore and Rugby (see enclosed sheet in the appendices)
Daily rainfall report from Henley-In-Arden P Sta No 2 and Solihull: Tudor Grange (see enclosed sheet in the appendices)

3.04 Anecdotal reports enclosed

No anecdotal reports were included in this report.

3.05 Sun and moon data

All times are universal.

On the 1st January 2009: Sunrise: 08:17, Sunset: 16:05, Moonrise: 10:27, Moonset: 21:39, Phase of Moon: waxing crescent (21%)

3.06 Interview and examination

None were conducted for this meteorological report.

3.07 Research papers

None were consulted for this meteorological report.

3.08 Measurements tests and experiments

None were conducted for this meteorological report.

4. My opinion, interpretation and conclusion

In addition to the hourly and daily meteorological data presented in the appendices within this meteorological report, I have also examined (but not included) other meteorological data based from other meteorological sources, for example examining synoptic meteorological charts, lightning maps and amateur meteorological stations (where available for the incident date). Based upon data analysis, a study of the general meteorological situation and aspects of meteorological theory, my conclusions, interpretation, interpolation and opinion therefore are as follows based on the relevant data available to me. The 1st January 2009 saw low pressure centred to the west of the Bay of Biscay, while high pressure was centred to the east of Iceland. A ridge of high pressure extended across the UK, while a cold front lay to the north of Scotland and a warm front lay close to SW England. The early morning period (0000-0100) of the 1st January 2009 across the Solihull, B94 postcode area saw light east to east-north-easterly winds (Beaufort Scale 1). The highest gusts that occurred within the area during that early morning period were less than 10mph. Other meteorological factors occurring over that time included, air temperatures were in the range -3°C, humidity values were high (99%), while the weather was dry and overcast and misty. These weather conditions would have resulted in a slight to moderate air frost to have occurred over that time period as the atmosphere was high in moisture content and the dew point was below freezing point. These conditions would have resulted in some icy stretches to have formed as air temperatures had been below constantly below freezing point since the mid afternoon of the 30th December, while a ground frost had been evident across the area since the afternoon of the 28th December. No rainfall occurred across the area within that time period with any rainfall amounts recorded solely down to condensation (dew) and high humidity levels. With these factors in mind, I conclude, based on my opinion, meteorological facts and data stated in this report, that on the balance of probability that air temperatures across the area had been below freezing point which would have resulted in an air frost to be evident over that time period which would have resulted in some icy patches, particularly in untreated areas.

5. Statement of compliance

I **Dr Richard J. Wild** comply that:

1. I understand that my overriding duty is to assist the court on matters within my expertise and that this duty overrides any obligation to XXXXXX XXXX Solicitors or their clients. I confirm that I have complied with that duty and will continue to do so and that I am aware of the requirements set out in Part 35 of the Civil Procedure Rules and the accompanying Practice Direction, the Protocol for Instruction of Experts to give evidence in Civil Claims and the relevant Pre-action Practice Direction/Protocol;
2. I have endeavoured in my meteorological report and in my opinion to be accurate and cover all relevant issues on concerning the matters stated, of which I have been asked to address;
3. I have endeavoured to include within this meteorological report those matters which I have knowledge of, or of which I have been aware, that might adversely affect the validity of my professional opinion;
4. I have indicated within this meteorological report all sources of information used in its completion;
5. I have indicated within my meteorological report the identify of any person, other than myself, who has carried out tests or experiments that have been relied upon in its completion, including their qualifications and experience;
6. I have not, without forming an independent view, included or excluded any information that has been suggested to me by others;
7. I will notify those who have engaged me immediately in writing of any reason my existing meteorological report requires any correction or qualification;
8. I understand I have not entered into any arrangement between the parties whereby the amount of payment in respect of my fee is dependent upon the outcome of the case;
9. I confirm that the meteorological records used are quality controlled and have been certified by the relevant meteorological provider;
10. I understand that my meteorological report, subject to any correction before swearing as to its correctness, will form the evidence to be given under oath or affirmation. I may be cross-examined on my meteorological report by a cross examiner assisted by an expert. I am likely to be the subject of public adverse criticism by the judge if the court concludes that I have not taken reasonable care in trying to meet the standards set out above.

6. Statement of truth

I confirm that I have made clear which facts and matters referred to in this meteorological report are within my own knowledge and which are not. Those that are within my own knowledge I confirm to be true. The opinions I have expressed represent my true and complete professional opinions on the matters to which they refer.

7. Date and signature

Date: 16th November 2010

To: XXXXX XXXXX
XXXXXX XXXX XXXXXXXXXX
XXXXXX XXXXX
X XXXX XXX
XXXXXX
XXX XXX

Signed:

Dr Richard J. Wild **BSc (Hons) PhD FRMetS FRGS MAE**
Weather Services Commercial Manager/Senior Forensic Meteorolo[illegible]WeatherNet Ltd

Appendices

1. My experience and qualifications

I am the Weather Services Commercial Manager and Forensic/Senior Meteorologist at WeatherNet Ltd. WeatherNet Ltd is a subsidiary of Cunningham Lindsey Ltd, the UK's largest Claims and Incident Management Company. I have been employed by WeatherNet Ltd as a Senior Meteorologist since the 10th July 1997 and have held my current titles and post since the 1st January 2000. My qualifications include a BSc (Hons) in Geography (2:1) (obtained June 1994), while in July 1997, I obtained a City and Guilds certificate in Teaching (stage 1) in further and adult education. In July 2005, I obtained a PhD investigating the spatial and temporal analysis of heavy snowfalls across Great Britain between the years 1861-1999.

