From: [redacted]
Sent: Wednesday, 14 July 2010 4:35 PM
To: [redacted]
Cc: [redacted]
Subject: RE: It's Annual Report Time AGAIN [SEC=UNCLASSIFIED]

Hi [redacted],

STS verification for Victoria attached.

Cheers,

[redacted]

[redacted]

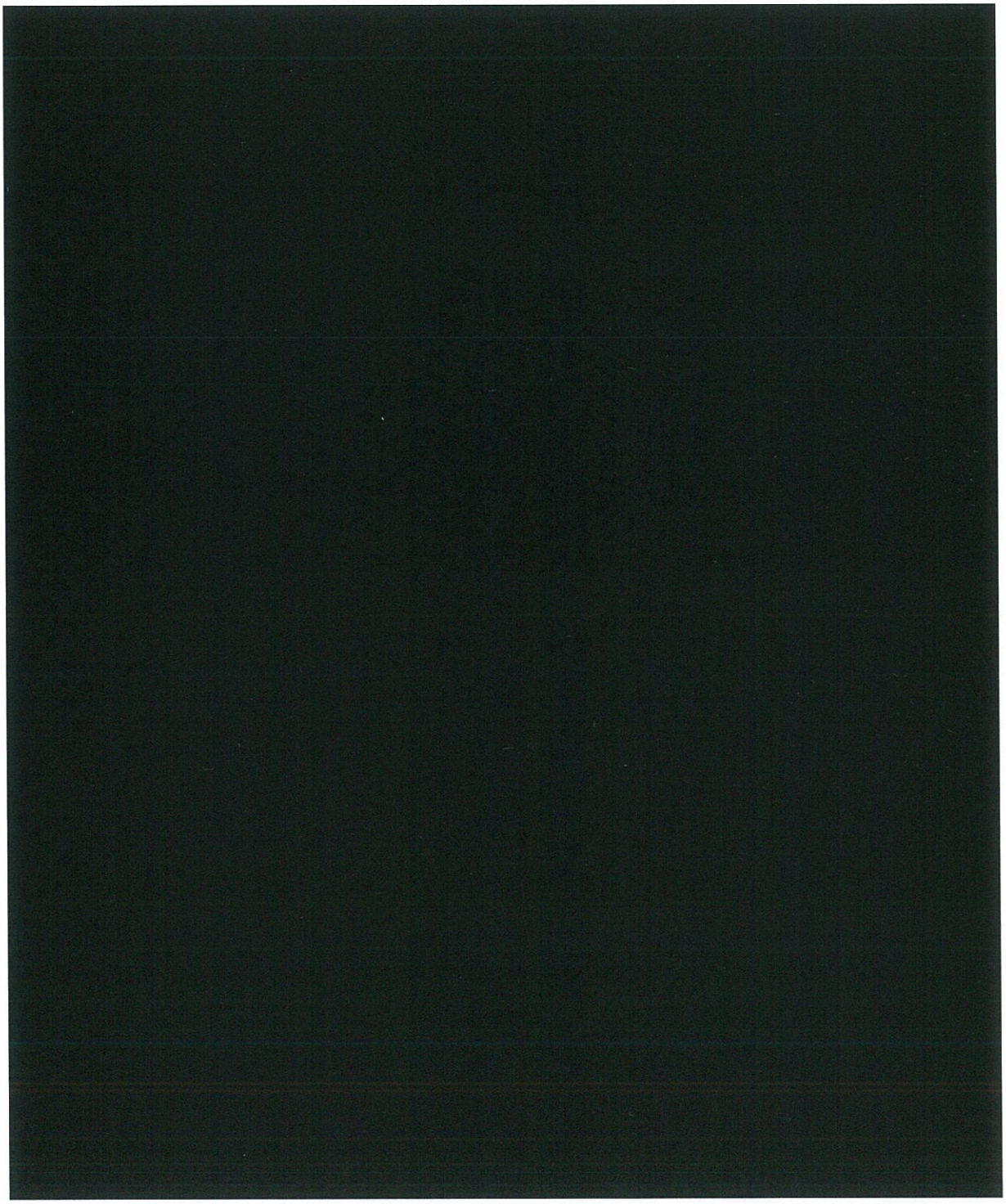
[redacted]

Released under FOI – FOI 30/5645 – Document 1

From: [redacted] [mailto:[redacted]@bom.gov.au]
Sent: Thursday, 1 July 2010 14:21
To: [redacted]
Cc: [redacted]
Subject: It's Annual Report Time AGAIN [SEC=UNCLASSIFIED]

Time for all those annoying **verification statistics!**

[redacted] STS



[redacted]

SEVERE THUNDERSTORMS:

Please fill in attached document as you did last year - noting the guidelines for defining events, hits & misses

15th July Please

Regards

[redacted]

[redacted] National Manager of Tropical Cyclone & Severe Thunderstorm Warning Services [redacted]

Australian Bureau of Meteorology | Weather Services Branch

GPO Box 1289 Melbourne VIC 3001

T [redacted] | M [redacted] | F [redacted]

email: [redacted]@bom.gov.au, [redacted]@bom.gov.au

web: www.bom.gov.au

Released under FOI – FOI 30/5645 – Document 1

Severe Thunderstorm Warning Verification

Required Information Form

Please fill in numbers/text where indicated in blue

REGION	**Victoria**
SEASON (July 1 – June 30)	**2009/10**

FIRST TWO ARE FOR THE WHOLE STATE/TERRITORY

Value: Whole Region Total Events	**50**
Explanation: EVENT: The definition of an event is not obvious in every situation. An extended trough-line may spawn severe thunderstorms along its length, but are these the same event? We cannot easily define what is and what is not a specific event, but do not define every individual STS in a cluster as individual events. **For the purpose of this exercise an event will be what is considered by the forecaster at the time as those storms encompassed by a single warning sequence.**	

Value: Whole Region Total Warnings Issued	**172**
Explanation: all individual warnings – detailed and regional.	

Continued over …

REMAINDER OF STATS ARE FOR "CITY FORECAST"

Explanation of "City Forecast":

	In most Regions there is an area defined for the purposes of the verification of warnings to be included in the Annual Report: As stated here: (in 2010)
NSW	**Sydney & Regions detailed warning area**
Vic	Greater Melbourne detailed warning area
Qld	**SE Queensland detailed warning area**
SA	Adelaide Region detailed warning area
WA	**Perth & Mandurah**
Tas	All Tasmania
NT	**Darwin and adjacent rural area**

Value: Number of HITS for warning area	**7**
Explanation: This is where the first relevant warning in a sequence is issued before the first occurrence of severe phenomena. The sequence of warnings is counted as ONE hit. SEQUENCE of warnings: if a number of warnings are issued sequentially for the same event it is called a single sequence. It should not last more than 24 hours.	

