



## Basic Climatological Station Metadata

Current status

Metadata compiled: 27 JUL 2022

**Station:** MACKAY M.O

**Bureau of Meteorology station number:** 033119

**Bureau of Meteorology district name:** East Central Coast

**State:** QLD

**World Meteorological Organization number:** 94367

**Identification:** MKY

**Network Classification:** CLIMAT Stations, GCOS Surface Network, Regional  
Basic Synoptic Network

**Station purpose:** Synoptic, Upper Air, Aeronautical

**Automatic Weather Station:** Almos



Current Station Location				
<b>Latitude</b>	<b>Decimal</b>	-21.1172	<b>Hour Min Sec</b>	21°7'2"S
<b>Longitude</b>	<b>Decimal</b>	149.2169	<b>Hour Min Sec</b>	149°13'1"E
<b>Station Height</b>	30.264 m	<b>Barometer Height</b>	30.3 m	
<b>Method of station geographic positioning</b>			GPS	

**Year opened:** 1959

**Status:** Open

## Station summary

No summary for this site has been written as yet.

**Historical metadata for this site has not been quality controlled for accuracy and completeness. Data other than current station information, particularly earlier than 1998, should be considered accordingly. Information may not be complete, as backfilling of historical data is incomplete.**

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<b>Bureau No.:</b> 033119	<b>WMO No.:</b> 94367	<b>Aviation ID:</b> MKY
<b>Latitude:</b> -21.1172	<b>Longitude:</b> 149.2169	<b>Elevation:</b> 30.264 m
	<b>Barometer Elev:</b> 30.3 m	<b>Opened:</b> 01 Jan 1959
		<b>Current Status:</b> Still open
		<b>Metadata compiled:</b> 27 JUL 2022

### Observation summary

The table below indicates the approximate completeness of the record for individual element types within the Australian Data Archive for Meteorology. For elements not listed see the note below.



#### DAILY DATA HOLDINGS

OBSERVATION TYPE	FIRST MONTH	LAST MONTH	COMPLETENESS (% estimate)	SINGLE DAYS MISSED	FULL MONTHS MISSED
MAXIMUM AIR TEMPERATURE	SEP 1959	JUN 2022	99.7	58	0
1 8 5 0	1 9 0 0	1 9 5 0	1 9 5 0	2 0 0 0	0 0 0 0
MAXIMUM WIND GUST SPEED	MAR 1968	JUN 2022	93.8	245	32
1 8 5 0	1 9 0 0	1 9 5 0	1 9 5 0	2 0 0 0	0 0 0 0
SUNSHINE HOURS	NOV 1983	APR 2016	96.7	385	0
1 8 5 0	1 9 0 0	1 9 5 0	1 9 5 0	2 0 0 0	0 0 0 0
WIND RUN ABOVE 10 FEET	NOV 1996	JUN 2022	98.6	125	0
1 8 5 0	1 9 0 0	1 9 5 0	1 9 5 0	2 0 0 0	0 0 0 0
RAINFALL	OCT 1959	JUL 2022	100	N/A	N/A
1 8 5 0	1 9 0 0	1 9 5 0	1 9 5 0	2 0 0 0	0 0 0 0

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### HOURLY DATA HOLDINGS - from 1 to 24 observations per day

OBSERVATION TYPE	FIRST MONTH	LAST MONTH	COMPLETENESS (% estimate)	FREQUENCY average daily	SINGLE DAYS MISSED	FULL MONTHS MISSED
AIR TEMPERATURE	SEP 1959	JUN 2022	97.9	9.7	31	0
DEW POINT	SEP 1959	JUN 2022	97.4	9.7	76	2
MEAN SEA LEVEL PRESSURE	SEP 1959	JUN 2022	98.2	9.8	32	0
SEA STATE	JAN 1960	NOV 2002	96.0	6.7	14	0
TOTAL CLOUD AMOUNT	SEP 1959	JUN 2022	94.3	6.6	368	1
WIND SPEED	SEP 1959	JUN 2022	98.2	9.8	44	0
UPPER AIR WIND SPEED	SEP 1959	OCT 2016	89.7	3.5	343	15

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### RAINFALL INTENSITY DATA HOLDINGS

OBSERVATION TYPE	FIRST MONTH	LAST MONTH	COMPLETENESS (% estimate)	SINGLE DAYS MISSED	FULL MONTHS MISSED
RAINFALL INTENSITY	SEP 1959	FEB 2016	83.2	1594	61

### ONE-MINUTE DATA HOLDINGS

OBSERVATION TYPE	FIRST MONTH	LAST MONTH	COMPLETENESS (% estimate)	FREQUENCY average daily	SINGLE DAYS MISSED	FULL MONTHS MISSED
ALL ELEMENTS	SEP 2001	JUL 2022	99.2	1428.7	N/A	1

### HALF-HOURLY DATA HOLDINGS

OBSERVATION TYPE	FIRST MONTH	LAST MONTH	COMPLETENESS (% estimate)	FREQUENCY average daily	SINGLE DAYS MISSED	FULL MONTHS MISSED
ALL ELEMENTS	OCT 1995	JUL 2022	79.3	38.1	N/A	0

### UPPER-AIR EDT DATA HOLDINGS

OBSERVATION TYPE	FIRST MONTH	LAST MONTH	COMPLETENESS (% estimate)	FREQUENCY average daily	SINGLE DAYS MISSED	FULL MONTHS MISSED
Wind only flights	Feb 2002	Oct 2016	N/A	2.4	268	0

#### Holdings calculated up to 01 Jul 2022

The % complete figure is the completeness of observations averaged over all months of record, for the given station and observation type, taking gaps into account. For hourly holdings, the completeness is relative to the maximum number of daily observations for the site each month, and is therefore an estimate. For daily holdings, the completeness figure shown is exact.

The single days missed figure is the total number of days for which no observation was received, not including full missed months. The full months missed figure is the total of full month gaps over the period of record. Where an element is not included assumptions can generally be made about availability, and the list to use has been suggested below.

#### Unlisted element

- Minimum air temperature
- Wet bulb temperature
- Soil temperature at 20, 50 & 100cm
- Relative humidity
- Minimum temp. of water in evaporimeter
- Visual observations eg. weather, visibility
- Sea related observations

#### Listed element to use

- Maximum air temperature
- Dew point
- 10cm soil temperature
- Dew point
- Evaporimeter - max water temp
- Total cloud amount
- Sea state

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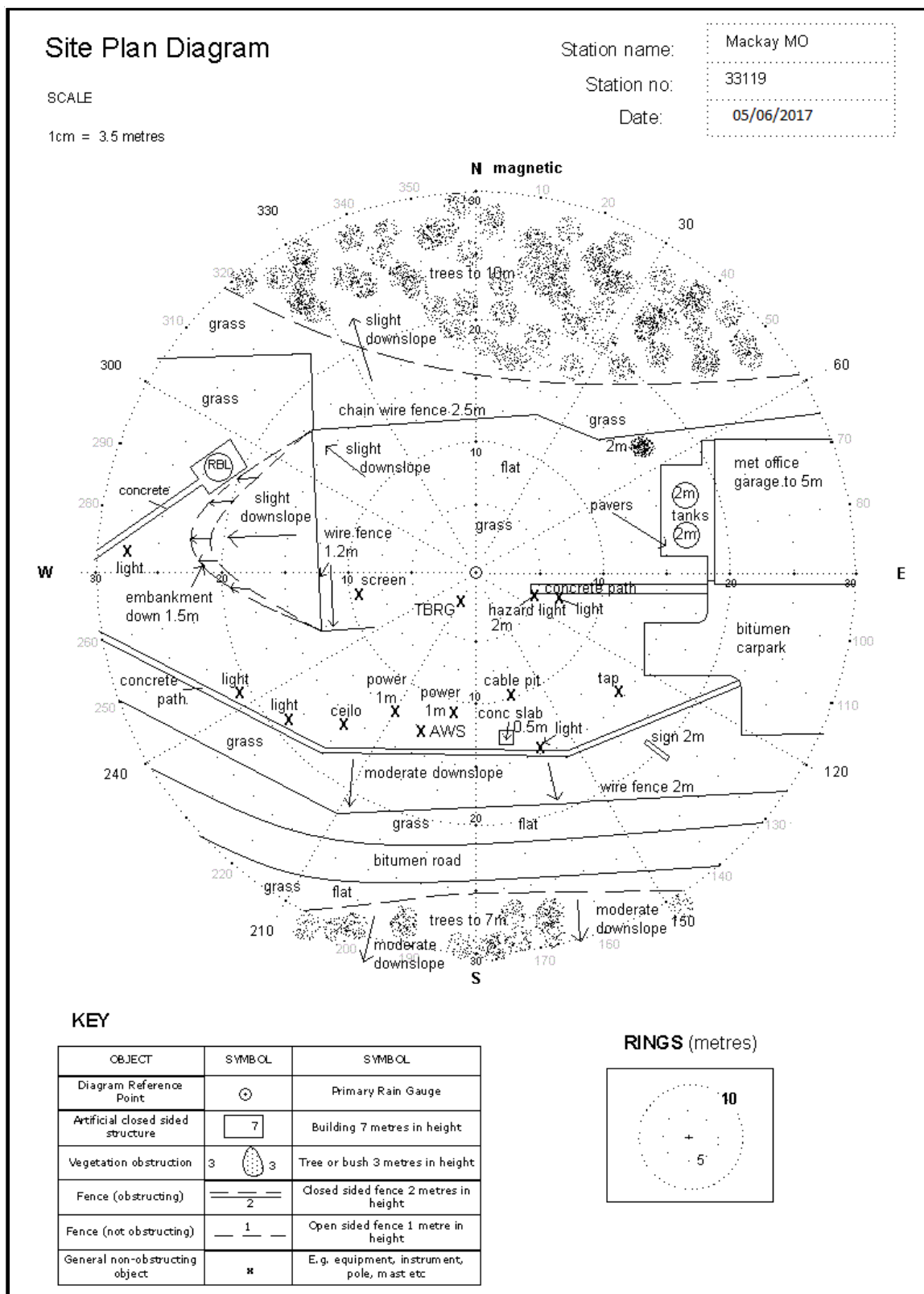
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### Instrument Location and Surrounding Features 05/06/2017(most recent)