I am a Fellow of the Royal Meteorological Society (since October 1990), a Member of the National Geographic Society (since January 1993), a Member of the Association of British Climatologists (since January 1995) and a Fellow of the Royal Geographical Society (since January 2005). I have produced thirty research articles about snow/snowfalls/blizzards in several academic publications (including the Journal of Meteorology and Weather) and two books since 1995. I have also made numerous talks at Universities, had local chats/written quotes for local/national radio, TV and newspapers. Finally, I have been credited on several films and TV programmes including Harry Potter and the Half-Blood Prince, Harry Potter and the Deathly Hallows: Part I and Britain's Worst Weather.

I am also a staff member of TORRO (Tornado and Storm Research Organisation (based at Oxford Brookes University)). My role is Research Leader of Heavy Snowfalls which is a part of the Thunderstorm and Severe Weather Division and I have held this post since July 1998.

To date, I have prepared in excess of 1000 legal meteorological reports since the year 1997 and in the last five years, I have given evidence in court on two occasions (April 2006 and December 2009).

I am (in association with WeatherNet Ltd) currently listed as an expert witness on several expert witness websites including www.intota.com, www.expertwitness.co.uk, www.expertsearch.co.uk, www.xproexperts.co.uk, www.thelawpages.com, www.insurance-directories.com, www.your-witness.co.uk, www.lawgazette.co.uk, www.witnessdirectory.com, www.thesolicitorsgroup.co.uk, www.solicitorsjournal.com, www.supplierhub.co.uk, www.expertwitness.com, www.hgexperts.com and www.waterlowlegal.com. I have also (in association with WeatherNet Ltd) been vetted by the Expert Witness Directory (www.legalhub.co.uk) since January 2005, the Expert Witness Directory of Ireland (www.expertwitnessireland.info) since October 2010 and the Expert Witness Directory of Scotland (www.expertwitnessscotland.info) since October 2010. I have also obtained membership of the UK Register of Expert Witnesses (www.jspubs.com) since February 2007, the Association of Personal Injury Lawyers (www.apil.org.uk) since April 2007, the Academy of Experts (www.academy-experts.org) since June 2007, the Round Table Group (www.roundtablegroup.com) since October 2007 and the Forensic Science Society (www.forensic-science-society.org.uk) since June 2009. Since July 2008, I have been trained by Bond Solon in the aspects of report writing and since September 2010, I have been included on the NPIA (National Policing Improvement Agency) Expert Advisers Database (www.npia.police.uk).

2. Hourly meteorological report for Hockley Heath, West Midlands (B94) for the 1st January 2009

See enclosed inserted sheets

3. Daily meteorological report for postcode B94 for the 1st January 2009

See enclosed inserted sheet.

4. Daily rainfall data for the 1st January 2009

Daily Rainfall Data for 1st January 2009

Daily Rainfall Station	Rainfall (mm)
Henley-In-Arden P Sta No 2	[illegible]
Solihull: Tudor Grange	[illegible]

5. UK radar sequence on the 1st January 2009

Rainfall radar data/images were available for this date a[illegible]wed; however permission was not granted from the originator for them to be shown w[illegible]n this re[illegible]

6. Beaufort scale

See enclosed inserted sheet

7. Explanatory notes

7.01 General

All meteorological readings presented [illegible]s report have been made using acknowledged instrumentation and in a[illegible]e with p[illegible]ocedures laid down by the World Meteorological Organisation (WMO). All mete[illegible]ical readings in this report have been subject to careful quality control by WeatherNet [illegible] A[illegible] ti[illegible]own is Greenwich Mean Time (GMT) unless otherwise stated. These[illegible]s will be 1-h[illegible]r B[illegible]HIND clock time for the period late March-late October when British S[illegible]mer Time (BST) is [illegible]eration in the United Kingdom.

7.02 Th[illegible]strument enclosure

Most meteorological instru[illegible]ents are located in an enclosure, a flat area of ground approximately 10 metres by 7 metr[illegible]ed by short grass and surrounded by fencing. The enclosure should be well away from trees or a[illegible]y other large obstructions. The distance of any object should be not less than twice the height of the object, and preferably four times the height.

7.03 Meteorological stations

At most meteorological stations, meteorological observations of the highest integrity are made by professional meteorological observers on a routine hourly basis throughout the 24-hour day, 365 days a year. Many meteorological parameters are monitored by automatic equipment (SAWS, SAMOS, CDL) and during periods when (some) meteorological stations are unmanned, evaluations of certain meteorological parameters (present weather, visibility for example) may go unrecorded Certain other meteorological stations (i.e. Auxiliary Meteorological Stations (e.g. Coastguard Stations)) only make routine meteorological observations at certain fixed times of the day - often at 3-hourly intervals. At cooperating Climatological Stations, the meteorological observer normally makes only one routine meteorological observation per day at 0900 GMT. This meteorological observation represents the past 24 hour's e.g. maximum and minimum air temperatures, rainfall, state of ground, sunshine etc. Not all meteorological stations record all meteorological parameters. They are manned by a large variety of persons and in some cases the meteorological observer is available to monitor certain meteorological elements during the daytime, recording a very brief description in the form of a diary. At rainfall stations only, the previous days' 24-hour daily rainfall reading is taken at 0900 GMT.