Value: Total number of EVENTS for warning area	**9**
Explanation: see previous page	

Value: Number of FALSE ALARMS for warning area	**10**
Explanation: A sequence of warnings issued for a situation where no severe phenomena occur is counted as ONE false alarm. *Note: if severe weather phenomena occur only outside the range of the area covered by the warning it counts as a false alarm AND a miss*	

Value: Total number of WARNING SEQUENCES issued for warning area	**18**
Explanation: This is the number of sequences of warnings; not total number of warnings issued.	

Value: Lead time for each HIT (in minutes)
LIST: 27, 30, 25, 34, 13, 21, 40
Explanation: For each event, lead time is the time elapsed from the first warning issue (covering the event location) to the first occurrence of severe phenomena.

Now send to [redacted] at [redacted]@bom.gov.au

From: [redacted]
Sent: Friday, 8 July 2011 1:35 PM
To: [redacted]
Subject: RE: Annual Report: Verification Statistics [SEC=UNCLASSIFIED]

Hi Alan,

Here are the stats for Victoria.

Cheers,

[redacted]

From: [redacted]
Sent: Friday, 24 June 2011 11:00
To: [redacted]
Cc: [redacted]
Subject: Annual Report: Verification Statistics [SEC=UNCLASSIFIED]

Good morning,

Yes it is that time of year again, when the annual report must be done, and verification statistics collated. The Annual Report team in head office is more keen than ever to get this published in a timely manner!

SEVERE THUNDERSTORM

[redacted]

Please fill in and submit a copy of the form to me before COB 8 July

[redacted]

[redacted]

[redacted]

Regards

[redacted]

[redacted] National manager, Tropical Cyclone & Severe Weather Services [redacted]

Australian Bureau of Meteorology | Weather Services Branch

GPO Box 1289 Melbourne VIC 3001

T [redacted] | M [redacted] | F [redacted]

email: [redacted]@bom.gov.au, [redacted]@bom.gov.au

web: www.bom.gov.au

Severe Thunderstorm Warning Verification

Required Information Form

Please fill in numbers/text where indicated in blue

REGION	**Victoria**
SEASON (July 1 – June 30)	**2010/2011**

FIRST TWO ARE FOR THE WHOLE STATE/TERRITORY

Value: Whole Region Total Events	**39**
Explanation: EVENT: The definition of an event is not obvious in every situation. An extended trough-line may spawn severe thunderstorms along its length, but are these the same event? We cannot easily define what is and what is not a specific event, but do not define every individual STS in a cluster as individual events. **For the purpose of this exercise an event will be what is considered by the forecaster at the time as those storms encompassed by a single warning sequence.**	

Value: Whole Region Total Warnings Issued	**200**
Explanation: all individual warnings – detailed and regional.	

Continued over …

REMAINDER OF STATS ARE FOR "CITY FORECAST"

Explanation of "City Forecast":

	In most Regions there is an area defined for the purposes of the verification of warnings to be included in the Annual Report: As stated here: (current in 2010)
NSW	**Sydney & Regions detailed warning area**
Vic	Greater Melbourne detailed warning area
Qld	**SE Queensland detailed warning area**
SA	Adelaide Region detailed warning area
WA	**Perth & Mandurah**
Tas	All Tasmania
NT	**Darwin and adjacent rural area**

Value: Number of HITS for warning area	**7**
Explanation: This is where the first relevant warning in a sequence is issued before the first occurrence of severe phenomena. The sequence of warnings is counted as ONE hit. SEQUENCE of warnings: if a number of warnings are issued sequentially for the same event it is called a single sequence. It should not last more than 24 hours.	

Value: Total number of EVENTS for warning area	**10**
Explanation: see previous page	

Value: Number of FALSE ALARMS for warning area	**11**
Explanation: A sequence of warnings issued for a situation where no severe phenomena occur is counted as ONE false alarm. *Note: if severe weather phenomena occur only outside the range of the area covered by the warning it counts as a false alarm AND a miss*	

Value: Total number of WARNING SEQUENCES issued for warning area	**21**
Explanation: This is the number of sequences of warnings; not total number of warnings issued.	

Value: Lead time for each HIT (in minutes)
LIST: 9, 20, 36, 40, 22, 75, 25
Explanation: For each event, lead time is the time elapsed from the first warning issue (covering the event location) to the first occurrence of severe phenomena.

Now send to [redacted] at [redacted]@bom.gov.au

From: [redacted]
Sent: Friday, 20 July 2012 10:38 AM
To: [redacted]
Subject: RE: 2011-12 Severe TS and TC verification data [SEC=UNCLASSIFIED]

Hi [redacted],

Sorry this has taken so long...

See attached doc.

Regards

[redacted]

[redacted] | Severe Weather Manager

Australian Government
Bureau of Meteorology

Victorian Regional Office

Bureau of Meteorology
GPO Box 1289 Melbourne VIC 3001
Level 6, 1010 Latrobe St, Docklands 3008
Tel: [redacted] | [redacted]@bom.gov.au
www.bom.gov.au

From: [redacted]
Sent: Tuesday, 3 July 2012 10:57 AM
To: [redacted]
Subject: 2011-12 Severe TS and [redacted] verification data [SEC=UNCLASSIFIED]

Hi All

HO requires the following verification data for Annual Reporting purposes:

- For Severe TS, [redacted]
- [redacted] Please **fill in and return** 'Reporting Form' (Word doc) ASAP;

Thanks and regards

[redacted]

[redacted] Severe Weather Project & Program Support

Australian Bureau of Meteorology | Weather & Ocean Services Branch

GPO Box 1289 Melbourne VIC 3001

T [redacted] | Fax: [redacted]

[redacted]@bom.gov.au | www.bom.gov.au

Severe Thunderstorm Warning Verification

Required Information Form

Please fill in numbers/text where indicated in blue

REGION	Victoria
SEASON (July 1 – June 30)	July 1 2011- June 30 2012

FIRST TWO ARE FOR THE WHOLE STATE/TERRITORY

Value: Whole Region Total Events	66
Explanation: EVENT: The definition of an event is not obvious in every situation. An extended trough-line may spawn severe thunderstorms along its length, but are these the same event? We cannot easily define what is and what is not a specific event, but do not define every individual STS in a cluster as individual events. **For the purpose of this exercise an event will be what is considered by the forecaster at the time as those storms encompassed by a single warning sequence.**	

Value: Whole Region Total Warnings Issued	58 sequences
Explanation: all individual warnings – detailed and regional.	