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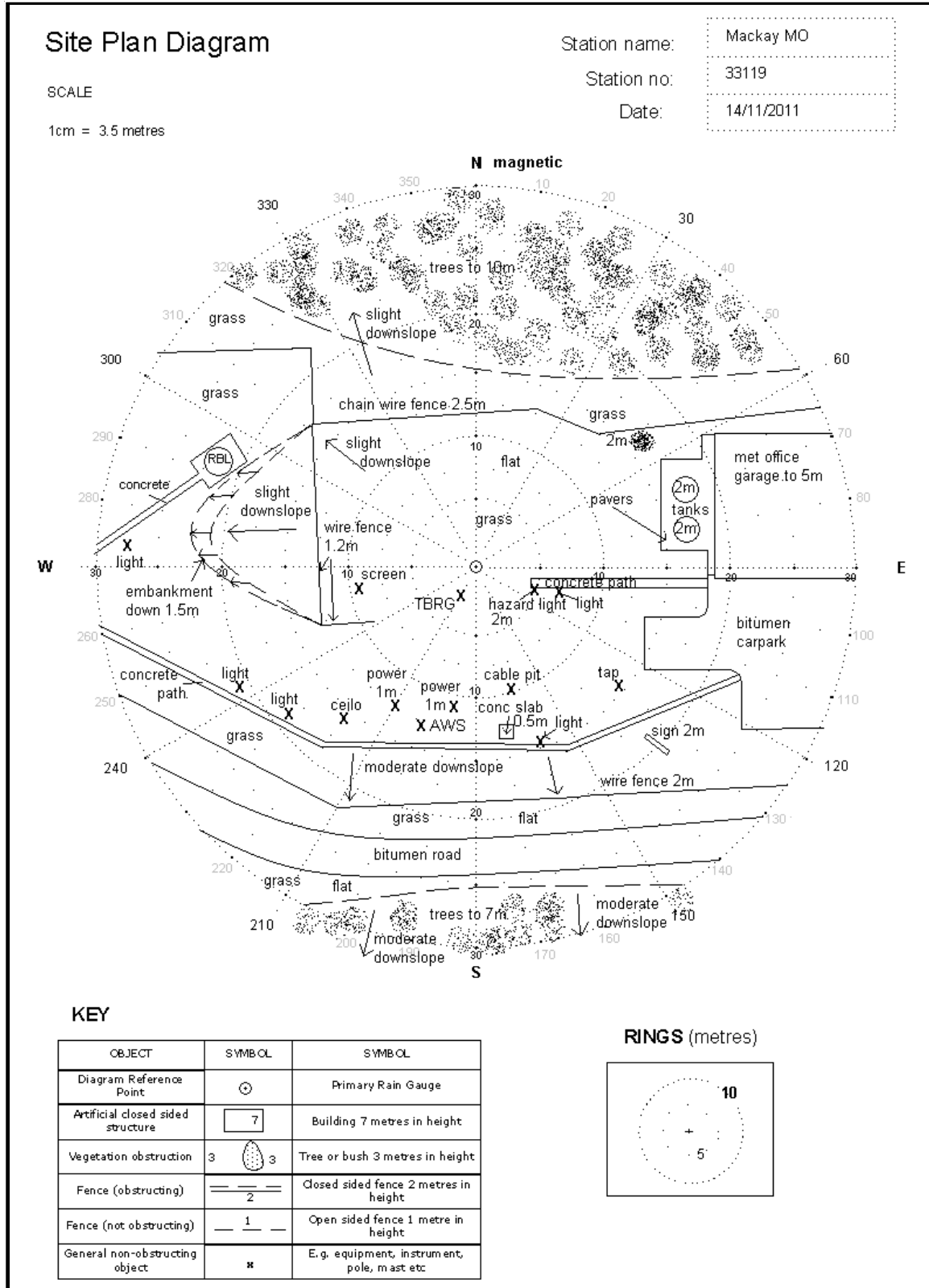
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### Instrument Location and Surrounding Features 14/11/2011



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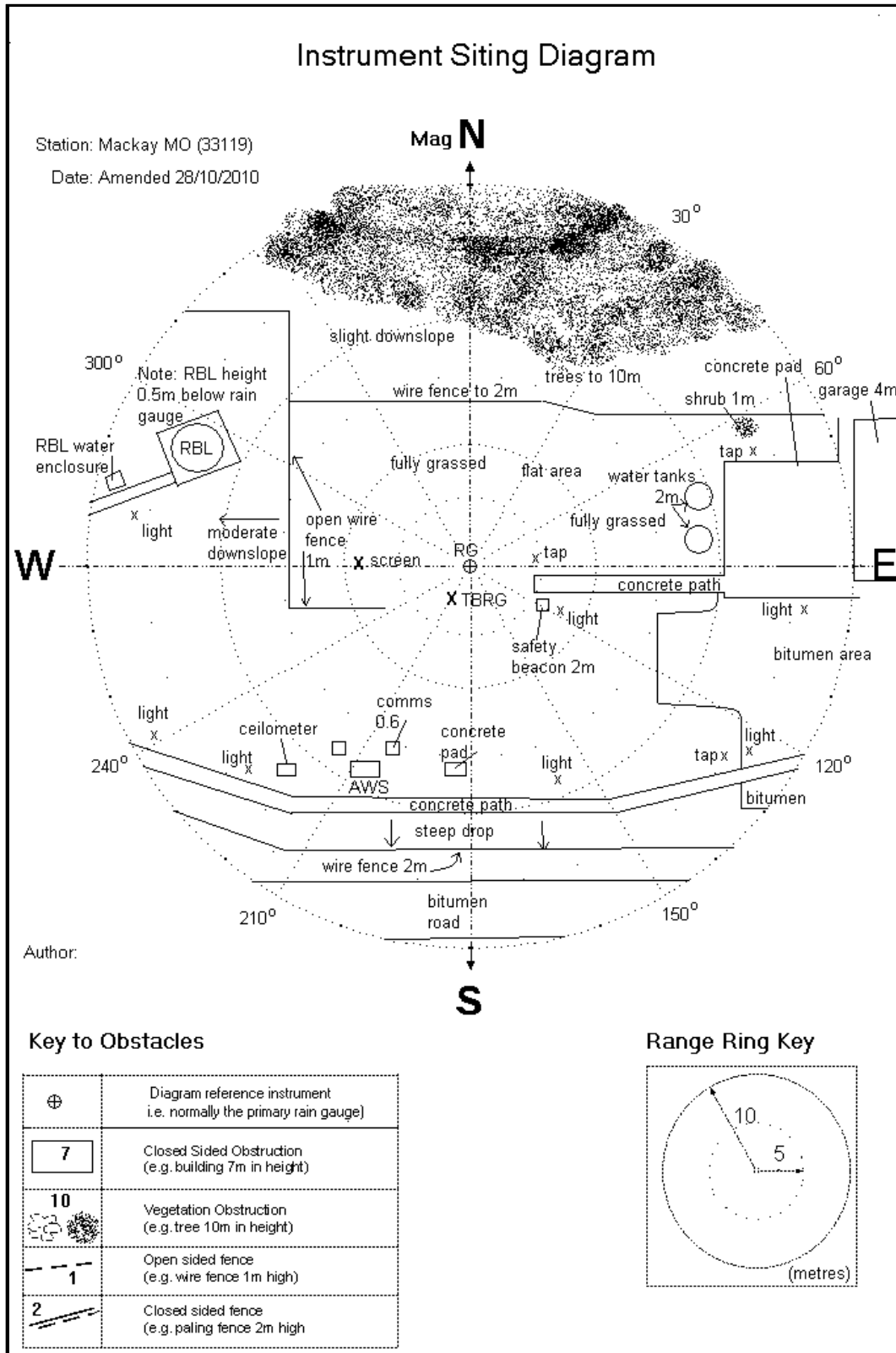
# Extended Climatological Station Metadata

All History

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## Instrument Location and Surrounding Features

28/08/2010



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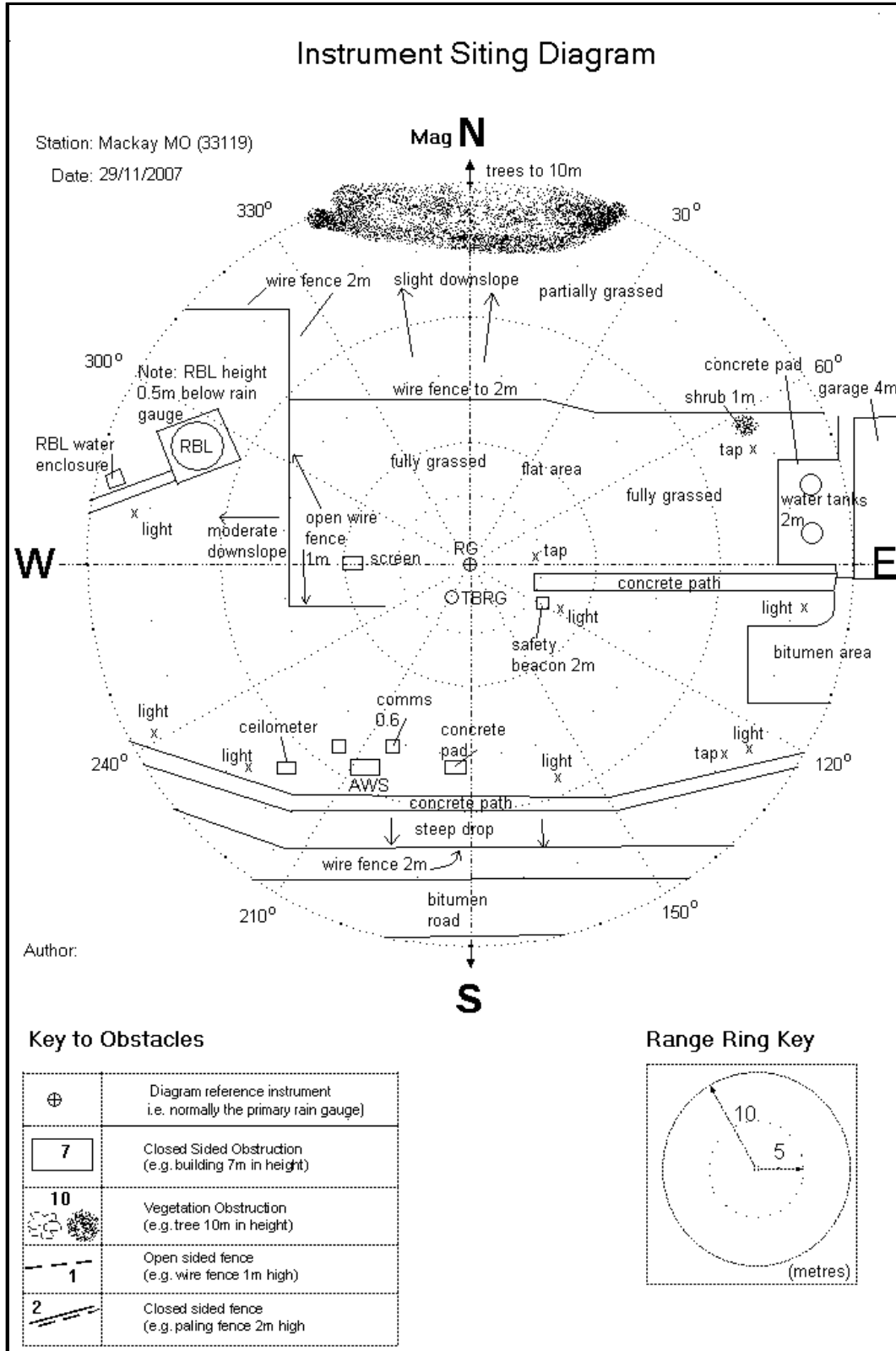
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### Instrument Location and Surrounding Features