7.04 Significant weather

Significant weather includes details of the occurrence of air and ground (grass) frosts; gales; details of any heavy or continuous rain; fog; freezing rain; hail; sleet; snow; lying snow; thunder, lightning; squalls and tornadoes to occur at the meteorological station in the 24-hours ending midnight. 'None' means that none of these types of weather occurred. 'X' means that no meteorological observation of weather was made.

7.05 Rainfall

The enemies of rainfall measurement are wind and in-splashing. Wind blows rain drops around a rain gauge and therefore the lower the rim (and therefore the lighter the wind) the better. However, if the rim of the rain gauge is too close to the ground then in-splashing occurs. As a compromise, the standard rain gauge has its rim 30cm above the ground. The diameter is 5 inches (127mm) and rainfall can be measured to a resolution of 0.1mm. From a tipping bucket rain gauge perspective, this does not provide details of the timing of small amounts of rain. A tip of the rain gauge may be triggered in one hour when most of the rain fell in a previous hour. Rainfall (noted in millimetres and tenths), includes any solid precipitation such as snow or hail which is melted and measured in the same way as rain. There may also be small additions due to deposition of dew, hoar frost and rime ice on the collecting surface of the rain gauge. Rainfall amounts of <0.05mm are usually recorded as 'trace'. In some instances, with automatic meteorological equipment, precipitation amounts less than 0.2mm (i.e. a few spots) will not be registered. Many rainfall stations in the UK are sited on Water Authority property, at reservoirs, sewage works and pumping stations. Daily rain gauges are normally read just once per day at 0900 GMT, the recorded value being a single measurement of the rainfall of the previous 24 hours. To convert rainfall in millimetres to inches, multiply by 25.4.

7.06 Intensity of rain

Rain (as opposed to rain showers) falls from dynamically produced stratiform (layered) cloud like stratus and nimbostratus in association with frontal zones. Slight rain is rain of low intensity; which usually consists of scattered large rain drops, or more numerous smaller rain drops. The rate of accumulation in a rain gauge is less than 0.5mm per hour. Moderate rain is rain falling fast enough to form puddles quickly, to make down pipes flow freely and to give some spray over hard surfaces. The rate of accumulation in a rain gauge is between 0.5mm and 4.0mm per hour. Heavy rain is sufficiently intense to produce a roaring noise on roofs, forms a misty spray of fine rain droplets by splashing on road surfaces etc. and accumulates in a rain gauge at a rate greater than 4.0mm per hour. Moderate and heavy rain is normally associated with layered cloud of great vertical depth, normally in association with frontal zones, or troughs of low pressure. Drizzle is precipitation where the rain droplet size is very small - true drizzle droplets does not make a splash, or circular waves in a puddle. Drizzle is normally associated with very low cloud of the type stratus, and is often experienced in fog, or hill fog (cloud enveloping high ground). Freezing rain/drizzle is liquid water drops, with an air temperature below the zero Celsius mark (super-cooled water), which freeze on impact with a ground surface whose temperature is also below the zero Celsius mark. This form of precipitation produces a particularly hazardous surface for foot and wheeled traffic. The ground effects of rain on a surface are determined by its rate of impact. In general terms, isolated periods of rain giving a 'trace' or 0.1mm of rainfall would do little more than dampen the ground, whereas 0.2mm falling in less than an hour would wet the ground, but without any puddle formation or puddles will form only slowly. Small puddles would form on some previously dry metalled surfaces (tarmac/concrete) if 0.5mm falls in a relatively short period - say, one hour. Clearly, the size of puddles at any one location/time is, in part, a product of local natural/artificial drainage characteristics. The above criteria based on the ground effects of rainfall amounts are an approximate guide. The state of ground will depend on the intensity of rainfall and the rate of evaporation. Evaporation is very low in winter but averages about 3mm per day in summer. Rainfall can also be described as continuous (rainfalls of one hour or more without a break), or intermittent (a period of less than one hour, or a longer period of rainfall with noticeable breaks). Intermittent rain should not be confused with rain showers (the cloud type from which the precipitate falls is different). With respect to the classification for showers, which are associated with convective cloud, are often of short duration and are characterised by rapid fluctuations of intensity. As a general rule, showers are regarded as slight if the rate of accumulation is <2.0mm/hr, moderate 2.0 to 10.0mm/hr, heavy 10.0 to 50.0mm/hr and violent >50.0mm/hr.

7.07 Rainfall equivalent

1mm of rain measured in a standard rain gauge is the equivalent of 1mm depth over an area of 1 square metre. 1cm. of snow is very roughly equal to 1mm. of rain. The range is from about 8 to 12 multiplied by the equivalent of rainfall, depending on the water content of the snow.

7.08 Rainfall radar

The methods of collecting rainfall data from rainfall stations are explained in sections 7.5 and 7.6; however this section will explain rainfall accumulation from rainfall radar. Rainfall Radar (RAdio Detection And Ranging) is an echo-sounding system, which uses the same aerial for transmitting a signal and receiving the returned echo. Short pulses of electro-magnetic waves are transmitted in a narrow beam for a short time (typically 2 microseconds). When the beam hits a suitable target, some of the energy is reflected back to the radar, which 'listens' out for it for a much longer period (3300 microseconds in the case of Met Office radars) before transmitting a new pulse. The distance of the target from the transmitter can be worked out from the time taken by a pulse to travel there and back. Corrections have to be made to the raw data collected, including amendments for attenuation by intervening rain and range, elimination of ground clutter and the conversion of radar reflectivity to rainfall rate.

