PACIFIC REGION TECHNICAL NOTES

85-003

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# THE PACIFIC WEATHER CENTRE'S FORECAST PRODUCTION ACCOUNTING SYSTEM

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## INTRODUCTION

The Pacific Weather Centre's Forecast Production Accounting System was developed in order to monitor and measure the forecast output of the Pacific Weather Centre (PWC). The basic concept is to account for quantity as well as the quality of the production output. Conceptually, the determination of forecast accuracy (commonly known as verification) is provided as a subset of quality monitoring.

This technical note presents an overview of the accounting system in its current state. This system culminates each month in an internal monthly publication for the exclusive use of the PWC. The monthly publication provides an executive summary, forecast production statistics, aviation forecast summaries, marine forecast verification, public forecast verification, satellite accounting and PWC activity report.

## THE SYSTEM

The Accounting system is partially automated using the PWC operational Hewlett Packard (HP) minicomputers. The basic design allows for the input of two streams of data. These are the observational weather data and the PWC weather products. This information is decoded and stored into an HP Image 1000 database. The two streams of data are continuously compared in real-time and for certain products such as aviation forecasts, an alert is issued to the forecasters when an amendment is necessary. The response time of forecasters to respond is monitored. There are other computer programs which provide the computation of statistics and allow for human intervention into the data base. It should be noted that this system is not totally automated and requires daily human monitoring for the many ways in which computer processed information becomes "bad". Also almost continuous maintenance is required to update the system for the seasonal changes in forecasts, the addition/deletion of new/old observation stations, and the changes in format, frequency, time and number of forecasts/observations. Without this human commitment the system would soon decay and become obsolete. Summary statistics, subjective analyses and interpretations are made available for the internal use of PWC managers, supervisors and staff.

## THE REPORT

A monthly report for PWC internal use is made from this system. The basic components of the report are an executive summary, forecast production statistics, aviation forecast summary, marine forecast verification, public verification, satellite accounting and a PWC activity report.

### The Executive Summary

The executive summary provides a highlight of significant results. Special attention is paid to exceptional achievement and also to poor performances where constructive praise or criticism will benefit future results.

### Forecast Production Statistics

This account contains a measure of the number of PWC products, (including regular, amendments and corrected issues), produced for distribution via the weather teletype network. Also included is the total quantity of lines of output and/or the number of characters in each product over a specific period of time. An example is provided in Appendix I.

### Aviation Forecast Summaries

The PWC accounting system reports on the forecaster's response time to conditions requiring an amendment. The system also reports on the number of amendments, corrections and regular FT issued for each of the 20 airports. The output of the FT phase of the accounting system is both tabular and graphical, with the accumulated percentage of FT amendments on the ordinate and the time in minutes (log scale) on the abscissa. (see Appendix II for example).

### Marine Forecast Verification

The PWC marine warning forecasts are verified according to maximum sustained and gust wind categories. The three categories are, less than gale (0-34 knots), gale (35-47 knots), and storm force (greater than 47 knots). Also, by using this approach, it would not be necessary to decode the marine forecast proper, but just the warning flag which follows the list of the forecast regions in the marine forecast. Warnings are verified against all available lightstation reports. An example of the contingency table verification is shown in Appendix III.

### Public Forecast Verification

Monthly point temperature verification scores for 17 B.C. locations as well as daily 5:00 a.m. forecast scores for Vancouver are computed. (see Appendix IV for partial examples).

Satellite Accounting

The PWC WIPS (Weather Image Processing System) transmits satellite images over three photo-facsimile lines. This satellite accounting presents a measure of the reliability of the WIPS. (see example in Appendix V).

PWC Activity Report

This report provides a brief summary of a) program and operational changes, b) changes in personnel, c) a brief discussion of major weather events, d) a list of meetings, tours and visits, e) courses, seminars, workshops and conferences, f) reports and publications from PWC, and g) a brief description of significant project activities.

## SUMMARY

A forecast production accounting system is now operational at the Pacific Weather Centre. This system is automated to the extent practical however a minimum of 5 person days is needed to maintain the system as it exists. Every month, a limited and selected amount of statistics on the quantity and quality of the PWC forecast production are produced for internal use.

## REFERENCES

Feuersinger, P. Report on Marine Verification Scheme. PWC ODIT Internal Report 84-034.

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Lofstrom, D. Report on a Preliminary Evaluation of the timeliness of FT Amendments. PWC ODIT Internal Report 83-040.