29/11/2007



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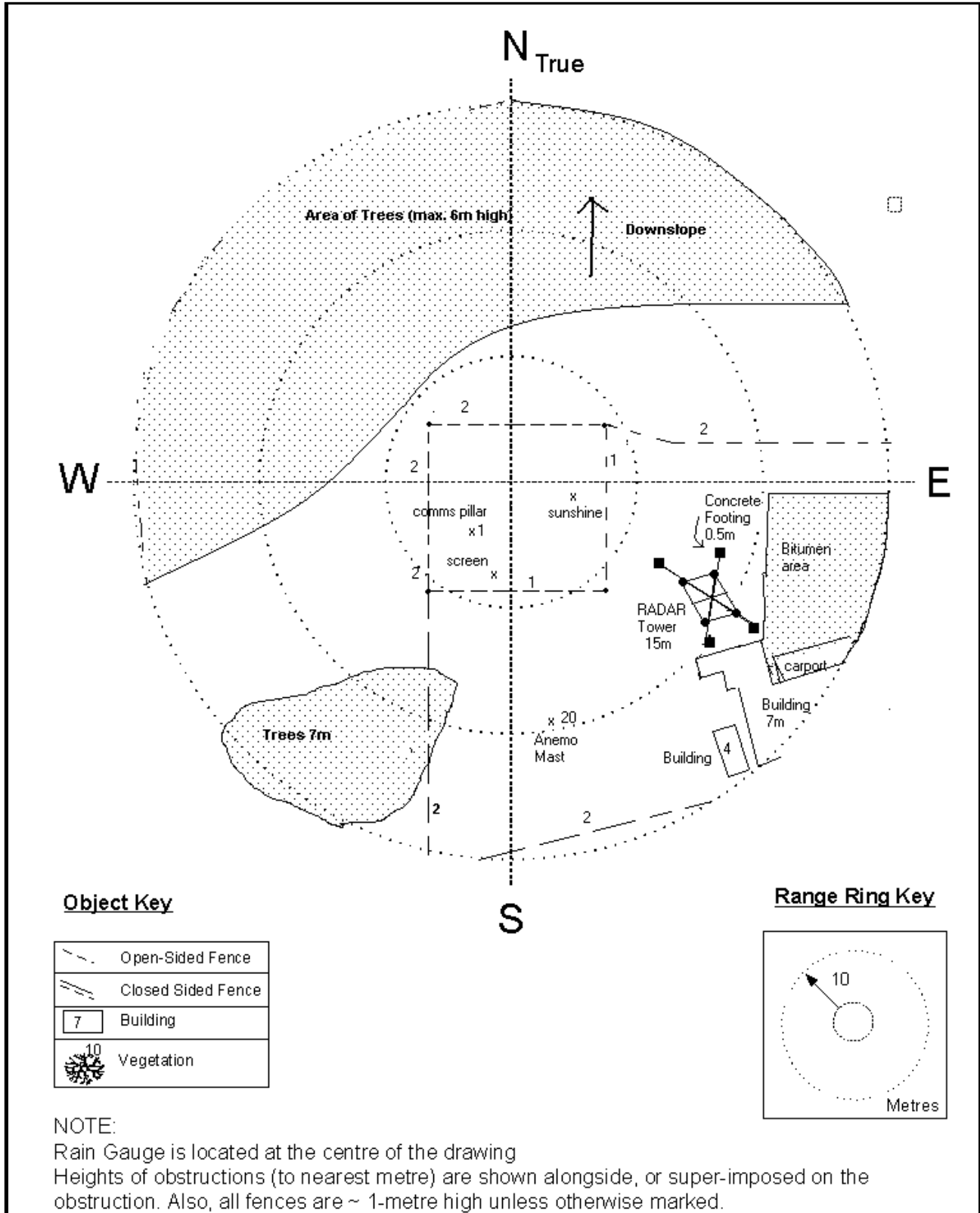
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### Instrument Location and Surrounding Features

31/10/2004



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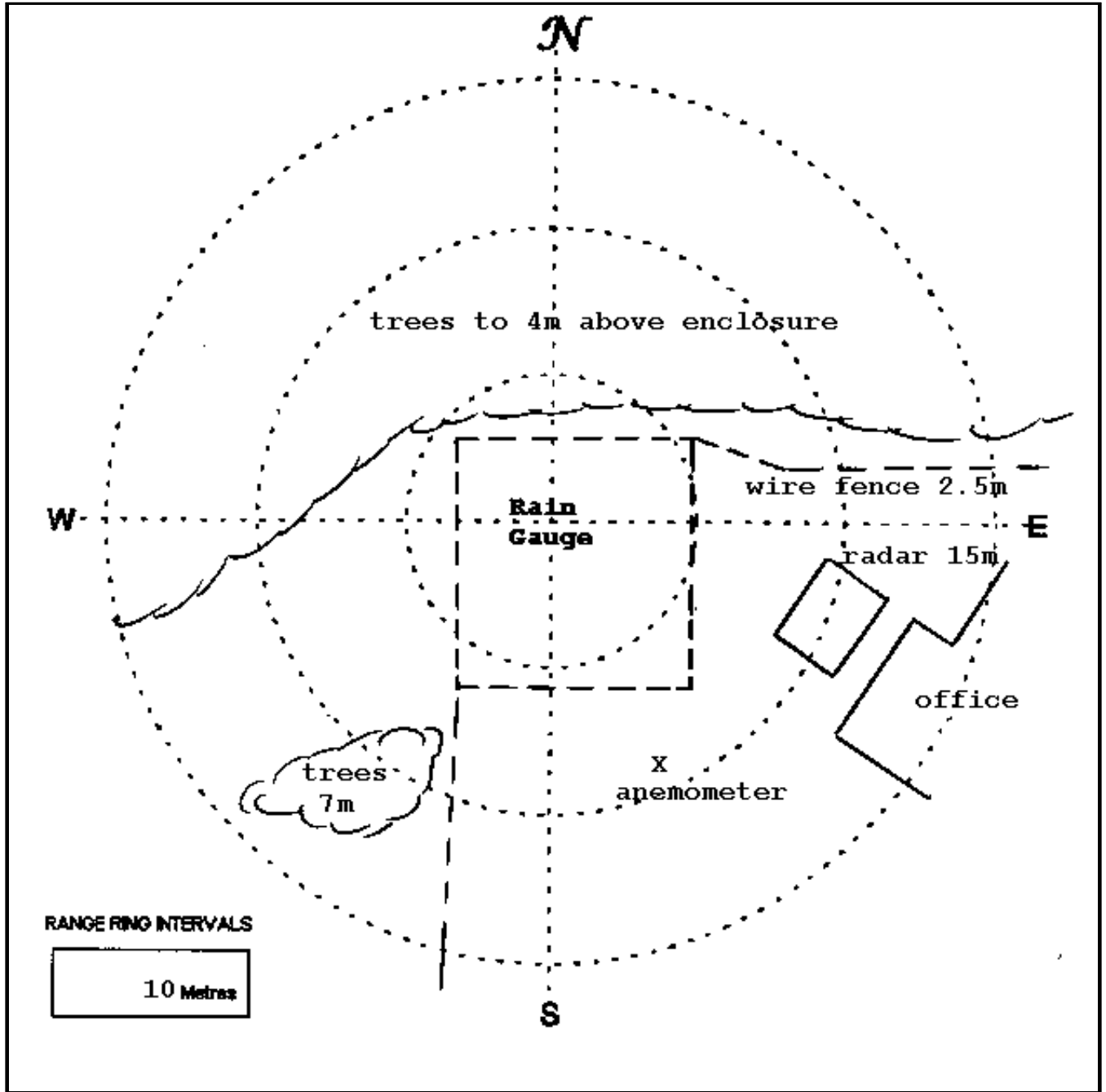
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### Instrument Location and Surrounding Features

06/10/2000



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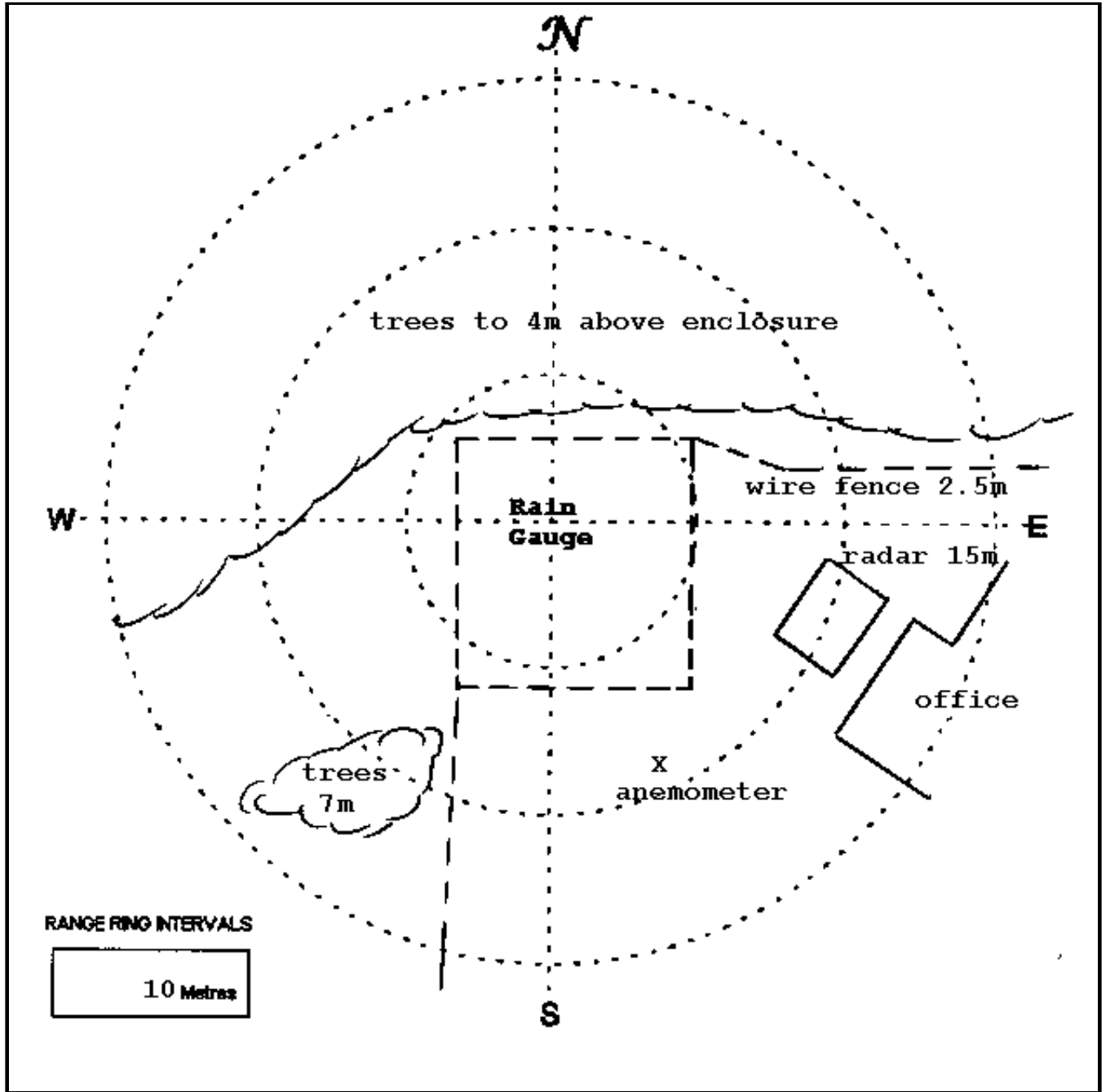
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### Instrument Location and Surrounding Features