Each radar completes a series of scans about a vertical axis between four and eight low-elevation angles every 5 minutes (typically between 0.5 and 4.0 degrees, depending on the height of surrounding hills). Each scan gives good, quantitative data that shows detailed distribution of precipitation intensities (1 and 2 km resolutions) out to a range of about 75 km and useful qualitative data that provides a good overall picture of the extent of precipitation at a national/regional scale (5 km resolution) to 255km.

Disadvantages of rainfall radar:
The radar rainfall display may not fully represent the rainfall observed at the ground due to:
• Permanent echoes (occultation) caused by hills or surface obstacles.
• Spurious echoes caused by ships, aircraft, sea waves, chaff in use on military exercises, technical problems or interference from other radars.
• Radar beam above the cloud at long ranges- difficulties in detecting low-level rain clouds.
• Evaporation of rainfall at lower levels beneath the beam giving an over-estimate of the actual rainfall.
• Orographic enhancement of rainfall at low levels- light precipitation generated in layers of medium-level cloud can increase in intensity by sweeping up other small droplets as it falls through moist, cloudy layers at low levels.
• Bright Band Radar echoes from both raindrops and snowflakes are calibrated to give correct intensities on the rainfall display. However, at the level where the temperature is near 0°C, melting snowflakes with large, reflective surfaces give strong echoes. These produce a false band of heavier rain, or bright band, on the radar picture.
• Anomalous propagation (anaprop) - radar beams travel in straight lines through a uniform medium but will be refracted when passing through air of varying density. When a low-level temperature inversion exists, the radar beam is bent downwards and strong echoes are returned from the ground, in a manner akin to the formation of mirages.

Advantages of rainfall radar:
• Detailed, instantaneous and integrated rainfall rates
• Areal rainfall estimates over a wide area
• Information in near-real time
• Information in remote land areas and over adjacent seas
• Location of frontal and convective (shower) precipitation
• Monitoring movement and development of precipitation areas
• Short-range forecasts made by extrapolation
• Data can be assimilated into numerical weather prediction models

7.09 Temperature

To convert temperatures in Celsius (°C) to Fahrenheit (°F), multiply by 9, divide by 5 and then add 32. The main problem in measuring air temperature is shielding thermometers from radiation, mainly short wave radiation from the sun but also long wave radiation from the ground. Mainly, due to the effect of radiation, the air (or dry bulb) temperature varies markedly with height above the ground and the type of surface. Thermometers also need to be kept dry as evaporation produces cooling. The solutions to these problems are resolved by recording the temperature of the air (recorded in degrees and tenths, Celsius) by housing the thermometers in the shade, at a height of 1.25 metres above the ground (normally over short grass, except in a few cities where roof top sites are used) in a louvered white box called a Stevenson Screen. The Stevenson Screen protects the thermometers from radiation and precipitation while the louvres permit ventilation. Air temperature values below zero degrees Celsius are preceded by a minus sign, while recordings are made at each (notional) clock hour. In most modern day meteorological stations, the thermometers are of electrical resistance whereas in older meteorological stations they are in form of liquid-in-glass. Different thermometers are used for recording the maximum and minimum temperature. The highest and lowest air temperature recorded during the previous 24-hour period finalises at 0900 GMT. The wet bulb temperature records the temperature of a wet surface by means of a piece of muslin wrapped around the bulb of a thermometer and kept moist by capillary action from a reservoir of distilled water. The wet bulb thermometer indicates the ‘temperature of evaporation’ which is, in normal circumstances, lower than the air (dry bulb) temperature. The difference between the dry bulb and wet bulb temperature is known as the wet bulb depression. From the dry and wet bulb readings, relative humidity and vapour pressure can be obtained. The maximum, minimum and wet bulb thermometers are all housed in the Stevenson Screen as mentioned above. The dew point is the temperature to which air must be cooled before it becomes saturated with water vapour. It is so called because it is also the temperature to which a surface must be cooled before dew will be deposited. With reference to thermometers housed outside the Stevenson screen, the grass minimum temperature is recoded by a thermometer exposed to the air one or two inches above the ground. The bulb is in contact with the tips of the grass blades, and refers to the period ending at 0900 GMT on the date of entry. The concrete minimum temperature, like the grass minimum temperature, is recorded by a thermometer, but in this instance, the bulb is positioned in the centre of and just touching the slab and again refers to the period ending at 0900 GMT on the date of entry. Finally, soil temperatures are read at 0900 GMT in the morning at selected weather stations. Bent stem thermometers record the soil temperature at 5cm, 10cm and 20cm under a bare soil surface.

7.10 Sun

The total amount of bright sunshine (hours and tenths) recorded on the date of entry. Measurement of the duration of sunshine refers to so-called 'bright' sunshine. Since different meteorological instruments differ in their response characteristics to solar radiation, this term has lacked precise definition. However, The World Meteorological Organisation decided in 1962 to adopt the Campbell-Stokes Recorder, as used in the British Isles, as the standard meteorological instrument for recording sunshine amount.

7.11 Total cloud

Total cloud amounts are estimated as the fraction, in eighths (oktas), of the sky covered by cloud. At manned meteorological stations, this is assessed by human observers. Some automatic meteorological stations make this assessment from cloud recording equipment.

7.12 State of ground

At manned meteorological stations, the state of ground refers to a bare patch of soil about 2m square and described accordingly. The state of ground includes descriptions such as dry, moist, wet, flooded, frozen, glazed, sand, ice, snow or dust covered.