Continued over …

REMAINDER OF STATS ARE FOR "CITY FORECAST"

Explanation of "City Forecast":

	In most Regions there is an area defined for the purposes of the verification of warnings to be included in the Annual Report: As stated here: (current in 2010)
NSW	**Sydney & Regions detailed warning area**
Vic	Greater Melbourne detailed warning area
Qld	**SE Queensland detailed warning area**
SA	Adelaide Region detailed warning area
WA	**Perth & Mandurah**
Tas	All Tasmania
NT	**Darwin and adjacent rural area**

Value: Number of HITS for warning area	**6**
Explanation: This is where the first relevant warning in a sequence is issued before the first occurrence of severe phenomena. The sequence of warnings is counted as ONE hit. SEQUENCE of warnings: if a number of warnings are issued sequentially for the same event it is called a single sequence. It should not last more than 24 hours.	

Value: Total number of EVENTS for warning area	**21**
Explanation: see previous page	

Value: Number of FALSE ALARMS for warning area	**16**
Explanation: A sequence of warnings issued for a situation where no severe phenomena occur is counted as ONE false alarm. *Note: if severe weather phenomena occur only outside the range of the area covered by the warning it counts as a false alarm AND a miss*	

Value: Total number of WARNING SEQUENCES issued for warning area	**22**
Explanation: This is the number of sequences of warnings; not total number of warnings issued.	

Value: Lead time for each HIT (in minutes)
LIST: 48, 150, 120, 45, 90, 60
Explanation: For each event, lead time is the time elapsed from the first warning issue (covering the event location) to the first occurrence of severe phenomena.

Now send to [redacted] at [redacted]@bom.gov.au

Verification

Severe thunderstorm reports are collected from a number of sources. These include surface observations from Bureau of Meteorology observers and automatic weather stations, the Severe Thunderstorm Spotter Network, SES reports, members of the public and newspaper articles. The number of severe thunderstorm reports is heavily biased by population density and hence it is difficult to verify severe thunderstorm warnings and advices in areas that are sparsely populated.

Severe Thunderstorm warnings are verified using two statistics:

- Probability of Detection (POD)
- False Alarm Ratio (FAR)

The POD is the ratio of the number of correctly warned events to the total number of events and is therefore a measure of the correctness of the warnings in time and space. A perfect score would have a POD = 1. The FAR is the ratio of the number of unverified warnings to the total number of warnings issued and is therefore potentially a measure of the degree of over-warning. A perfect score would have a FAR = 0. The performance targets within the Bureau of Meteorology are 0.70 for POD and 0.40 for FAR. The verification statistics for the warnings issued over the past six financial years in Victoria are shown in Table 1 and Table 2.

	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
POD	[redacted]					0.66
FAR						0.89

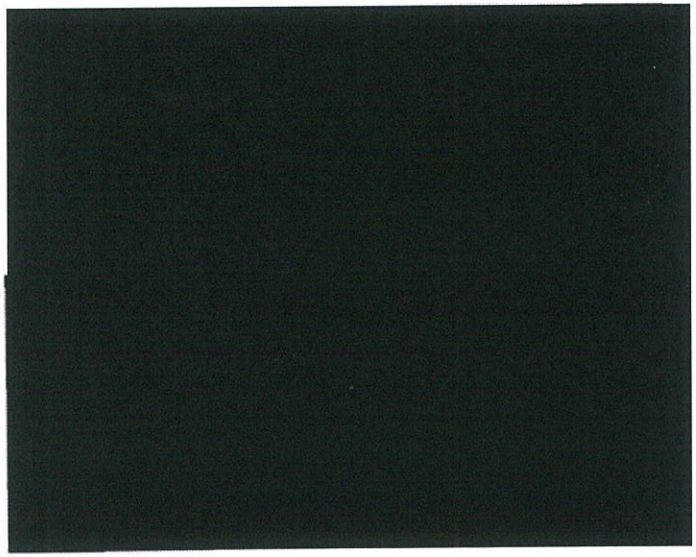
Table 1. *Verification statistics for district based warnings throughout Victoria.*

	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
POD	[redacted]					0.67
FAR						0.56

Table 2. *Verification statistics for warnings covering the Greater Melbourne area.*

The verification statistics for Victoria for the 2009/10 season show a disappointing decrease from the fantastic value that was observed in the previous season. For the first time since the 2001/02 season the probability of detection this year failed to reach our performance target, although not by a long way. The false alarm ratio for the district based warnings remained, disappointingly, at the same high value as the previous 2 years. Due to the verification methodology however, it is likely that this false alarm ratio will remain high into the future because we are reliant on reports of severe weather from storm spotters and others to count a warning as a "hit". The general view of the severe weather section is that it is better to have a good POD and high FAR than a poor POD and a low FAR.

The verification statistics for the Greater Melbourne area for 2009/10 show a slight improvement in the probability of detection compared with the previous year. The value of 0.67 remains below the Bureau's performance target, however with the number of events in the Greater Melbourne area relatively low the value of this statistic can oscillate significantly based on just one or two event misses. The false alarm ratio for the Greater Melbourne area has also worsened slightly compared with the previous year although remains significantly better than previous seasons.



Verification

Severe thunderstorm reports are collected from a number of sources to enable verification of our severe thunderstorm warnings. Sources include surface observations from Bureau of Meteorology observers and automatic weather stations, the Severe Thunderstorm Spotter Network, SES reports, members of the public and newspaper articles. The number of severe thunderstorm reports is heavily biased by population density and hence it is difficult to verify severe thunderstorm warnings and advices in areas that are sparsely populated.