11/10/1999



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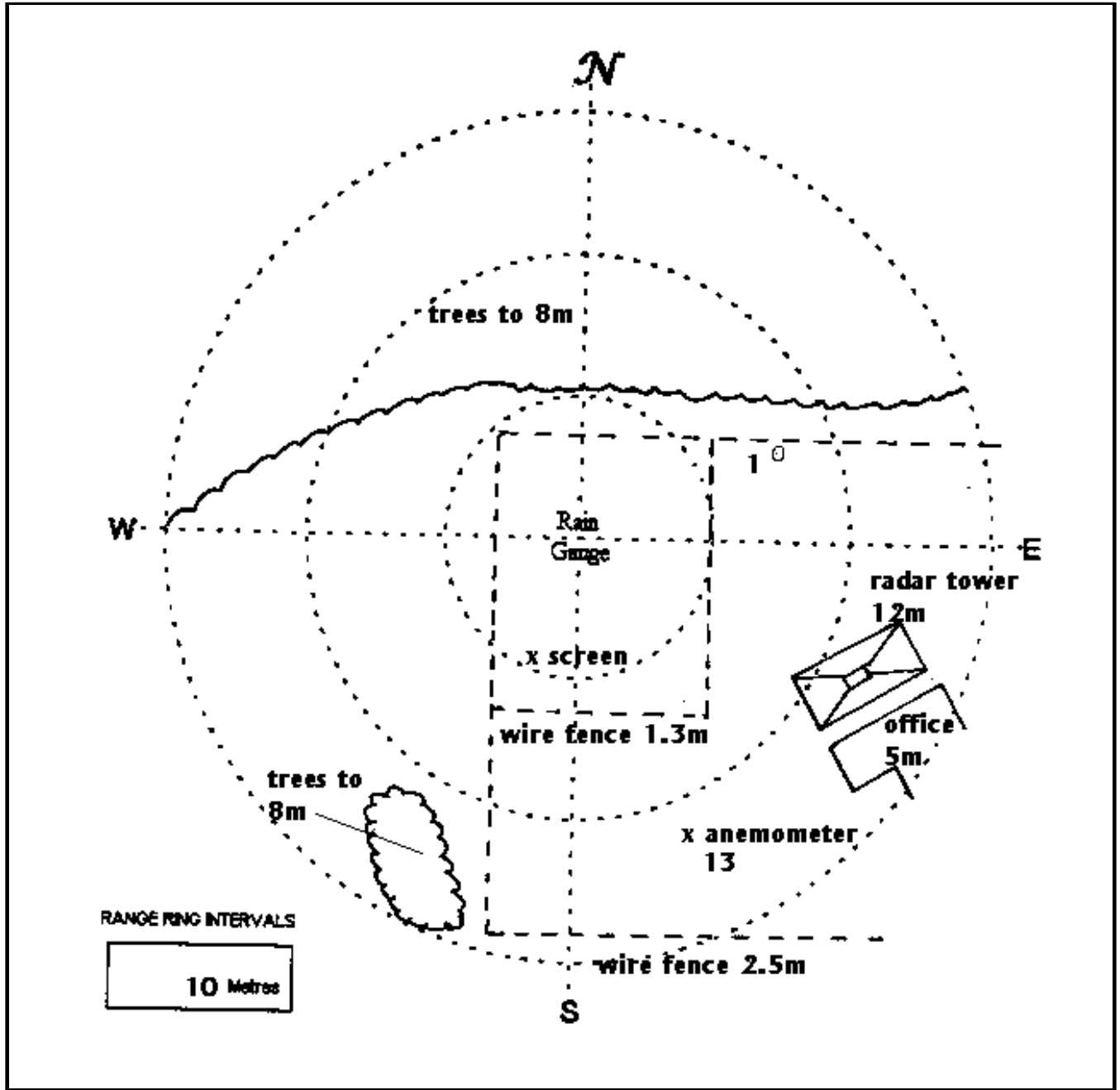
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### Instrument Location and Surrounding Features

16/10/1998



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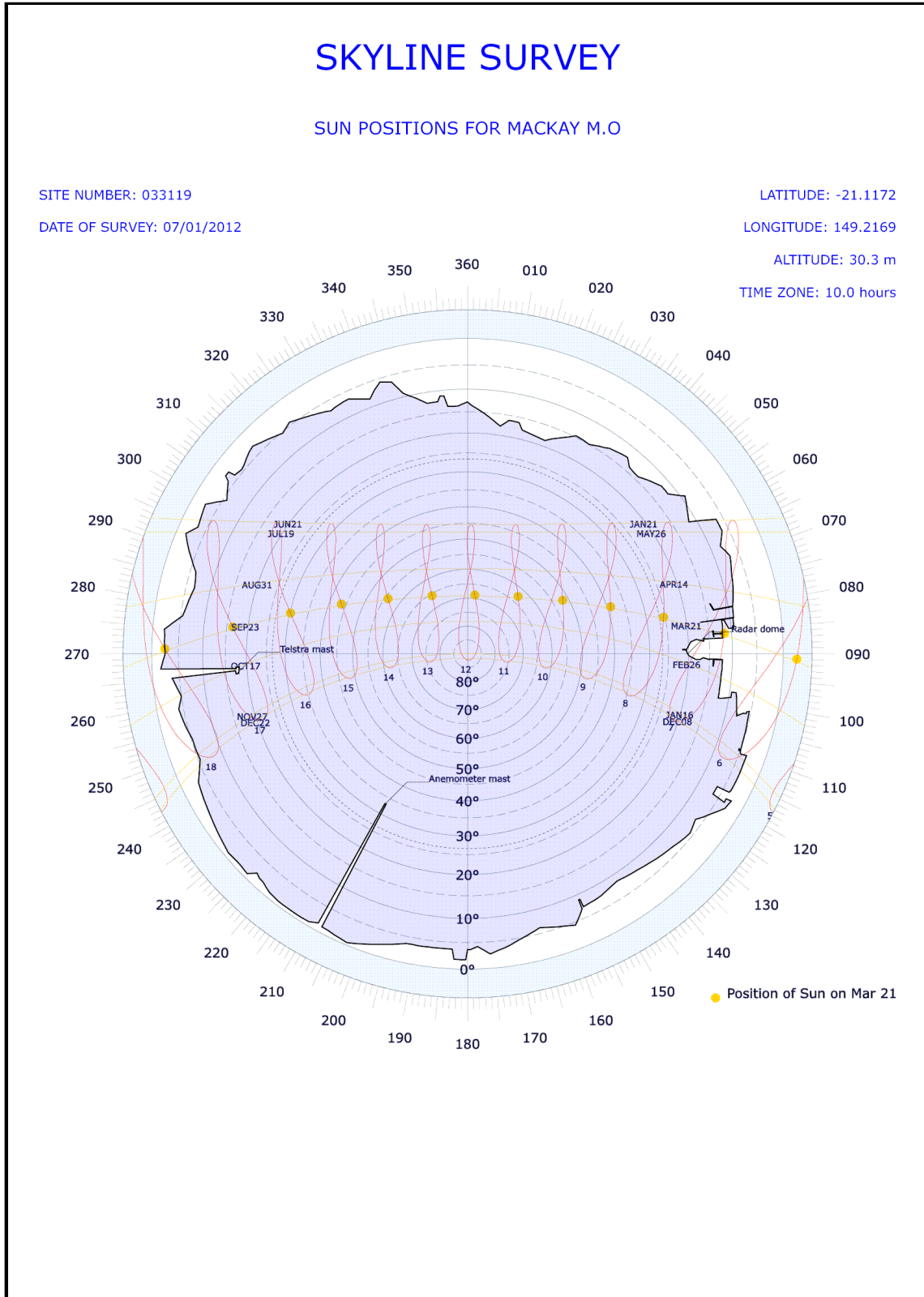


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### Skyline Diagram 07/01/2012(most recent)



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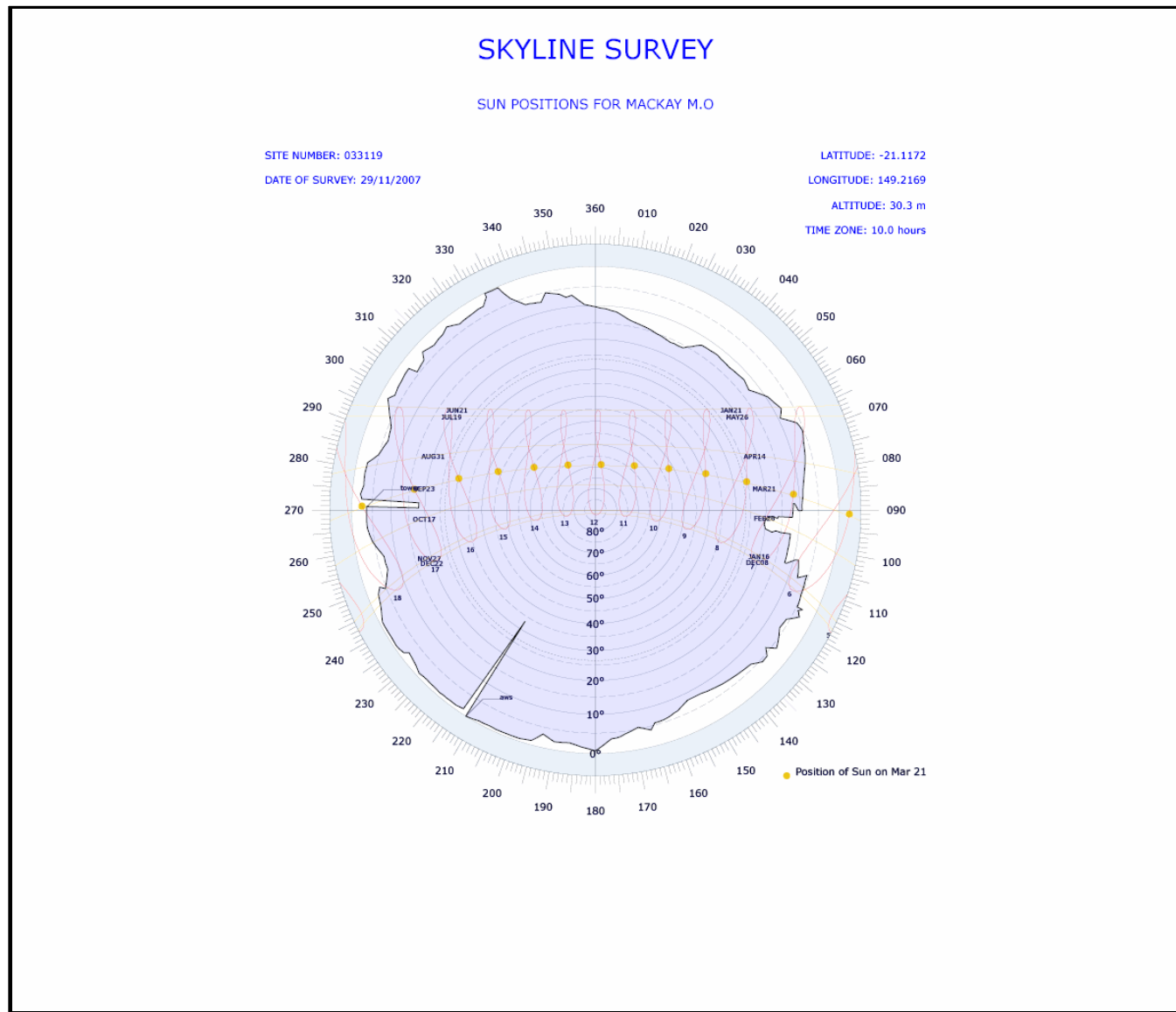
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## Skyline Diagram