7.13 Snow

Snow is much more difficult to measure than rain because the snowflakes blow around, rather than into, a rain gauge. The snow that does enter the gauge blocks it and prevents the normal operation of the rain gauge. Nevertheless, the aim is to record the amount of water substance that falls as snow. At manned meteorological stations this is achieved by melting the snow and recording the amount of water as 'rain'. Automatic rain gauges do not work well at temperatures below freezing point. Any solid precipitation that falls collects in the rain gauge and no precipitation is registered. When the temperature rises above freezing, the snow melts and the rain gauge starts registering, even though the current weather may be dry. Daily rainfall amounts are quality controlled to remove this deficiency and estimates of the correct daily rainfall are made. For hourly rainfall, it is more likely that original and erroneous data remain on the computer archive. There is a close relationship between the intensity of snowfall and visibility. Thus if it is known that poor visibility is due to falling snow, the intensity of the precipitation can be inferred from the following table.

Visibility	Description of snowfall intensity	Equivalent rainfall intensity
5km	Slight snow	0.2mm/hr
2km	Slight /moderate snow	0.5mm/hr
1km	Moderate snow	1.0mm/hr
250m	Moderate/heavy snow	4.0mm/hr
110m	Heavy snow	10.0mm/hr

Dry snowflakes result in visibilities only about half of those given above. Visibility in wet snow is somewhat better, as wet snowflakes collapse to a smaller volume and become translucent. Blowing snow (most likely when the snow is dry and powdery) gives very low visibilities.

7.14 Snow depth

At manned meteorological stations, snow depth is measured with a ruler at three different locations and the average is then taken. The area chosen for these measurements should be as close as possible to the rain gauge and not affected by drifting or scoured by the wind. Some automatic meteorological stations measure snow depth by an optical technique.

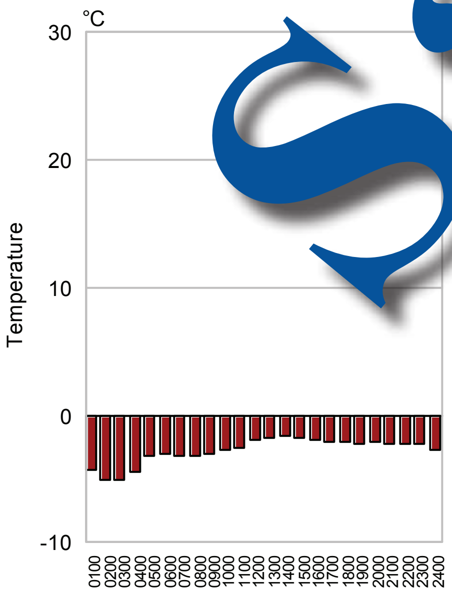
7.15 Wind

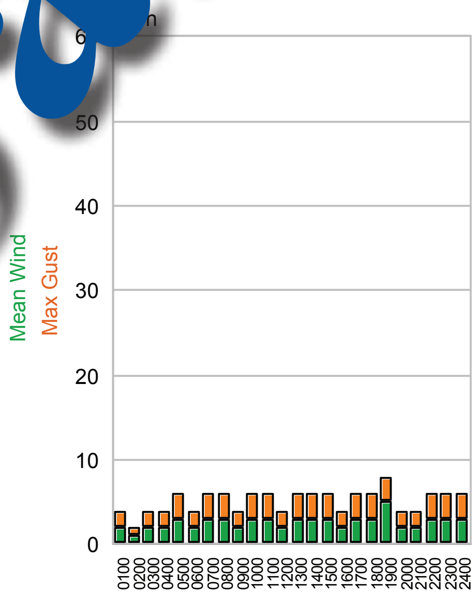
Wind direction is measured in degrees from north (360 degrees of a circle) and relates to the direction from which the wind is blowing from. The quoted figures represent the wind direction averaged over the hour ending at the time of entry. A direction reported as 360 degrees represents a wind from due north (a northerly wind); 090 degrees is from due east (an easterly wind) etc. Wind speeds are recorded in knots (where 1 knot = 1.1515 mph), and they refer to the average speed (which includes all gusts and all lulls) during the hour ending at the time of entry. The mean wind speed refers to the highest mean wind at 10m above ground in an open level situation measured in the 10 minutes immediately preceding each hour. The maximum gust speed is also recorded in knots; the highest value (even if only of momentary duration) attained during the hour ending at the time of entry. The maximum wind gust refers to the highest 3-5 second gust at 10m above ground level by an anemometer. Gale force gusts are gusts >=39 mph. A gust is a rapid, but momentary increase in the speed of the wind, relative to the mean wind speed at the time. Equally, a lull is a momentary decrease below the mean wind speed. Wind speed generally increases with height according to a power law expression, i.e. Speed at height H = speed recorded at 10 metres x Pow ((Height H in metres/10 metres) p) where the power p takes a value between 0.067 and 0.29 depending upon local terrain roughness and whether it is mean or gust speed under consideration. Beaufort Force = Pow(Pow((“Wind Speed (mph)” / 1.87), 2), 1/3). Beaufort Forces apply only to mean wind speeds and must not be used in reference to gusts.