Severe Thunderstorm warnings are verified using two statistics:

- Probability of Detection (POD)
- False Alarm Ratio (FAR)

The POD is the ratio of the number of correctly warned events to the total number of events and is therefore a measure of the correctness of the warnings in time and space. A perfect score would have a POD = 1. The FAR is the ratio of the number of unverified warnings to the total number of warnings issued and is therefore potentially a measure of the degree of over-warning. A perfect score would have a FAR = 0. The performance targets within the Bureau of Meteorology are 0.70 for POD and 0.40 for

PAR. The verification statistics for the warnings issued over the past six financial years in Victoria are shown in Table 1. Table 2 shows verification statistics for the Greater Melbourne area.

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
POD	[redacted]				0.66	0.73
FAR					0.89	0.81

Table 1. *Verification statistics for district based warnings throughout Victoria.*

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
POD	[redacted]				0.67	0.70
FAR					0.56	0.52

Table 2. *Verification statistics for warnings covering the Greater Melbourne area.*

The verification statistics for Victoria for the 2010/11 season show an improvement in terms of both the probability of detection and the false alarm rate when compared with the previous season. Importantly, following 2009/10's disappointing result, the probability of detection is back above the performance target of 0.70. The false alarm ratio for the district based warnings remains well above the target rate of 0.40, however due to the verification methodology it is likely that this statistic will remain high into the future because we are reliant on reports of severe weather from storm spotters and others to count a warning as a "hit". The general view of staff in the severe weather section is that because we get limited reports from sparsely populated areas, it is better to have a good POD and high PAR than a poor POD and a low PAR.

The verification statistics for the Greater Melbourne area for 2010/11 show a slight improvement in the probability of detection compared with the previous year and attains the Bureau's performance target value of 0.7. The false alarm ratio for the Greater Melbourne area is significantly better than for Victoria as a whole, which is to be expected as we are more likely to receive confirmation of severe storms in Melbourne due to greater population density.

6 Verification

The BoM collates reports of severe thunderstorm activity from a variety of sources to enable verification of our severe thunderstorm warnings. Sources include observations from BoM observers, automatic weather stations, volunteer storm spotters, external organisations such as the SES, media reports and feedback from the general public. It must be acknowledged that the verification of severe thunderstorms in the Victorian region (and more widely across Australia) is reliant on all of these sources. Without these, the information about thunderstorm severity or even thunderstorm occurrence would be extremely limited. The number of severe thunderstorm reports is heavily biased by population density and hence it is difficult to verify severe thunderstorm warnings in areas that are sparsely populated.

Severe Thunderstorm warnings are verified using two statistics:

- Probability of Detection (POD)
- False Alarm Ratio (FAR)

The POD is the number of correctly warned events divided by the total number of events and is therefore a measure of the correctness of the warnings in time and space. A perfect score would have a POD = 1. Warnings must be issued prior to receiving an initial report of severe weather to be deemed correct. The performance target within the BoM is for POD > 0.7

The FAR is the ratio of the number of unverified warnings to the total number of warnings issued and is therefore potentially a measure of the degree of 'over-warning'. A perfect score would have a FAR = 0. The BoM performance target is 0.40 for FAR.

The verification statistics for the severe thunderstorm warnings issued over the past 6 financial years across Victoria and in the Greater Melbourne area are shown in Table 1 and Table 2 respectively.

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
POD	[redacted]			0.66	0.73	0.66
FAR				0.89	0.81	0.87

Table 1- Verification statistics for State-based warnings throughout Victoria.

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
POD	[redacted]			0.67	0.70	0.50
FAR				0.56	0.52	0.73

Table 2- Verification statistics for warnings covering the Greater Melbourne area.

The state-wide POD value of 0.66 is just below the BoM performance target of 0.7. The state-wide FAR value of 0.87 is similar to the value in previous years. This value is usually always higher than the BoM performance target value of 0.4, as it is completely reliant upon reports of severe weather from our storm spotters, observers and/or automatic weather stations to count a warning as 'verified' in a district. With very few storm spotters and observers across the State to provide timely, descriptive reports, the values of FAR are likely to remain high well into the future.

In the Greater Melbourne area, there were 22 warning sequences issued during 2011/2012, 6 of which were verified by reports. There were no reports corresponding to the remaining 16 warning sequences, so it is not known if these warnings were warranted or not. Also accounted for in the verification statistics for Greater Melbourne are the 6 reports received when there was no severe thunderstorm warning current. These weighed heavily on the low POD value of 0.5. In the Greater Melbourne area, the FAR value of 0.73 was higher than in previous years, which can be attributed to the lack of verified reports received from the Greater Melbourne area.

[redacted]

Severe Thunderstorm Warning Services

QUALITY Performance Measure	Target	09/10
POD+ for Severe Thunderstorm Warning – Melbourne Area	0.70	0.67
FAR++ for Severe Thunderstorm Warning – Melbourne Area	0.40	0.56
QUANTITY		**09/10**
Severe Thunderstorm Warnings issued for Victoria districts		549

+ POD = Number of correctly forecast events / Total number of events (1 is perfect)
++ FAR = Number of incorrect forecasts / Total number of forecasts (0 is perfect)
Source S:\Victoria\SevereWX\storms\sts_report\Verification_year.xls

[redacted]

[redacted]

From: [redacted]
Sent: Thursday, 15 July 2010 1:50 PM
To: [redacted]
Cc: [redacted]
Subject: RE: It's Annual Report Time AGAIN [SEC=UNCLASSIFIED]

Hello [redacted],

Please find attached a preliminary version of the requested severe thunderstorm verification report.

The total number of severe thunderstorm events (65) is the most rubbery number. I will endeavour to provide a final number for you before next Monday 19/07 (when I go on leave).

many regards

[redacted]

From: [redacted] [mailto:[redacted]@bom.gov.au]
Sent: Thursday, 1 July 2010 13:51
To: [redacted]
Cc: [redacted]
Subject: It's Annual Report Time AGAIN [SEC=UNCLASSIFIED]

Time for all those annoying **verification statistics!**

[redacted] STS

[redacted]

[redacted]

SEVERE THUNDERSTORMS:

Please fill in attached document as you did last year - noting the guidelines for defining events, hits & misses

15th July Please

Regards

[redacted]

[redacted] National Manager of Tropical Cyclone & Severe Thunderstorm Warning Services [redacted]

Australian Bureau of Meteorology | Weather Services Branch

GPO Box 1289 Melbourne VIC 3001

T [redacted] | M [redacted] | F [redacted]

email: [redacted]@bom.gov.au, [redacted]@bom.gov.au

web: www.bom.gov.au

Severe Thunderstorm Warning Verification

Required Information Form

Please fill in numbers/text where indicated in blue

REGION	South Australia
SEASON (July 1 – June 30)	2009-10

FIRST TWO ARE FOR THE WHOLE STATE/TERRITORY

Value: Whole Region Total Events	65***

*** ***PLEASE NOTE … this is a preliminary number only … will update it asap.***

Explanation:

EVENT:

The definition of an event is not obvious in every situation. An extended trough-line may spawn severe thunderstorms along its length, but are these the same event? We cannot easily define what is and what is not a specific event, but do not define every individual STS in a cluster as individual events.