29/11/2007



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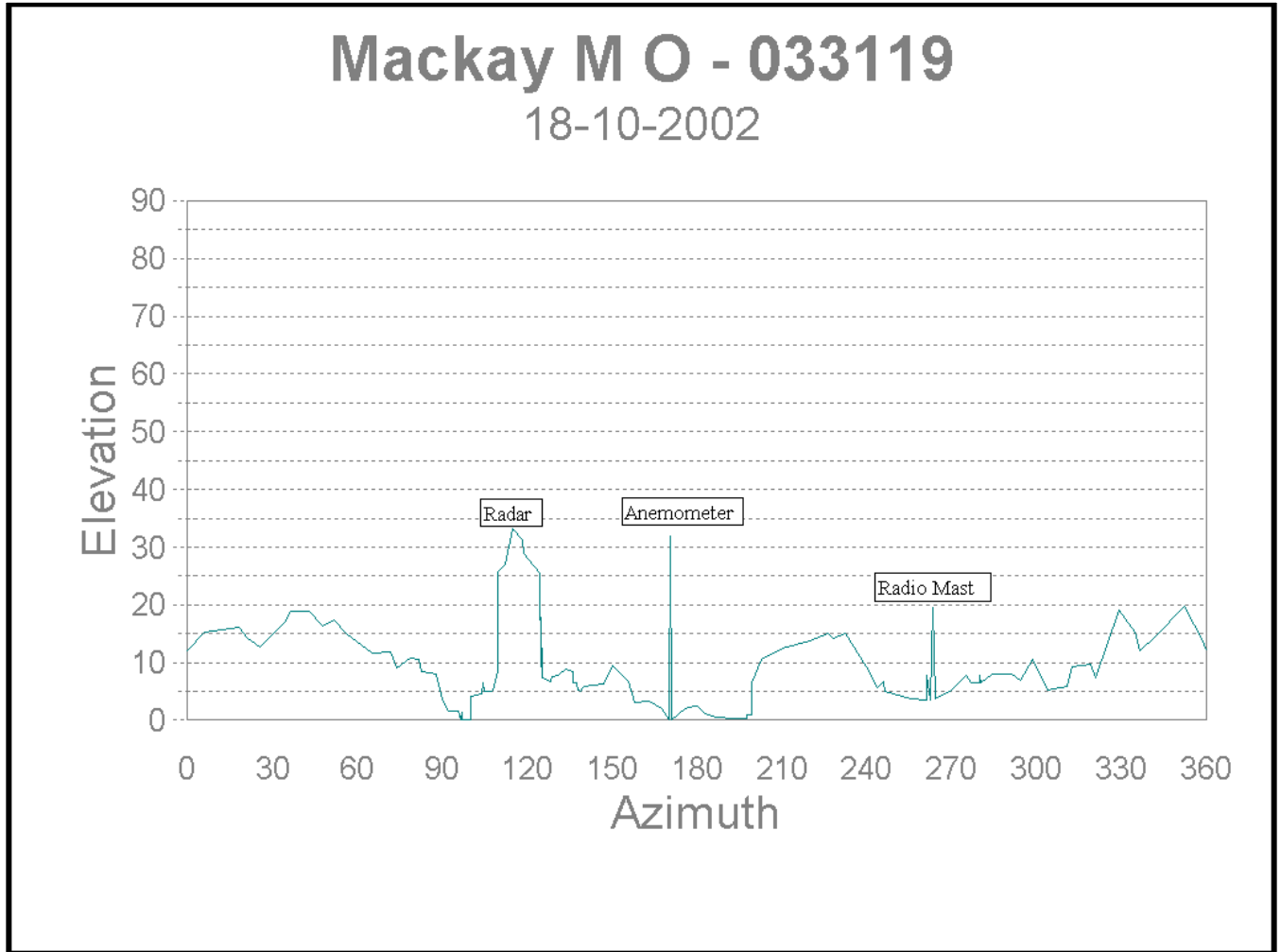
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### Skyline Diagram

18/10/2002



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Station Observation Program Summary (Surface Observations) from 25/09/1959 to 11/09/2001

Current Observation	Continuous	Half Hourly	Hourly
Surface Observations	-	-	Y

Current Observation	Program Type	12 AM	3 AM	6 AM	9 AM	12 PM	3 PM	6 AM	9 AM
Surface Observation	PERFORMED	Y	Y	Y	Y	Y	Y	Y	Y
Surface Observation	REPORTED	Y	Y	Y	Y	Y	Y	Y	Y
Surface Observation	SEASONAL	-	-	-	-	-	-	-	-

Station Observation Program Summary (Surface Observations) from 11/09/2001 to 06/04/2009

Current Observation	Continuous	Half Hourly	Hourly
Surface Observations	Y	Y	Y

Current Observation	Program Type	12 AM	3 AM	6 AM	9 AM	12 PM	3 PM	6 AM	9 AM
Surface Observation	PERFORMED	Y	Y	Y	Y	Y	Y	Y	Y
Surface Observation	REPORTED	Y	Y	Y	Y	Y	Y	Y	Y
Surface Observation	SEASONAL	-	-	-	-	-	-	-	-

Station Observation Program Summary (Surface Observations) from 06/04/2009 to 28/04/2016

Current Observation	Continuous	Half Hourly	Hourly
Surface Observations	Y	Y	Y

Current Observation	Program Type	12 AM	3 AM	6 AM	9 AM	12 PM	3 PM	6 AM	9 AM
Surface Observation	PERFORMED	Y	Y	Y	Y	Y	Y	Y	Y
Surface Observation	REPORTED	Y	Y	Y	Y	Y	Y	Y	Y
Surface Observation	SEASONAL	-	-	-	-	-	-	-	-

Station Observation Program Summary (Surface Observations) 27 JUL 2022 (most recent)

Current Observation	Continuous	Half Hourly	Hourly
Surface Observations	Y	Y	Y

Current Observation	Program Type	12 AM	3 AM	6 AM	9 AM	12 PM	3 PM	6 AM	9 AM
Surface Observation	PERFORMED	Y	Y	Y	Y	Y	Y	Y	Y
Surface Observation	REPORTED	Y	Y	Y	Y	Y	Y	Y	Y
Surface Observation	SEASONAL	-	-	-	-	-	-	-	-

Upper Air Routine 01/07/1999 to 28/04/2016

Flight type	Time UTC	Mon	Tue	Wed	Thur	Fri	Sat	Sun
Wind & Temp.	00:00	-	-	-	-	-	-	-
Wind & Temp.	06:00	-	-	-	-	-	-	-

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Station metadata	Wind	00:00	Y	Y	Y	Y	Y	Y	Y
	Wind	06:00	Y	Y	Y	Y	Y	Y	Y
	Wind	12:00	Y	Y	Y	Y	Y	Y	Y
	Wind	18:00							





## Extended Climatological Station Metadata

All History

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<b>Bureau No.:</b> 033119	<b>WMO No.:</b> 94367	<b>Aviation ID:</b> MKY	<b>Opened:</b> 01 Jan 1959		<b>Current Status:</b> Still open
<b>Latitude:</b> -21.1172	<b>Longitude:</b> 149.2169	<b>Elevation:</b> 30.264 m	<b>Barometer Elev:</b> 30.3 m	<b>Metadata compiled:</b> 27 JUL 2022	

### Upper Air Routine 28/04/2016 to 10/10/2016

Flight type	Time UTC	Mon	Tue	Wed	Thur	Fri	Sat	Sun
Wind & Temp.	00:00	-	-	-	-	-	-	-
Wind & Temp.	06:00	-	-	-	-	-	-	-
Wind & Temp.	12:00	-	-	-	-	-	-	-
Wind & Temp.	18:00	-	-	-	-	-	-	-
Wind	00:00	Y	Y	Y	Y	Y	Y	Y
Wind	06:00	Y	Y	Y	Y	Y	-	-
Wind	12:00	-	-	-	-	-	-	-
Wind	18:00	-	-	-	-	-	-	-

### Upper Air Routine 10/10/2016 (most recent)

Flight type	Time UTC	Mon	Tue	Wed	Thur	Fri	Sat	Sun
Wind & Temp.	00:00	-	-	-	-	-	-	-
Wind & Temp.	06:00	-	-	-	-	-	-	-
Wind & Temp.	12:00	-	-	-	-	-	-	-
Wind & Temp.	18:00	-	-	-	-	-	-	-
Wind	00:00	-	-	-	-	-	-	-
Wind	06:00	-	-	-	-	-	-	-
Wind	12:00	-	-	-	-	-	-	-
Wind	18:00	-	-	-	-	-	-	-

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All History

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### Station Equipment History

#### Equipment Install/Remove

##### Cloud Height

02/FEB/2004 INSTALL Ceilometer (Type Vaisala CT25K S/N - Y08108) Surface Observations  
 11/FEB/2020 REPLACE Ceilometer (Now Vaisala CL31 S/N - G5050004) Surface Observations  
 17/MAR/2015 REPLACE Ceilometer (Now Vaisala CL31 S/N - K3820002) Surface Observations  
 13/DEC/2006 REPLACE Ceilometer (Now Vaisala CT25K S/N - W09410) Surface Observations  
 10/MAR/2010 REPLACE Ceilometer (Now Vaisala CT25K S/N - X11504) Surface Observations  
 24/FEB/2006 REPLACE Ceilometer (Now Vaisala CT25K S/N - Y08103) Surface Observations  
 25/SEP/1959 INSTALL Cloud Base Searchlight (Type 63 Degree S/N - Unknown) Surface Observations  
 01/MAR/2004 REMOVE Cloud Base Searchlight (Type 90 Degree S/N - Unknown) Surface Observations  
 22/FEB/1992 REPLACE Cloud Base Searchlight (Now 90 Degree S/N - Unknown) Surface Observations

##### River Height (No Electronic History)

##### Wind Run (No Electronic History)

##### Spectral Radiation (No Electronic History)

##### Sea Surface Temperature (No Electronic History)

##### Sea Water Temperature (No Electronic History)

##### Evaporation (No Electronic History)

##### Minimum Temperature

25/SEP/1959 INSTALL Thermometer, Alcohol, Min (Type Unknown S/N - Unknown) Surface Observations  
 30/NOV/2016 REMOVE Thermometer, Alcohol, Min (Type Amarol S/N - 19188) Surface Observations  
 03/DEC/2014 REPLACE Thermometer, Alcohol, Min (Now Amarol S/N - 19188) Surface Observations  
 28/OCT/2008 REPLACE Thermometer, Alcohol, Min (Now Amarol S/N - 19443) Surface Observations  
 18/OCT/1995 REPLACE Thermometer, Alcohol, Min (Now Dobbie S/N - 4833) Surface Observations

##### Soil Temperature 50cm (No Electronic History)

##### Sub Surface Temperature (No Electronic History)

##### Electrical Conductivity (No Electronic History)

##### Maximum Temperature

25/SEP/1959 INSTALL Thermometer, Mercury, Max (Type Unknown S/N - Unknown) Surface Observations  
 30/NOV/2016 REMOVE Thermometer, Mercury, Max (Type Dobbie S/N - 4634) Surface Observations  
 18/OCT/2002 REPLACE Thermometer, Mercury, Max (Now Dobbie S/N - 4634) Surface Observations  
 18/OCT/1995 REPLACE Thermometer, Mercury, Max (Now Dobbie S/N - M0320) Surface Observations

##### Soil Temperature 20cm (No Electronic History)

##### Solar Radiation (No Electronic History)

##### Soil Temperature 5cm (No Electronic History)

##### Oxygen Content (No Electronic History)

##### Sea Water Level (No Electronic History)

##### Surface Inclination (No Electronic History)

##### Terrestrial Minimum Temperature (No Electronic History)

##### Visibility (No Electronic History)

##### Solar Radiation (Direct) (No Electronic History)

##### Magnetic Bearing (No Electronic History)

##### Wind Direction

28/APR/2016 INSTALL Anemometer (Type Synchronac Cups - Type 732 S/N - 78296) Surface Observations  
 18/OCT/1995 INSTALL Anemometer (Type Synchronac Vane - Type 706 S/N - WS=70905 WD=70929) Surface Observations

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## Extended Climatological Station Metadata

All History

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### Station Equipment History (continued)