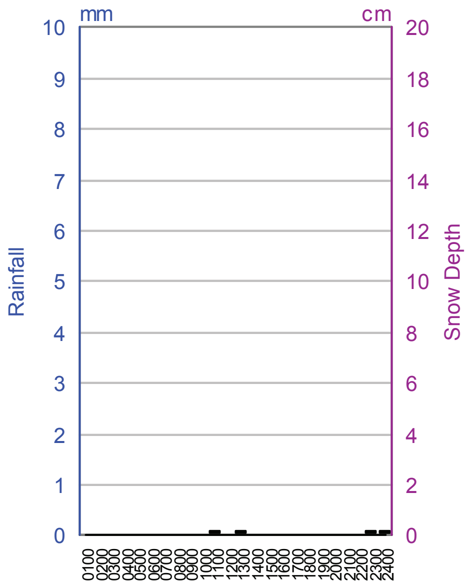
Weather Report for Coleshill (96m AMSL) @ 9.3 miles from B94 6NX

Wednesday, December 31, 2008

Hour Ending (GMT)	Temperature (°C)	Humidity (%)	Rainfall (mm)	Sunshine (hours)	Wind Direction	Wind Speed (mph)	Max Wind Gust (mph)	Snow Depth (cm)	Significant Weather
0100	-4.5	97	0.0	0.0	NE	2	4		Air frost; Mist
0200	-5.2	97	0.0	0.0	N	1	2		Air frost; Mist
0300	-5.2	98	0.0	0.0	NNW	2	4		Air frost; Fog
0400	-4.6	98	0.0	0.0	E	2	4		Air frost; Mist
0500	-3.4	99	0.0	0.0	WNW	3	6		Air frost; Fog
0600	-3.2	99	0.0	0.0	NW	2	4	0	Air frost; Fog - thickening
0700	-3.3	100	0.0	0.0	NNE	3	6		Air frost; Fog - static
0800	-3.3	100	0.0	0.0	NNW	3	6		Air frost; Fog depositing rime
0900	-3.2	99	0.0	0.0	N	2	4		Air frost; Fog - static
1000	-2.8	100	0.0	0.0	E	3	6		Air frost; Fog depositing rime
1100	-2.7	99	0.1	0.0	SE	3	6		Air f[illegible]ost; P[illegible]cipitation
1200	-2.1	99	0.0	0.0	ESE	2	4		Air [illegible]; [illegible]og pat[illegible]es
1300	-1.9	99	0.1	0.0	ESE	3	6		Air fr[illegible]ation
1400	-1.8	99	0.0	0.0	ESE	3	6		[illegible] frost; [illegible]
1500	-1.9	99	0.0	0.0	NW	3	6		[illegible]st; Mist
1600	-2.1	99	0.0	0.0	W	2	4		Air [illegible]; Mist
1700	-2.2	99	0.0	0.0	NE	3	[illegible]		Air frost; Mist
1800	-2.3	99	0.0	0.0	E	3	[illegible]		[illegible]ir frost; Fog
1900	-2.4	99	0.0	0.0	ESE	5	[illegible]		Air frost; Fog - thickening
2000	-2.3	99	0.0	0.0	NNE	[illegible]	4		Air frost; Fog - thickening
2100	-2.4	99	0.0	0.0	N	[illegible]	4		[illegible] frost; Fog
2200	-2.4	99	0.0	0.0	E	3	[illegible]		Air frost; Fog
2300	-2.4	99	0.1	0.0	[illegible]	[illegible]	[illegible]		Air frost; Slight-moderate precipitation; Fog
2400	-2.8	99	0.1	0.0	[illegible]E	[illegible]	6		Air frost; Precipitation
Total			0.4	0.0					
Average	-2.9								
Maximum	-1.8	100				5	8	0	
Minimum	-5.2								







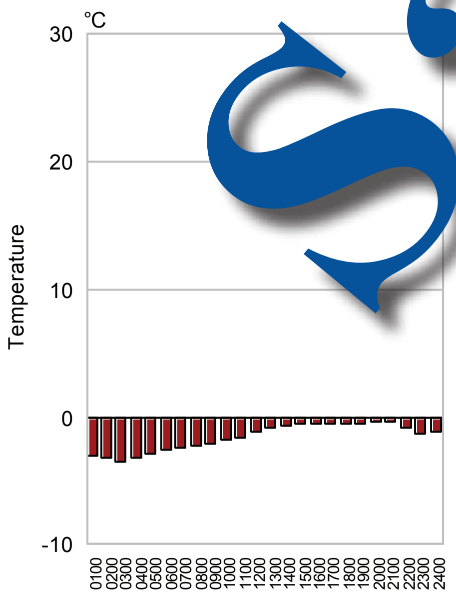
Notes

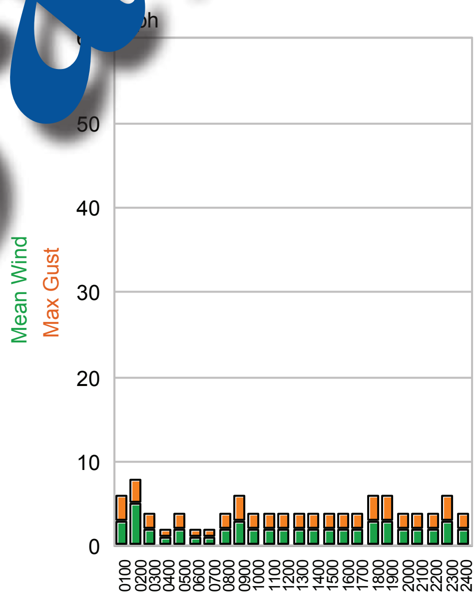
Tel: 01202-296396; Fax: 314064; www.weathernet.co.uk