For the purpose of this exercise an event will be what is considered by the forecaster at the time as those storms encompassed by a single warning sequence.

This is somewhat different to what we have been doing previously … and we would prefer to continue applying the same definition … that is we try and identify every severe thunderstorm. If we have two reports and we are unable to establish whether or not they were caused by the same thunderstorm cell, we treat them as two events if they are separated in time by > 30 minutes or are separated in space by > 25 km.

Value: Whole Region Total Warnings Issued	135

Explanation:

all individual warnings – detailed and regional.

Have counted all warnings <u>except</u> cancellation messages
131 Regional and 4 Detailed Warnings

Continued over …

REMAINDER OF STATS ARE FOR "CITY FORECAST"

Explanation of "City Forecast":

	In most Regions there is an area defined for the purposes of the verification of warnings to be included in the Annual Report: As stated here: (in 2010)
NSW	**Sydney & Regions detailed warning area**
Vic	Greater Melbourne detailed warning area
Qld	**SE Queensland detailed warning area**
SA	Adelaide Region detailed warning area
WA	**Perth & Mandurah**
Tas	All Tasmania
NT	**Darwin and adjacent rural area**

Value: Number of HITS for warning area	**4**
Explanation: This is where the first relevant warning in a sequence is issued before the first occurrence of severe phenomena. The sequence of warnings is counted as ONE hit. SEQUENCE of warnings: if a number of warnings are issued sequentially for the same event it is called a single sequence. It should not last more than 24 hours.	

Value: Total number of EVENTS for warning area	**8**
Explanation: see previous page	

Value: Number of FALSE ALARMS for warning area	**6**
Explanation: A sequence of warnings issued for a situation where no severe phenomena occur is counted as ONE false alarm. *Note: if severe weather phenomena occur only outside the range of the area covered by the warning it counts as a false alarm AND a miss*	

Value: Total number of WARNING SEQUENCES issued for warning area	**10**
Explanation: This is the number of sequences of warnings; not total number of warnings issued. ***Total number of warnings issued for A&MLR =***	

Value: Lead time for each HIT (in minutes)
LIST: 260 min, 135 min, 0 min, 0 min
Explanation: For each event, lead time is the time elapsed from the first warning issue (covering the event location) to the first occurrence of severe phenomena.

Now send to [redacted] at [redacted]@bom.gov.au

From: [redacted]
Sent: Tuesday, 5 July 2011 4:38 PM
To: [redacted]
Cc: [redacted]
Subject: RE: Annual Report: Verification Statistics [SEC=UNCLASSIFIED]

Hi [redacted],

Attached are the SA stats.

cheers,

[redacted]

Meteorologist

SA Severe Weather Section

Bureau of Meteorology

Ph: [redacted]

Email: [redacted]@bom.gov.au

From: [redacted]
Sent: Friday, 24 June 2011 10:30
To: [redacted]
Cc: [redacted]
Subject: Annual Report: Verification Statistics [SEC=UNCLASSIFIED]

Good morning,

Yes it is that time of year again, when the annual report must be done, and verification statistics collated. The Annual Report team in head office is more keen than ever to get this published in a timely manner!

SEVERE THUNDERSTORM

[redacted]

Please fill in and submit a copy of the form to me before COB 8 July

TROPICAL CYCLONE

[redacted]

[redacted]

Regards

[redacted]

[redacted] National manager, Tropical Cyclone & Severe Weather Services [redacted]

Australian Bureau of Meteorology | Weather Services Branch

GPO Box 1289 Melbourne VIC 3001

T [redacted] | M [redacted] | F [redacted]

email: [redacted]@bom.gov.au, [redacted]@bom.gov.au

web: www.bom.gov.au

Severe Thunderstorm Warning Verification

Required Information Form

Please fill in numbers/text where indicated in blue

REGION	SA
SEASON (July 1 – June 30)	2010-2011

FIRST TWO ARE FOR THE WHOLE STATE/TERRITORY

Value: Whole Region Total Events	58

Explanation:

EVENT:

The definition of an event is not obvious in every situation. An extended trough-line may spawn severe thunderstorms along its length, but are these the same event? We cannot easily define what is and what is not a specific event, but do not define every individual STS in a cluster as individual events.

For the purpose of this exercise an event will be what is considered by the forecaster at the time as those storms encompassed by a single warning sequence.

We try and identify every severe thunderstorm. If we have two reports and we are unable to establish whether or not they were caused by the same thunderstorm cell, we treat them as two events if they are separated in time by > 30 minutes or are separated in space by > 25 km.

Value: Whole Region Total Warnings Issued	154

Explanation:

all individual warnings – detailed and regional.

Have counted all warnings <u>except</u> cancellation messages
149 Regional (issued on 46 days) and 5 Detailed Warnings (issued on 1 day)

Continued over …

REMAINDER OF STATS ARE FOR "CITY FORECAST"

Explanation of "City Forecast":

	In most Regions there is an area defined for the purposes of the verification of warnings to be included in the Annual Report: As stated here: (current in 2010)
NSW	**Sydney & Regions detailed warning area**
Vic	Greater Melbourne detailed warning area
Qld	**SE Queensland detailed warning area**
SA	Adelaide Region detailed warning area
WA	**Perth & Mandurah**
Tas	All Tasmania
NT	**Darwin and adjacent rural area**

Value: Number of HITS for warning area	**7**
Explanation: This is where the first relevant warning in a sequence is issued before the first occurrence of severe phenomena. The sequence of warnings is counted as ONE hit. SEQUENCE of warnings: if a number of warnings are issued sequentially for the same event it is called a single sequence. It should not last more than 24 hours.	