#### Equipment Install/Remove(Continued)

- 01/SEP/1959 INSTALL Mast Anemometer (Type Pivot, Standard 8m S/N - 223670/05) Infrastructure
- 10/MAY/2021 REPLACE Anemometer (Now Synchronac Cups - Type 732 S/N - 94200) Surface Observations
- 10/MAY/2021 REPLACE Anemometer (Now Synchronac Vane - Type 706 S/N - 261106) Surface Observations
- 28/APR/2016 REPLACE Anemometer (Now Synchronac Vane - Type 706 S/N - 78223) Surface Observations
- 08/AUG/2005 REPLACE Anemometer (Now Synchronac Vane - Type 706 S/N - WD=81259,WS=81271) Surface Observations
- 12/APR/2011 REPLACE Anemometer (Now Synchronac Vane - Type 706 S/N - WS-84348,WD-D486) Surface Observations
- 06/FEB/2001 REPLACE Anemometer (Now Synchronac Vane - Type 706 S/N - WS:77555-WD:NONE) Surface Observations

#### Air Temperature

- 21/JUN/2017 INSTALL Humidity Probe (Type Rotronics MP101A-T4-W4W S/N - 11666-001) Surface Observations
- 28/NOV/2016 INSTALL Humidity Probe (Type Vaisala HMP45D S/N - C4420017) Surface Observations
- 06/JUN/2017 REMOVE Humidity Probe (Type Vaisala HMP45D S/N - V0720033) Surface Observations
- 27/JUL/2017 REPLACE Humidity Probe (Now Rotronics MP101A-T4-W4W S/N - 16239006) Surface Observations
- 13/MAR/2018 REPLACE Humidity Probe (Now Rotronics MP101A-T4-W4W S/N - 19522014) Surface Observations
- 05/JUN/2017 REPLACE Humidity Probe (Now Vaisala HMP45D S/N - V0720033) Surface Observations
- 18/OCT/1995 INSTALL Temperature Probe - Dry Bulb (Type Rosemount S/N - 0094) Surface Observations
- 24/MAR/2010 REPLACE Temperature Probe - Dry Bulb (Now Rosemount S/N - 0361) Surface Observations
- 08/AUG/2005 REPLACE Temperature Probe - Dry Bulb (Now Rosemount ST2401 S/N - 0312) Surface Observations
- 06/MAR/2013 REPLACE Temperature Probe - Dry Bulb (Now WIKA TR40 S/N - 98197-10) Surface Observations
- 25/SEP/1959 INSTALL Thermograph (Type Weekly S/N - Unknown) Surface Observations
- 01/JAN/1981 REMOVE Thermograph (Type Weekly S/N - Unknown) Surface Observations
- 18/OCT/2002 INSTALL Thermometer, Mercury, Dry Bulb (Type Dobbie S/N - 16906) Surface Observations
- 03/DEC/2014 INSTALL Thermometer, Mercury, Dry Bulb (Type Dobbie S/N - 18721) Surface Observations
- 25/SEP/1959 INSTALL Thermometer, Mercury, Dry Bulb (Type Dobbie S/N - Unknown) Surface Observations
- 03/DEC/2014 REMOVE Thermometer, Mercury, Dry Bulb (Type Dobbie S/N - 16906) Surface Observations
- 30/NOV/2016 REMOVE Thermometer, Mercury, Dry Bulb (Type Dobbie S/N - 18721) Surface Observations
- 18/OCT/2002 REMOVE Thermometer, Mercury, Dry Bulb (Type Dobbie S/N - 5746) Surface Observations
- 18/OCT/1995 REPLACE Thermometer, Mercury, Dry Bulb (Now Dobbie S/N - 5746) Surface Observations

#### Wet Bulb Temperature

- 18/OCT/1995 INSTALL Temperature Probe - Wet Bulb (Type Rosemount S/N - 0123) Surface Observations
- 28/NOV/2016 REMOVE Temperature Probe - Wet Bulb (Type Rosemount ST2401 S/N - 0223) Surface Observations
- 08/AUG/2005 REPLACE Temperature Probe - Wet Bulb (Now Rosemount S/N - 0758) Surface Observations
- 24/MAR/2010 REPLACE Temperature Probe - Wet Bulb (Now Rosemount ST2401 S/N - 0223) Surface Observations
- 03/DEC/2014 INSTALL Thermometer, Mercury, Wet Bulb (Type Dobbie S/N - 16906) Surface Observations
- 25/SEP/1959 INSTALL Thermometer, Mercury, Wet Bulb (Type Unknown S/N - Unknown) Surface Observations
- 30/NOV/2016 REMOVE Thermometer, Mercury, Wet Bulb (Type Amarol S/N - 19583) Surface Observations
- 03/DEC/2014 REMOVE Thermometer, Mercury, Wet Bulb (Type Amarol S/N - 19583) Surface Observations
- 02/FEB/2016 REPLACE Thermometer, Mercury, Wet Bulb (Now Amarol S/N - 19583) Surface Observations
- 28/AUG/2010 REPLACE Thermometer, Mercury, Wet Bulb (Now Amarol S/N - 19583) Surface Observations
- 18/OCT/1995 REPLACE Thermometer, Mercury, Wet Bulb (Now Dobbie S/N - 12830) Surface Observations
- 31/OCT/2004 REPLACE Thermometer, Mercury, Wet Bulb (Now Dobbie S/N - 20085) Surface Observations
- 18/OCT/2002 REPLACE Thermometer, Mercury, Wet Bulb (Now Dobbie S/N - M6206) Surface Observations

#### Lightning (No Electronic History)

#### Turbidity (No Electronic History)

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## Extended Climatological Station Metadata

All History

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<b>Bureau No.:</b> 033119	<b>WMO No.:</b> 94367	<b>Aviation ID:</b> MKY	<b>Opened:</b> 01 Jan 1959	<b>Current Status:</b> Still open
<b>Latitude:</b> -21.1172	<b>Longitude:</b> 149.2169	<b>Elevation:</b> 30.264 m	<b>Barometer Elev:</b> 30.3 m	<b>Metadata compiled:</b> 27 JUL 2022

### Station Equipment History (continued)

#### Equipment Install/Remove(Continued)

##### Total Column Ozone Amount (No Electronic History)

##### Pressure

- 25/SEP/1959 INSTALL Barometer (Type Kew pattern mercury S/N - 1736) Surface Observations
- 01/JUN/1995 INSTALL Barometer (Type Vaisala PA11A S/N - 661815) Surface Observations
- 18/OCT/1995 INSTALL Barometer (Type Vaisala PA11A S/N - 661815) Surface Observations
- 31/MAY/1995 REMOVE Barometer (Type Kew pattern mercury S/N - 1736) Surface Observations
- 17/OCT/1995 REMOVE Barometer (Type Vaisala PA11A S/N - 661815) Surface Observations
- 24/DEC/1999 REPLACE Barometer (Now Vaisala PA11A S/N - P3720019) Surface Observations
- 26/AUG/2005 REPLACE Barometer (Now Vaisala PTB220B S/N - W1140022) Surface Observations
- 27/NOV/2013 REPLACE Barometer (Now Vaisala PTB330B (General Use) S/N - J4030009) Surface Observations

##### Humidity

- 21/JUN/2017 INSTALL Humidity Probe (Type Rotronics MP101A-T4-W4W S/N - 11666-001) Surface Observations
- 28/NOV/2016 INSTALL Humidity Probe (Type Vaisala HMP45D S/N - C4420017) Surface Observations
- 06/JUN/2017 REMOVE Humidity Probe (Type Vaisala HMP45D S/N - V0720033) Surface Observations
- 27/JUL/2017 REPLACE Humidity Probe (Now Rotronics MP101A-T4-W4W S/N - 16239006) Surface Observations
- 13/MAR/2018 REPLACE Humidity Probe (Now Rotronics MP101A-T4-W4W S/N - 19522014) Surface Observations
- 05/JUN/2017 REPLACE Humidity Probe (Now Vaisala HMP45D S/N - V0720033) Surface Observations
- 25/SEP/1959 INSTALL Hygrograph (Type Hair Hygrograph S/N - Unknown) Surface Observations
- 01/JAN/1981 REMOVE Hygrograph (Type Hair Hygrograph S/N - Unknown) Surface Observations

##### Sunshine Hours

- 01/DEC/1983 INSTALL Sunshine Recorder (Type Campbell-Stokes S/N - 5137) Surface Observations
- 28/APR/2016 REMOVE Sunshine Recorder (Type Campbell-Stokes S/N - 5137) Surface Observations

##### Pressure Trend

- 07/MAR/2011 INSTALL Barograph (Type Weekly S/N - 104) Surface Observations
- 25/SEP/1959 INSTALL Barograph (Type Weekly S/N - CBM038) Surface Observations
- 07/MAR/2011 REMOVE Barograph (Type Weekly S/N - CBM038) Surface Observations
- 21/JUN/2017 REMOVE Barograph (Type Weekly S/N - CBM042) Surface Observations
- 02/NOV/2014 REPLACE Barograph (Now Weekly S/N - CBM042) Surface Observations

##### Snow Height (No Electronic History)

##### Wind Speed

- 28/APR/2016 INSTALL Anemometer (Type Synchrotac Cups - Type 732 S/N - 78296) Surface Observations
- 18/OCT/1995 INSTALL Anemometer (Type Synchrotac Vane - Type 706 S/N - WS=70905 WD=70929) Surface Observations
- 01/SEP/1959 INSTALL Mast Anemometer (Type Pivot, Standard 8m S/N - 223670/05) Infrastructure
- 10/MAY/2021 REPLACE Anemometer (Now Synchrotac Cups - Type 732 S/N - 94200) Surface Observations
- 10/MAY/2021 REPLACE Anemometer (Now Synchrotac Vane - Type 706 S/N - 261106) Surface Observations
- 28/APR/2016 REPLACE Anemometer (Now Synchrotac Vane - Type 706 S/N - 78223) Surface Observations
- 08/AUG/2005 REPLACE Anemometer (Now Synchrotac Vane - Type 706 S/N - WD=81259,WS=81271) Surface Observations
- 12/APR/2011 REPLACE Anemometer (Now Synchrotac Vane - Type 706 S/N - WS-84348,WD-D486) Surface Observations
- 06/FEB/2001 REPLACE Anemometer (Now Synchrotac Vane - Type 706 S/N - WS:77555-WD:NONE) Surface Observations

##### Rainfall

- 25/SEP/1959 INSTALL Pluviograph (Type Dines syphoning S/N - 132) Rainfall Intensity
- 18/OCT/2002 REMOVE Pluviograph (Type Dines syphoning S/N - 132) Rainfall Intensity
- 01/OCT/1959 INSTALL Raingauge (Type 203 mm (8in) - 200mm capacity S/N - NONE) Surface Observations

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All History

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### Station Equipment History (continued)

#### Equipment Install/Remove(Continued)

18/OCT/1995 INSTALL Raingauge (Type Rimco 7499 TBRG S/N - 70883) Surface Observations  
 17/JAN/2019 REMOVE Raingauge (Type 203 mm (8in) - 200mm capacity S/N - NONE) Surface Observations  
 08/AUG/2005 REPLACE Raingauge (Now Rimco 7499 TBRG S/N - 81203) Rainfall Intensity  
 08/AUG/2005 REPLACE Raingauge (Now Rimco 7499 TBRG S/N - 81203) Surface Observations  
 29/OCT/2009 REPLACE Raingauge (Now Rimco 7499 TBRG S/N - 82434) Rainfall Intensity  
 29/OCT/2009 REPLACE Raingauge (Now Rimco 7499 TBRG S/N - 82434) Surface Observations  
 05/JUN/2017 REPLACE Raingauge (Now Rimco 7499 TBRG S/N - 82508) Rainfall Intensity  
 05/JUN/2017 REPLACE Raingauge (Now Rimco 7499 TBRG S/N - 82508) Surface Observations  
 31/MAY/2000 SHARE Raingauge (Type Rimco 7499 TBRG S/N - 70883) Rainfall Intensity  
 31/MAY/2000 SHARE Raingauge (Type Rimco 7499 TBRG S/N - 81203) Rainfall Intensity  
 31/MAY/2000 SHARE Raingauge (Type Rimco 7499 TBRG S/N - 82434) Rainfall Intensity  
 23/JUN/2020 UNSHARE Raingauge (Type Rimco 7499 TBRG S/N - 82508) Rainfall Intensity