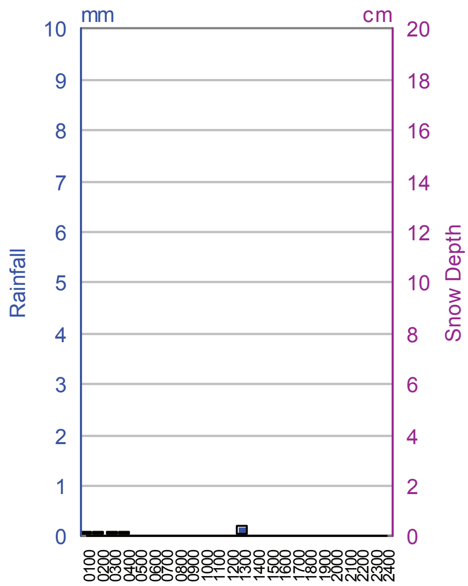
Weather Report for Coleshill (96m AMSL) @ 9.3 miles from B94 6NX

Thursday, January 1, 2009

Hour Ending (GMT)	Temperature (°C)	Humidity (%)	Rainfall (mm)	Sunshine (hours)	Wind Direction	Wind Speed (mph)	Max Wind Gust (mph)	Snow Depth (cm)	Significant Weather
0100	-3.1	99	0.1	0.0	ENE	3	6		Air frost; Precipitation
0200	-3.4	99	0.1	0.0	NE	5	8		Air frost; Precipitation
0300	-3.7	98	0.1	0.0	ESE	2	4		Air frost; Precipitation
0400	-3.4	98	0.1	0.0	S	1	2		Air frost; Precipitation
0500	-3.0	98	0.0	0.0	S	2	4		Air frost; Mist
0600	-2.7	99	0.0	0.0	E	1	2	0	Air frost; Mist
0700	-2.6	99	0.0	0.0	NNW	1	2		Air frost; Mist
0800	-2.4	99	0.0	0.0	NNE	2	4		Air frost; Mist
0900	-2.2	99	0.0	0.0	N	3	6		Air frost; Mist
1000	-2.0	99	0.0	0.0	N	2	4		Air frost; Mist
1100	-1.7	99	0.0	0.0	NNE	2	4		Air frost; Mist
1200	-1.3	99	0.0	0.0	N	2	4		Air frost; Mist
1300	-1.0	99	0.2	0.0	NNW	2	4		Air frost; Mist
1400	-0.8	99	0.0	0.0	N	2	4		Air frost; Mist
1500	-0.6	99	0.0	0.0	N	2	4		Air frost; Mist
1600	-0.6	99	0.0	0.0	N	2	4		Air frost; Mist
1700	-0.6	99	0.0	0.0	N	2	4		Air frost; Mist
1800	-0.6	100	0.0	0.0	N	3	6		Air frost; Mist
1900	-0.6	100	0.0	0.0	N	3	[illegible]		Air frost; Mist
2000	-0.5	99	0.0	0.0	NNW	2	4		Air frost; Mist
2100	-0.5	99	0.0	0.0	NNW	[illegible]	4		Air frost; Fog - thickening
2200	-1.0	100	0.0	0.0	NW	2	4		Air frost; Fog
2300	-1.5	100	0.0	0.0	[illegible]	3	6		Air frost; Fog - thickening
2400	-1.3	100	0.0	0.0	NW	[illegible]	4		Air frost; Fog - thinning
Total			0.6	0.0					
Average	-1.7								
Maximum	-0.5	100				5	8	0	
Minimum	-3.7								







Notes

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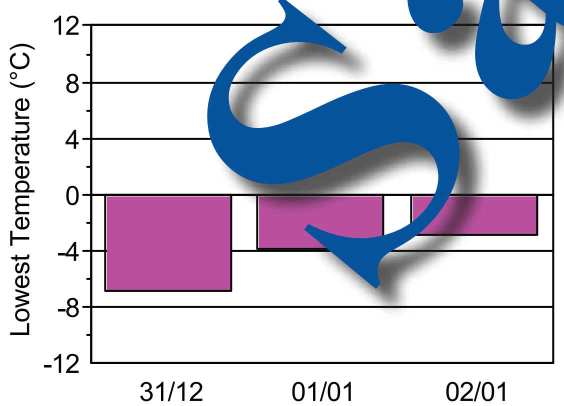
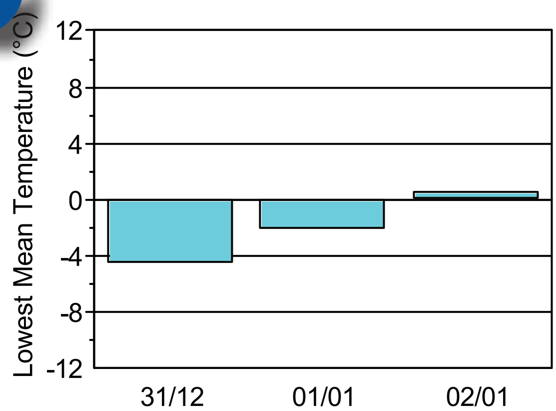
Freeze Report for 25 Miles around B94 01/01/2009 ± 1 Days