Value: Total number of EVENTS for warning area	**9**
Explanation: see previous page	

Value: Number of FALSE ALARMS for warning area	**1**
Explanation: A sequence of warnings issued for a situation where no severe phenomena occur is counted as ONE false alarm. *Note: if severe weather phenomena occur only outside the range of the area covered by the warning it counts as a false alarm AND a miss*	

Value: Total number of WARNING SEQUENCES issued for warning area	**8**
Explanation: This is the number of sequences of warnings; not total number of warnings issued. ***Total number of warnings issued for A&MLR = 19 regional + 5 detailed***	

Value: Lead time for each HIT (in minutes)
LIST: 120, 60, 60, 60, 0, 0, 180
Explanation: For each event, lead time is the time elapsed from the first warning issue (covering the event location) to the first occurrence of severe phenomena.

Now send to [redacted] at [redacted]@bom.gov.au

Released under FOI – FOI 30/5645 – Document 14

From: [redacted]
Sent: Monday, 2 July 2012 5:32 PM
To: [redacted]
Subject: RE: 2011-12 Annual Report submission [SEC=UNCLASSIFIED]

Hi [redacted],

Attached are the stats for SA.

Based on these, the POD for the Adelaide and Mount Lofty Ranges district is 71% and the FAR is 71%

Cheers,

[redacted]

Meteorologist

SA Severe Weather Section

Bureau of Meteorology

Ph: [redacted]

Email: [redacted]@bom.gov.au

From: [redacted]
Sent: Thursday, 7 June 2012 10:13
To: [redacted]
Subject: RE: 2011-12 Annual Report submission [SEC=UNCLASSIFIED]

Hi All

Can I please also have total numbers, POD and FAR stats for STS Warnings, and [redacted]

HO want them yesterday, but please just do what you can - preferably by early next week.

Cheers

[redacted]

[redacted]

a/National Manager Tropical Cyclone & Severe Weather Services [redacted]

Australian Bureau of Meteorology | Weather & Ocean Services Branch

GPO Box 1289 Melbourne VIC 3001

T [redacted] | Fax: [redacted]

[redacted]@bom.gov.au | [redacted]@bom.gov.au | www.bom.gov.au

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[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

T [redacted] | Fax: [redacted]

[redacted]@bom.gov.au | [redacted]@bom.gov.au | www.bom.gov.au

Severe Thunderstorm Warning Verification

Required Information Form

Please fill in numbers/text where indicated in blue

REGION	SA
SEASON (July 1 – June 30)	2011-2012

FIRST TWO ARE FOR THE WHOLE STATE/TERRITORY

Value: Whole Region Total Events	25

Explanation:

EVENT:

The definition of an event is not obvious in every situation. An extended trough-line may spawn severe thunderstorms along its length, but are these the same event? We cannot easily define what is and what is not a specific event, but do not define every individual STS in a cluster as individual events.

For the purpose of this exercise an event will be what is considered by the forecaster at the time as those storms encompassed by a single warning sequence.

Value: Whole Region Total Warnings Issued	102

Explanation:

all individual warnings – detailed and regional.

Have counted all warnings except cancellation messages

96 Regional and 6 Detailed Warnings

Continued over …

REMAINDER OF STATS ARE FOR "CITY FORECAST"

Explanation of "City Forecast":

	In most Regions there is an area defined for the purposes of the verification of warnings to be included in the Annual Report: As stated here: (current in 2010)
NSW	**Sydney & Regions detailed warning area**
Vic	Greater Melbourne detailed warning area
Qld	**SE Queensland detailed warning area**
SA	Adelaide Region detailed warning area
WA	**Perth & Mandurah**
Tas	All Tasmania
NT	**Darwin and adjacent rural area**

Value: Number of HITS for warning area	**2**
Explanation: This is where the first relevant warning in a sequence is issued before the first occurrence of severe phenomena. The sequence of warnings is counted as ONE hit. SEQUENCE of warnings: if a number of warnings are issued sequentially for the same event it is called a single sequence. It should not last more than 24 hours.	

Value: Total number of EVENTS for warning area	**5**
Explanation: see previous page	

Value: Number of FALSE ALARMS for warning area	**5**
Explanation: A sequence of warnings issued for a situation where no severe phenomena occur is counted as ONE false alarm. *Note: if severe weather phenomena occur only outside the range of the area covered by the warning it counts as a false alarm AND a miss*	

Value: Total number of WARNING SEQUENCES issued for warning area	**8**
Explanation: This is the number of sequences of warnings; not total number of warnings issued.	

Value: Lead time for each HIT (in minutes)
LIST: 30, 30
Explanation: For each event, lead time is the time elapsed from the first warning issue (covering the event location) to the first occurrence of severe phenomena.

Now send to [redacted] at [redacted]@bom.gov.au

Warning Performance

For the Adelaide and Mount Lofty Ranges district, severe weather occurred on twelve days. There were five severe thunderstorm events, convective severe winds occurred on two days and non-convective severe winds on six days. There were no abnormally high sea level events.

For the Adelaide and Mount Lofty Ranges district, the following performance measures were achieved;
For Severe Thunderstorm Warnings POD = 75% FAR = 63%