#### Soil Temperature 100cm (No Electronic History)

#### Soil Temperature 10cm (No Electronic History)

#### Solar Radiation (Long Wave) (No Electronic History)

#### RF Reflectivity

31/JAN/2006 INSTALL Equipment Shelter (Type Radar - Purpose Built Building S/N - Unknown) Infrastructure  
 01/SEP/1959 INSTALL Radar (Type 277F S/N - Unknown) Upper Air  
 01/SEP/1959 INSTALL Radar (Type 277F S/N - Unknown) WeatherWatch  
 01/SEP/1971 INSTALL Radar (Type WF44 S/N - Unknown) Upper Air  
 01/SEP/1971 INSTALL Radar (Type WF44 S/N - Unknown) WeatherWatch  
 01/APR/2006 INSTALL Radar Interface (Type BOM S/N - 0206) Upper Air  
 21/AUG/2014 INSTALL Radar Safety System (RSS) (Type RSS (2502C/8502S) S/N - 5652-06) WeatherWatch  
 01/SEP/1971 INSTALL Radar Tower (Type Lattice WF44 - 30 ft S/N - Unknown) Infrastructure  
 01/APR/2006 INSTALL WW Radar Interface (Type BOM S/N - NONE) WeatherWatch  
 01/SEP/1971 REMOVE Radar (Type 277F S/N - Unknown) Upper Air  
 01/SEP/1971 REMOVE Radar (Type 277F S/N - Unknown) WeatherWatch  
 30/MAR/2006 REMOVE Radar Tower (Type Lattice WF44 - 30 ft S/N - Unknown) Infrastructure  
 01/APR/2006 REPLACE Radar (Now TVDR 2500C S/N - 003) Upper Air  
 01/APR/2006 REPLACE Radar (Now TVDR 2500C S/N - 003) WeatherWatch

The following table summarises information on field performance checks available electronically over the period indicated. The number of instances an instrument was found to fail field performance checks should only be used as a guide. A system of data quality flags is implemented by the Bureau of Meteorology to indicate the data quality of an observation as determined by a multi-stage quality control process.

Available Date Range	Element	Fail Field Performance Check
15/AUG/2006 - 23/APR/2021	Cloud Height	2
07/NOV/2009 - 24/OCT/2013	Sea Surface Temperature	0
04/OCT/2001 - 02/FEB/2016	Minimum Temperature	0
04/OCT/2001 - 02/FEB/2016	Maximum Temperature	0
26/FEB/1998 - 10/MAY/2021	Wind Direction	9
26/FEB/1998 - 23/APR/2021	Air Temperature	6

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### Station Equipment History (continued)

Available Date Range	Element	Fail Field Performance Check
26/FEB/1998 - 28/NOV/2016	Wet Bulb Temperature	4
26/FEB/1998 - 23/APR/2021	Pressure	2
28/NOV/2016 - 23/APR/2021	Humidity	4
04/OCT/2001 - 02/FEB/2016	Pressure Trend	0
26/FEB/1998 - 10/MAY/2021	Wind Speed	9
26/FEB/1998 - 23/APR/2021	Rainfall	2
15/AUG/2001 - 19/APR/2021	RF Reflectivity	3

### Station Detail Changes

02/FEB/2004	CLASSIFICATION AWS Funding - Aviation Funded Assets (AVAF)
01/FEB/2021	CLASSIFICATION AWS Priority 3 - Standard (SLP3-AWS)
01/JUL/2011	CLASSIFICATION Australian Climate Observations Reference Network - Surface Air Temperature (ACORN-SAT)
18/OCT/1995	CLASSIFICATION Basic & Severe (FBS)
26/JUN/2002	CLASSIFICATION CLIMAT Stations (CLC)
10/JAN/2011	CLASSIFICATION Critical (ASOSCRIT)
01/MAY/1997	CLASSIFICATION GCOS Surface Network (GSN)
01/JUL/1998	CLASSIFICATION Information and Observations (MIO)
30/AUG/2021	CLASSIFICATION Mastered in EAMS (EAMS)
01/JUL/2017	CLASSIFICATION Observing Operations Hub - Cairns (OOH-C)
21/MAR/2016	CLASSIFICATION Processed by ASOS (PBA)
01/SEP/1992	CLASSIFICATION Reference Climate Stations (RCS) ENDED 30-06-2011
14/FEB/1997	CLASSIFICATION Regional Basic Synoptic Network (RBSN)
01/JUL/2017	CLASSIFICATION SLS Flood forecasting priority â€™ Low (FWP-L)
01/JUL/1998	CLASSIFICATION Upper Wind only (UW)
28/AUG/2019	OBJECT Document/03311920190828_Mast Inspection
07/MAR/2019	OBJECT Document/BAROMETER COEFFICIENTS
29/MAY/2018	OBJECT Document/BOM backflow test results May 2018
14/MAY/2019	OBJECT Document/BOM backflow test reults May 2019
29/JUN/2011	OBJECT Document/CEILOMETER STATUS
01/NOV/2011	OBJECT Document/CEILOMETER STATUS
28/JUN/2012	OBJECT Document/CEILOMETER STATUS
26/JUN/2014	OBJECT Document/CEILOMETER STATUS
15/JUL/2015	OBJECT Document/CEILOMETER STATUS
20/JUL/2016	OBJECT Document/CEILOMETER STATUS
23/APR/2021	OBJECT Document/CEILOMETER STATUS
13/JUN/2013	OBJECT Document/CEILOMETER STATUS
17/JAN/2019	OBJECT Document/CEILOMETER STATUS
20/OCT/2020	OBJECT Document/CEILOMETER STATUS
13/MAR/2018	OBJECT Document/CEILOMETER STATUS
29/AUG/2018	OBJECT Document/CEILOMETER STATUS
11/FEB/2020	OBJECT Document/CEILOMETER STATUS
02/FEB/2016	OBJECT Document/CEILOMETER STATUS
05/JUN/2017	OBJECT Document/CEILOMETER STATUS

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## Extended Climatological Station Metadata

All History

<b>Station:</b> MACKAY M.O	<b>Location:</b> MACKAY M.O			<b>State:</b> QLD
<b>Bureau No.:</b> 033119	<b>WMO No.:</b> 94367	<b>Aviation ID:</b> MKY	<b>Opened:</b> 01 Jan 1959	<b>Current Status:</b> Still open
<b>Latitude:</b> -21.1172	<b>Longitude:</b> 149.2169	<b>Elevation:</b> 30.264 m	<b>Barometer Elev:</b> 30.3 m	<b>Metadata compiled:</b> 27 JUL 2022

### Station Equipment History (continued)

#### Station Detail Changes(Continued)

02/JUL/2020 OBJECT Document/ComAp Configuration notes  
08/MAR/2006 OBJECT Document/FW Mackay Met Office - Sitrep No 1- 6  
19/SEP/2016 OBJECT Document/Fire response Mackay office 2016  
13/MAY/2015 OBJECT Document/HYDRO INSPECTION CHECKSHEET  
18/DEC/2018 OBJECT Document/Height Survey Report  
08/MAR/2006 OBJECT Document/Mackay AWS Chart  
04/MAY/2018 OBJECT Document/Mackay Munro 1995  
08/MAR/2006 OBJECT Document/Mackay Pressure Transducer  
01/JUN/2015 OBJECT Document/Mackay\_General\_OHS\_Audit\_Checklist January 2014  
28/OCT/2008 OBJECT Document/Observation Advice 45-523 Mackay radar replacement  
02/SEP/2015 OBJECT Document/RSS VALIDATION RECORD  
17/MAR/2016 OBJECT Document/RSS VALIDATION RECORD  
03/AUG/2018 OBJECT Document/RSS VALIDATION RECORD  
21/AUG/2014 OBJECT Document/RSS VALIDATION RECORD  
07/JAN/2012 OBJECT Document/SKYLINE DATA  
18/OCT/2002 OBJECT Document/SKYLINE DATA  
29/NOV/2007 OBJECT Document/SKYLINE DATA  
08/JUL/2015 OBJECT Document/Site Sharing Agreement - CQUni  
21/NOV/2013 OBJECT Document/Test &Tag Results Mackay Met Office 1\_20131111  
21/NOV/2013 OBJECT Document/Test &Tag Results Mackay Met Office 2\_20131111  
01/JAN/1959 STATION - (nondb seeding) Opened  
01/JAN/1959 STATION - (nondb seeding) wmo\_num Changed to 94367  
01/JAN/1959 STATION aero\_ht Changed to  
31/OCT/1997 STATION aviation\_id Changed to MKY  
05/MAR/2019 STATION bar\_ht Changed to 30.34  
01/JAN/1959 STATION bar\_ht Changed to 32.8  
28/FEB/2006 STATION bar\_ht Changed to 36.344  
28/FEB/2006 STATION bar\_ht\_deriv Changed to SURVEY  
01/JAN/1959 STATION bar\_ht\_deriv Changed to SURVEY  
05/MAR/2019 STATION bar\_ht\_deriv Changed to SURVEY  
01/JAN/1959 STATION latitude Changed to -21.1172Seeded from NonDb  
01/JAN/1959 STATION latlon\_deriv Changed to GPS  
01/JAN/1959 STATION longitude Changed to 149.2169Seeded from NonDb  
16/OCT/1998 STATION lu\_0\_100m Changed to Forest  
16/OCT/1998 STATION lu\_100m\_1km Changed to City area, buildings > 10 metres (3 storey)  
16/OCT/1998 STATION lu\_1km\_10km Changed to City area, buildings < 10 metres (3 storey)  
31/OCT/2004 STATION lu\_1km\_10km Changed to City area, buildings > 10 metres (3 storey)  
01/JAN/1959 STATION name Changed to MACKAY M.O  
16/OCT/1998 STATION soil\_type Changed to black soil  
01/JAN/1959 STATION stn\_ht Changed to 30.264  
01/JAN/1959 STATION stn\_ht\_deriv Changed to SURVEY  
16/OCT/1998 STATION surface\_type Changed to fully covered by grass

#### System Changes

01/JAN/1999 SYSTEM Flood Warning Commenced

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## Extended Climatological Station Metadata

All History

<b>Station:</b>	MACKAY M.O		<b>Location:</b>	MACKAY M.O		<b>State:</b>	QLD	
<b>Bureau No.:</b>	033119	<b>WMO No.:</b>	94367	<b>Aviation ID:</b>	MKY	<b>Opened:</b>	01 Jan 1959	
<b>Latitude:</b>	-21.1172	<b>Longitude:</b>	149.2169	<b>Elevation:</b>	30.264 m	<b>Barometer Elev:</b>	30.3 m	
							<b>Current Status:</b>	Still open
							<b>Metadata compiled:</b>	27 JUL 2022

### Station Equipment History (continued)

#### System Changes(Continued)

01/SEP/1959 SYSTEM Infrastructure Commenced  
 23/JUN/2020 SYSTEM Rainfall Intensity Ceased  
 01/SEP/1959 SYSTEM Rainfall Intensity Commenced  
 29/APR/2020 SYSTEM Reference Standards Ceased  
 24/FEB/2012 SYSTEM Reference Standards Commenced  
 25/SEP/1959 SYSTEM Surface Observations Commenced  
 01/SEP/1959 SYSTEM Upper Air Commenced  
 01/SEP/1959 SYSTEM WeatherWatch Commenced

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## Notes on these metadata

The following notes have been compiled to assist with interpreting the metadata provided in this document. These notes are subject to change as the network evolves. Changes in station-specific metadata occur more frequently, both as recent changes are recorded and historical information is transferred from paper file to electronic database.