Weather Station	Miles from B94	Temperature (°C) Max	Min	Mean	Sun (hrs)	Rain (mm)	Max Wind (mph) Dirn	Mean	Gust	Significant Weather
Wednesday 31 December 2008										
Birmingham Airport	8	**-2.0**	**-7.0**	**-4.5**	0.0	0.0	NE	5	8	Severe air frost
Coleshill	10	**-1.7**			0.0	0.0	E	5	6	Air frost all day; Severe ground frost (-8°C)
Bromsgrove	11	**-2.3**	**-4.7**	**-3.5**		0.0				Air frost all day
Bablake AWS	13	**-1.5**	**-4.8**	**-3.1**	0.0	0.0	NE	6	10	Air frost all day; Severe ground frost (-10.8°C)
Coventry Airport	13	**-1.0**	**-3.0**	**-2.0**						Air frost all day
Pershore	17	**-1.3**					E	5	6	Air frost all day; Severe ground frost (-10°C)
Rugby	20	**-1.0**			0.0					Air frost all day; Severe ground frost (-12°C)
Thursday 01 January 2009										
Birmingham Airport	8	**0.0**	**-4.0**	**-2.0**	0.0	0.0	N	5	7	Air frost
Coleshill	10	**-0.5**	**-3.9**	**-2.2**	0.0	0.2	NE	[illegible]	6	Air frost all day
Bromsgrove	11	**0.3**	**-3.7**	**-1.7**		0.0				Air fr[illegible]
Bablake AWS	13	**0.0**	**-3.8**	**-1.9**	0.0	0.0	NNE	5	[illegible]	Air frost; Severe ground frost (-6.6°C)
Coventry Airport	13		**-2.0**							[illegible]ost
Pershore	17	**0.6**	**-2.2**	**-0.8**		0.0	E	[illegible]	7	Air frost
Rugby	20	**0.0**	**-3.0**	**-1.5**	0.0	0.0	[illegible]	[illegible]	[illegible]	Air frost; Ground frost (-3°C)
Friday 02 January 2009										
Birmingham Airport	8	**4.0**	**-3.0**	**0.5**	1.4	0.1	N	[illegible]	13	Air frost
Coleshill	10	**3.7**			2.0	[illegible]	N	[illegible]	[illegible]	Ground frost (-4°C); Snow 0700-0800
Bromsgrove	11	**4.0**	**-2.3**	**0.9**	[illegible]	0.2				Air frost
Bablake AWS	13	**3.4**	**-2.2**	**0.6**	[illegible]	0.2	NNE	10	18	Air frost; Severe ground frost (-9.3°C); Slight snow 0650-0730
Coventry Airport	13	**4.0**	**1.0**	[illegible]	[illegible]					X
Pershore	17	**4.5**			[illegible]	0.4	E	8	10	Severe ground frost (-8°C)
Rugby	20	**3.9**			2.[illegible]	0.8				Severe ground frost (-9°C)

Summary for Period





WeatherNet

Beaufort Scale

1 mph = 0.868 Knots

Beaufort Force	Description	Mean Speed (mph)	Lower Limit (mph)	Upper Limit (mph)	Specification on Land	As Used at Sea: State of Sea	As Used at Sea: Specififcation at Sea	Height of Waves (ft)
0	**Calm**	0	0	1	Calm; s[illegible]ke rises vertically	**Calm**	Sea like a mirror	0
1	**Light Air**	2	1	3	[illegible]rectio[illegible] of wind shown by smoke [illegible]t but not by wind vanes	**Calm**	Ripples with the appearance of scales are formed, without foam crests	0.3
2	**Light Breeze**	5	4	7	[illegible]d felt on face; leaves rustle	**Smooth**	Small wavelets, still short but more pronounced; crests have a glassy appearance and do not break	0.6
3	**Gentle Breeze**	10	8	12	Leaves & small [illegible]s in constant mo[illegible]s light flag	**Smooth**	Large wavelets; crests begin to break; foam is of glassy appearance; scattered white horses	2
4	**Moderate Breeze**	15	13	18	Dus[illegible]er raised; [illegible]mall branches [illegible]d	**Slight**	Small waves; becoming longer; fairly frequent white horses	3
5	**Fresh Breeze**	21	18	24	Small trees [illegible]sway; crested wavelets f[illegible] water	**Moderate**	Moderate waves with more pronounced long form; many white horses; chance of some spray	7
6	**Strong Breeze**	27	24	31	Large branches in m[illegible]ion; w[illegible]g heard in telegraph wires	**R[illegible]h**	Large waves begin to form; white foam crests are more extensive everywhere; probably some spray	10
7	**Near Gale**	35	31	38	Whole trees in motion; inconvenience felt when walking against the wind	**[illegible]ry Rou[illegible]**	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind	13
8	**Gale**	42	39	46	Twigs break off trees; difficult to walk against wind	**Hig[illegible]**	M[illegible]rately hig[illegible]ves of greater length; edges of crests begin to [illegible] into sp[illegible] foam blown along the direction of the wind	18
9	**Strong Gale**	50	47	54	Slight structural damage to chimney pots, aerials & roof slates	**[illegible] High**	[illegible]gh wav[illegible]se streaks of foam along the direction of the wind; crests o[illegible]s topple, tumble and roll over; spray may affect visibi[illegible]	23
10	**Storm**	59	55	63	Trees uprooted; considerable structural damage	**Very High**	Ve[illegible] wave[illegible] long overhanging crests; foam patches blown in de[illegible]e whit[illegible]ks; h[illegible]y “tumbling” of sea; visibility affected	30
11	**Violent Storm**	68	64	72	Widespread structural damage	**Phenomenal**	Exceptionall[illegible] wave[illegible] ships sometimes lost to view behind the waves); ever[illegible]ere the edges of the wave crests are blown into froth	38
12	**Hurricane**	-	73	-	Devastation	**Phenomenal**	Air is filled with foam and spray; sea completely white with driving spray; visibility very seriously affected	47