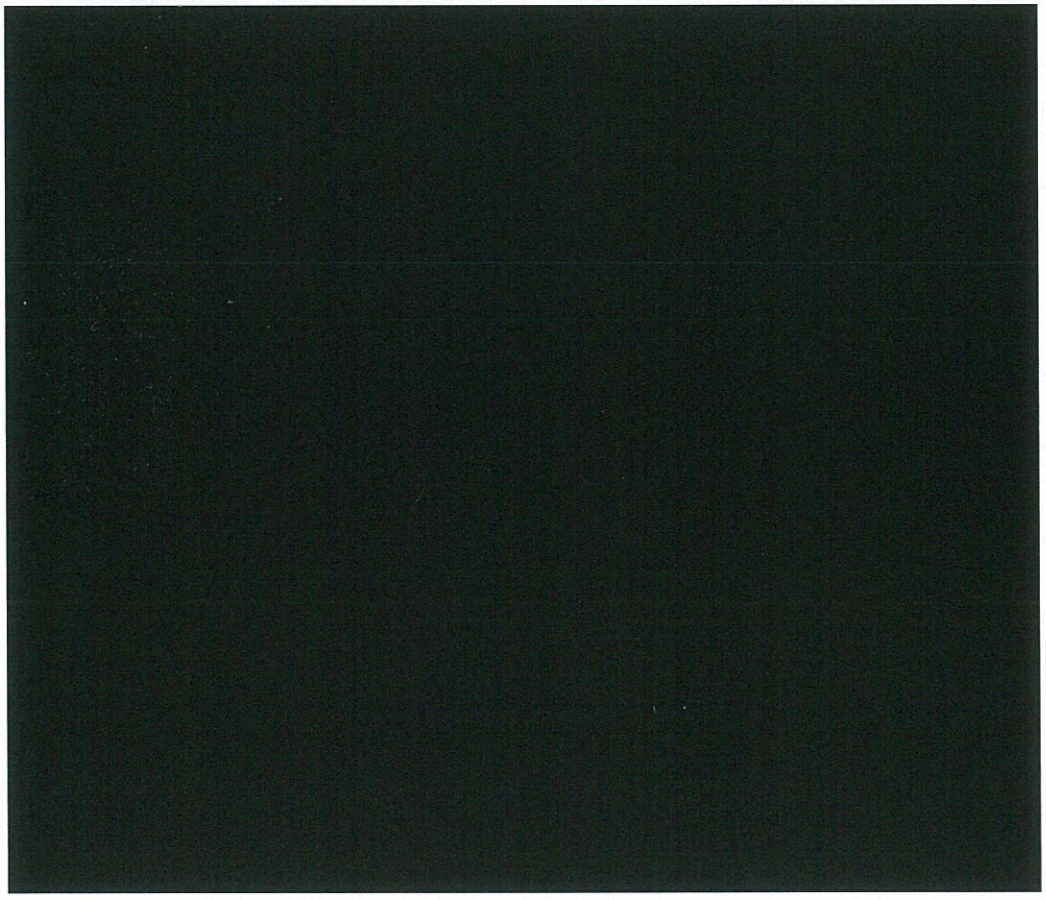
[redacted]

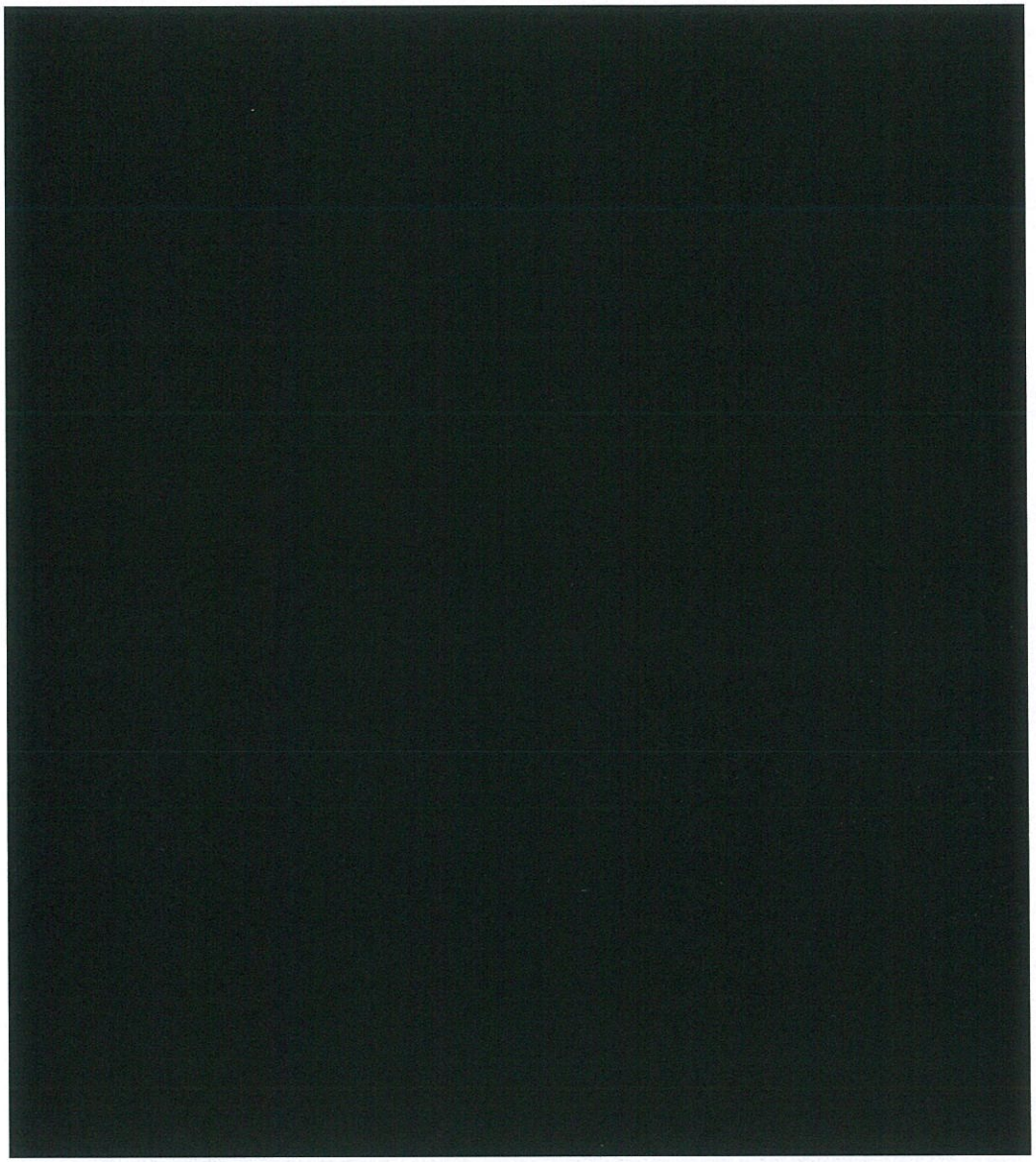
For South Australia, 277 warnings of severe weather or severe thunderstorms were issued (133 severe thunderstorm warnings were issued on 34 days and 144 severe weather warnings for 29 days). Four detailed Adelaide Region Severe Thunderstorm warnings were issued, one on 27 November 2009 and three on 10 February 2010.

On a district basis across the whole of South Australia, the following performance measures were achieved;
For Severe Thunderstorm Warnings POD = 79% FAR = 66%

[redacted]

The slightly higher state-wide FAR reflects the difficulty in detecting the occurrence of localised severe weather phenomena outside metropolitan Adelaide.





Warning Performance

For the Adelaide and Mount Lofty Ranges district, severe weather occurred on eighteen days. There were nine severe thunderstorm events, convective severe winds occurred on one day, convective heavy rain occurred on one day, non-convective severe winds on six days and non convective heavy rain on one day. There was one abnormally high sea level event above "advice" threshold but below "warning" threshold at Outer Harbor.