### Reliability of the metadata

The Commonwealth Bureau of Meteorology maintains information on more than 20,000 stations which have operated since observations began in the mid 1800s. The amount of information available for each of these sites and its associated uncertainty are influenced by a number of factors including the type and purpose of the station and the time over which it operated.

Early information about stations was held only on paper file. In 1998 a corporate electronic database was established to help maintain information about the network and its components. The number of parameters recorded about a station is now much greater than before this database was established. The national database has also helped improve consistency in the metadata through the implementation of predefined fields. As a result, and through the refinement of operating procedures, station metadata recorded since 1998 are of a higher overall standard than previously, although occasional omissions and errors are still possible.

The Bureau is part way through a task of entering historical information held on paper file into the corporate database. **Until this process is completed there will remain large gaps in the information contained in these metadata documents and considerable caution should be used when deriving conclusions from the metadata.** As an example, two consecutive entries about a rain gauge dated 50 years apart may appear in the equipment metadata. This may either mean that nothing happened to that instrument over the 50 years, or that information for the intervening period has yet to be entered into the database. Similarly, if no information was available about instruments at a site when it was first established, fields which were required to have a value present may have used the earliest information available as a best-guess estimate. Sometimes this was the metadata current when the database was established in 1998. In some instances there may be gaps in metadata relevant to the post 1998 period.

For the above reasons it is recommended that all metadata prior to 1998 be considered as indicative only, and used with caution, unless it has been quality controlled. The Bureau of Meteorology should be contacted if further information or confirmation of the data is required. Depending on the nature of the inquiry there may be a fee associated with this request. Contact details are provided in the telephone book for each capital city or the Bureau's web site at:  
<http://www.bom.gov.au>

The following pages contain explanatory notes for selected terms found in this document.

### Station Number

The Bureau of Meteorology station number uniquely specifies a station and is not intended to change over time, although on very rare occasions a station number may change or be deleted from the record (usually to correct an error). Generally a new station number is established if an existing station changes in a way that would affect the climate data record for that site (measured in terms of air temperature and precipitation). Significant station moves are an example of this.

Some stations also possess a World Meteorological Organization (WMO) station number. The WMO number is different to the Bureau of Meteorology number. It also uniquely specifies a station at any given time but can be reassigned to another station if the new station takes priority in the global reporting network. Only selected stations will have a WMO number. Significant stations may maintain their WMO number for many decades.

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## Notes on these metadata

### Network Classification

<b>SUPPORTING the BASIC CLIMATE SERVICE</b>
Global Climate Observing System (GCOS)
GCOS Upper Air Network (GUAN)
GCOS Surface Network (GSN)
National Climate Network {not yet assigned}
Reference Climate Stations (RCS)
Regional Basic Climatological Network (RBCN)
CLIMAT Stations (CLC)
CLIMAT TEMP Stations (CLT)
<b>SUPPORTING the NATIONAL WEATHER WATCH SYSTEM</b>
WMO Global Observing System (GOS)
GOS Upper Air Network
GOS Satellite Network
Global Atmospheric Watch
Background Atmospheric Pollution Monitoring Network (BAPMON)
Basic Ozone Network
Basic Solar and Terrestrial Radiation Network
Regional Basic Synoptic Network (RBSN)
WMO Global Oceanic Observing System (GOOS)
<b>SUPPORTING the BASIC WEATHER SERVICE (BWS)</b>
BWS Land Network
Significant Land Locations
Capital City Mesonets
National Benchmark Network for Agrometeorology (NBNA)
BWS Marine Network
Significant Coastal Locations
Open Ocean Network
BWS Upper Air Network
Major Significant Locations
BWS Remote Sensing Network
Weather Watch Radar Network
Fire Weather Wind Mesonets
High Resolution Satellite
<b>SUPPORTING the BASIC HYDROLOGICAL SERVICE</b>
Regional Flood Warning Network
Water Resources Assessment Network
Global Hydrological Network
Global Terrestrial Observing System (GTOS)
World Hydrological Cycle Observing System (WHYCOS)
National Hydrological Network

Networks of stations are defined for a variety of purposes (as defined in above table).

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## Notes on these metadata

### Network Classification Continued...

Stations may be included in several different networks, which may change over time. The table on the previous page lists current network classifications related to the scientific purpose of the network. Some of these networks - the GCOS network for instance - are components of a global network. Entries in the database for some networks may not be complete, thus not properly representing the status of the network. The composition of the network will usually change over time. While several of the networks have international significance, other network classifications have been developed to aid operational management.

### Station Purpose

The station purpose can be classified according to the observation program listed below. Parameters in brackets list some of the various different configurations which occur.

- Synoptic [Seasonal, River Height, Climatological, Telegraphic Rain, Aeronautical, Upper Air]
- Climatological [Seasonal, Telegraphic Rain]
- Aeronautical
- Rainfall [River Height]
- River Height
- Telegraphic Rain [Non-Telegraphic River Height, Telegraphic River Height]
- Non-Telegraphic Rain [Telegraphic River Height]
- Evaporation [Rainfall, River Height, Telegraphic River Height, Non-Telegraphic River Height, Telegraphic Rain, Non-Telegraphic Rain]
- Pluviograph [Rainfall, Telegraphic Rain, Non-Telegraphic Rain, River Height, Telegraphic River Height, Non-Telegraphic River Height]
- Radiation
- Lightning Flash Counter
- Public Information
- Local Conditions
- Radar Site
- Unclassified
- No Routine Observations

Note: Telegraphic observations are those which are sent by some electronic means be it a phone or telegram to the responsible Bureau office. It is a term which is historically linked to analogue non automatic data transmission.

### Station Observation Program Summary

#### Surface Observations

The following terms are used to describe the frequency of surface observations at a site. Historical observation programs will typically be missing for many sites until the database is backfilled with information.

Set a)

- Continuous Program
  - More than half hourly observations sent (eg an automatic weather station {AWS} which continuously transmits 10 minute observations). This will automatically include half hourly and hourly observations programs.
- Half hourly observations
  - Half hourly observations sent. This will automatically include hourly observations.
- Hourly observations
  - Hourly observations sent only. Stations report on non-synoptic hours (ie. 0100, 0200, 0400, 0500, etc)

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## Notes on these metadata

### Surface observations continued....

#### Set b)

- Performed
  - Observations performed, instruments read and observations recorded
- Reported
  - Observations performed, instruments read and reported real time
- Seasonal
  - The program may only be performed during a defined season (such as Fire Weather observations) or the routine program may increase in reporting frequency and/or parameters. The program dates are currently modified at the start and end of each season for stations performing seasonal observations. Historically this was not always the case.

### Current Station Equipment Summary

Equipment listed in this metadata product is catalogued under one of systems listed below, appropriate to its application. The "Infrastructure" category has been included since it contains information about the mast height of an anemometer (if present).

- Flood Warning
- Infrastructure
- Radiation
- Rainfall Intensity
- Surface Observations
- Upper Air
- Weather Watch {RADAR}

### Station Equipment History

#### Equipment Install/Remove

One of four types of actions can be performed on an instrument in this listing:

**Install** - A new instrument is installed at the site. This can be either a completely new addition (eg the first barometer at the site), or the replacement of an existing instrument with a different type (eg replacing mercury barometer with electronic barometer)

**Remove** - An instrument can be removed either when it is no longer necessary to measure a particular element, or when the element is to be measured by an instrument of a different type ( see under "Install" above)

**Replace** - This occurs when one instrument is replaced with another of the same type (eg Kew pattern mercury barometer replacing another Kew pattern mercury barometer)

**Share** - The same instrument is used for observations under two (or more) systems (eg a rain gauge may be used within both Surface Observations and Rainfall Intensity systems)

**Unshare** - The instrument is no longer shared between systems

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## Notes on these metadata

### Calibration

During a site inspection an instrument will be calibrated as either being within or not within the specified tolerance in accuracy.

Where a quantitative calibration result can be achieved by comparison to a transfer standard (eg barometer comparisons and tipping bucket rain gauge calibrations), the instrument will be recorded as being within or outside the required tolerance. Instruments (such as 203mm rain gauges, screens and evaporation pans) where quantitative calibrations cannot be derived should be regarded as meeting specifications when the instrument is in 'good working order'.

This product provides a summary table of the number of times an instrument was found to be out of calibration

### Station Detail Changes

This set of metadata indicates when some aspect of the general information about a station has changed.

#### - STATION

Metadata which are categorised as pertaining to STATION are items of (textual) information describing a specific attribute of the station. A reference to (nondB seeding) indicates initial information of this field has been sourced from a previous database.

#### Station position

##### - Latitude and longitude

Derivation of station latitude and longitude, defined by the location of the rain gauge when it is present, has changed over time. Current practice is to locate or verify open and operational station latitude and longitude based on Global Positioning System equipment. Methods used to locate a station as described in this product (latlon\_deriv) are as follows: GPS, MAP 1:10000, MAP 1:12500, MAP 1:25000, MAP 1:50000, MAP 1:100000, MAP 1:250000, SURVEY, and Unknown (which is more commonly represented by a null value). The field latlon\_error should be used with caution as the method of determining this value has been interpreted in different ways over time.

##### - Height

Determination of heights for observing sites is by survey where possible. Otherwise height may be determined using a Digital Aneroid Barometer and a known surveyed point, or derived from map contours. The source of height is provided in the corresponding parameter with a suffix of "\_deriv".

Heights which may appear in these metadata are:

- aero\_ht
  - The official elevation of the aerodrome which normally corresponds to the altitude of the highest threshold of the runways at that airport;
- bar\_ht
  - this represents the height of the mercury barometer cistern or the digital aneroid barometer above mean sea level (MSL);
- stn\_ht
  - this normally represents the height of the rain gauge above MSL

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## Notes on these metadata

### - Land Use

To assist the long term understanding of climate change it is important to be able to determine the differences over time which are attributed to variations in the climate. Since land use has an effect on the micro climate around the site, and changes in land use will therefore affect the climate record, it is important that the characteristics of the site are monitored. Soil types are recorded as they affect the land use and also add to the knowledge of the site details.

#### Defined Land use Types.

- Non-vegetated (barren, desert)
- Coastal or Island
- Forest
- Open farmland, grassland or tundra
- Small town, less than 1000 population
- Town 1000 to 10,000 population
- City area with buildings less than 10 metres (3 stories)
- City area with buildings greater than 10 metres (3 stories)
- Airport

The land use code is entered on the station inspection form in the ranges 0 to 100 m, 100 to 1 km and 1km to 10 km; ie:

- lu\_0\_100m: Land Use 0 to 100 metres from the enclosure
- lu\_100m\_1km: Land Use 100 metres to 1 kilometre
- lu\_1km\_10km: Land Use 1 kilometre to 10 kilometres

#### Defined Soil Type (At Enclosure).

- unable to determine
- sand
- black soil
- clay
- rock
- red soil
- other

#### Surface Type (At Enclosure).

- unable to determine
- fully covered by grass
- mostly covered by grass
- partly covered by grass
- bare ground
- sand
- concrete
- asphalt
- rock
- other

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