For the Adelaide and Mount Lofty Ranges district, the following performance measures were achieved;
For Severe Thunderstorm Warnings POD = 78% FAR = 13%

[redacted]

For South Australia, 280 warnings of severe weather or severe thunderstorms were issued (149 severe thunderstorm warnings were issued on 46 days and 131 severe weather warnings for 19 days). Five detailed Adelaide Region Severe Thunderstorm warnings were issued, all on the 7 December 2010.

On a district basis across the whole of South Australia, the following performance measures were achieved;
For Severe Thunderstorm Warnings POD = 79% FAR = 78%

[redacted]

The higher state-wide FAR reflects the difficulty in detecting the occurrence of localised severe weather phenomena outside metropolitan Adelaide, due mainly to the lower density in surface observations.

[redacted]

From: [redacted]
Sent: Wednesday, 4 August 2010 3:43 PM
To: [redacted]
Subject: FW:STS verification [SEC=UNCLASSIFIED]

[redacted],

Sorry [redacted]
Here it is.

Regards

[redacted]

[redacted] *Regional Manager Severe Weather Services*

Australian Bureau of Meteorology, Perth, Western Australia

PO Box 1370

West Perth WA 6872

Ph [redacted] | *Fax* [redacted]

[redacted]@bom.gov.au http://www.bom.gov.au/

[redacted]

[redacted]

[redacted]

Severe Thunderstorm Warning Verification

Required Information Form

Please fill in numbers/text where indicated in blue

REGION	WA
SEASON (July 1 – June 30)	2009/10

FIRST TWO ARE FOR THE WHOLE STATE/TERRITORY

Value: Whole Region Total Events	11
Explanation: EVENT: The definition of an event is not obvious in every situation. An extended trough-line may spawn severe thunderstorms along its length, but are these the same event? We cannot easily define what is and what is not a specific event, but do not define every individual STS in a cluster as individual events. **For the purpose of this exercise an event will be what is considered by the forecaster at the time as those storms encompassed by a single warning sequence.**	

Value: Whole Region Total Warnings Issued	110
Explanation: all individual warnings – detailed and regional.	

Continued over …

REMAINDER OF STATS ARE FOR "CITY FORECAST"

Explanation of "City Forecast":

	In most Regions there is an area defined for the purposes of the verification of warnings to be included in the Annual Report: As stated here: (in 2010)
NSW	**Sydney & Regions detailed warning area**
Vic	Greater Melbourne detailed warning area
Qld	**SE Queensland detailed warning area**
SA	Adelaide Region detailed warning area
WA	**Perth & Mandurah**
Tas	All Tasmania
NT	**Darwin and adjacent rural area**

Value: Number of HITS for warning area	**1**
Explanation: This is where the first relevant warning in a sequence is issued before the first occurrence of severe phenomena. The sequence of warnings is counted as ONE hit. SEQUENCE of warnings: if a number of warnings are issued sequentially for the same event it is called a single sequence. It should not last more than 24 hours.	

Value: Total number of EVENTS for warning area	**1**
Explanation: see previous page	

Value: Number of FALSE ALARMS for warning area	**0**
Explanation: A sequence of warnings issued for a situation where no severe phenomena occur is counted as ONE false alarm. *Note: if severe weather phenomena occur only outside the range of the area covered by the warning it counts as a false alarm AND a miss*	

Value: Total number of WARNING SEQUENCES issued for warning area	**1**
Explanation: This is the number of sequences of warnings; not total number of warnings issued.	

Value: Lead time for each HIT (in minutes)
LIST: 60 minutes
Explanation: For each event, lead time is the time elapsed from the first warning issue (covering the event location) to the first occurrence of severe phenomena.

Now send to [redacted] at [redacted]@bom.gov.au

From: [redacted]
Sent: Wednesday, 10 August 2011 12:07 PM
To: [redacted]
Cc: [redacted]
Subject: Thunderstorm verification for Perth Metro [SEC=UNCLASSIFIED]

Hi [redacted],

Please find attached the severe thunderstorm stats for Perth Metro region for the 2010/11 FY.

Regards,

[redacted]

Severe Weather, Perth

Date	Issue Time (WST)	Severe TS in Perth Metro	Time of event (WST)	
29/01/2011	12:00	N		
16/02/2011	17:45	N		
28/02/2011	15:30	Y	14:00 (estimated)	Missed event

2009:10 STS Verification Statistics

Whole Region	[redacted]				
Events	50	[redacted]	65	11	[redacted]
Warn/Adv	172		135	110	
CAPITAL	**VIC**		**SA**	**WA**	
HITS	7		4	1	
MISSES	2		4	0	
F.ALARMS	10		6	0	
Warnings	18		10	1	
Events	9		8	1	
Mean Lead Time	21.1		49.4	60.0	minutes
COUNT	7		4	1	
POD	78%		50%	100%	
FAR	59%		60%	0%	
Lead times (min)	27		260	60	
(max 5 hours)	30		135		
	25		0		
	34		0		
	13				
	21				
	40				

2010:11 STS Verification Statistics

Whole Region	[redacted]				
Events	39		58	29	
Warn/Adv	200		154	86	
CAPITAL	**VIC**		**SA**	**WA**	
HITS	7		7	0	
MISSES	3		2	1	
F.ALARMS	11		1	2	
Warnings	21		8	3	
Events	10		9	1	
Mean Lead Time	22.7		53.3	0.0	minutes
COUNT	7		7	0	
POD	70%		78%	0%	
FAR	61%		13%	100%	
Lead times (min)	9		120		
(max 5 hours)	20		60		
	36		60		
	40		60		
	22		0		
	75		0		
	25		180		

2011:12 STS Verification Statistics

Note: still awaiting [redacted] WA data

Whole Region	[redacted]		[redacted]		[redacted]	
Events		66		25		
Warn/Adv		58		102		
CAPITAL		**VIC**		**SA**	**WA**	
HITS		6		2		
MISSES		15		3	0	
F.ALARMS		16		5		
Warnings		22		8		
Events		21		5		
Mean Lead Time		0.0		0.0	######	minutes
COUNT		0		0	0	
POD		29%		40%	######	
FAR		73%		71%	######	
Lead times (min)						
(max 5 hours)						

Released under FOI – FOI 30/5645 – Document 25