Lofstrom, D. Report on the FT Quality control and Verification Program. PWC ODIT Internal Report 84-035.

Louie, S. Report on the PWC Marine, Aviation and Public Verification System. PWC ODIT Internal Report 85-037.

PWC Forecast Quality Control Manual - 1985 (Reference Manual).

Roch, M. Report on Marine Verification Specifications. PWC ODIT Internal Report 83-022.

Roch, M., Blanchet P. Representative Lighthouse Reports for Marine Coastal Regions. Pacific Region Technical Note 82-023.

# APPENDIX I

## FORECAST PRODUCTION STATISTICS

PACIFIC WEATHER CENTRE

FORECAST PRODUCTION ACCOUNTING

(QUANTITY STATISTICS)

FOR

OCTOBER 1985

| | NUMBER ISSUED | | | | NUMBER OF LINES | |
|---|---|---|---|---|---|---|
| | REG | AMD | COR | TOTAL | REG | TOTAL |
| MARINE | | | | | | |
| FPCN20 | 114 | 42 | 13 | 169 | 11494 | 13525 |
| | | | | 169 | 11494 | 13525 |
| PUBLIC | | | | | | |
| FPCN11 | 111 | 15 | 9 | 135 | 9527 | 10305 |
| FPCN13 | 110 | 14 | 6 | 130 | 7162 | 7770 |
| FPCN52 | 29 | 1 | 0 | 30 | 891 | 924 |
| WBCN1 | 30 | 3 | 0 | 33 | 825 | 915 |
| | | | | 328 | 18405 | 19914 |
| AVIATION | | | | | | |
| FACN1 | 112 | 9 | 7 | 128 | 4952 | 5256 |
| FACN2 | 103 | 7 | 8 | 118 | 4324 | 4574 |
| FT | 303 | 268 | 28 | 599 | 3656 | 4398 |
| FTCN35 | 106 | 32 | 7 | 145 | 636 | 796 |
| FUCN1 | 100 | 0 | 0 | 100 | 732 | 732 |
| | | | | 1090 | 14300 | 15756 |
| WARNINGS | | | | | | |
| WWMAR | 66 | 2 | 2 | 70 | 956 | 1025 |
| WWPUB | 58 | 1 | 0 | 59 | 991 | 1001 |
| WPCN1 | N/A | N/A | N/A | N/A | N/A | N/A |
| WSCN1 | 203 | 0 | 2 | 205 | 1685 | 1698 |
| | | | | 334 | 3632 | 3724 |
| MOUNTAIN | | | | | | |
| FPCN50 | N/A | N/A | N/A | N/A | N/A | N/A |
| WBCN3 | N/A | N/A | N/A | N/A | N/A | N/A |
| WBCN4 | N/A | N/A | N/A | N/A | N/A | N/A |
| | | | | N/A | N/A | N/A |
| FORESTRY | | | | | | |
| FPCN30 | 36 | 0 | 1 | 37 | 923 | 952 |
| FPCN31 | 21 | 0 | 0 | 21 | 322 | 322 |
| FPCN33 | 7 | 0 | 0 | 7 | 141 | 141 |
| FPCN34 | 13 | 0 | 0 | 13 | 209 | 209 |
| FPCN35 | 20 | 0 | 0 | 20 | 393 | 393 |
| FPCN36 | 18 | 0 | 0 | 18 | 315 | 315 |
| | | | | 116 | 2303 | 2332 |
| BULLETINS | | | | | | |
| CXCN1 | 13 | 0 | 0 | 13 | 236 | 236 |
| CXCN2 | 9 | 0 | 0 | 9 | 155 | 155 |
| FZCN2 | 136 | 0 | 6 | 142 | 4326 | 4533 |
| WBCN2 | 55 | 0 | 0 | 55 | 3576 | 3576 |
| | | | | 219 | 8293 | 8500 |
| MISCELLANEOUS | | | | | | |
| FXCN1 | 107 | 0 | 2 | 109 | 2747 | 2782 |
| FXCN4 | 56 | 0 | 1 | 57 | 1807 | 1821 |
| | | | | 166 | 4554 | 4603 |
| | | | | 166 | 4554 | 4603 |

# APPENDIX II

## AVIATION FORECAST SUMMARIES

TERMINAL FORECAST SUMMARY FOR YYJ
for 1-11 NOVEMBER 1985

| Regular FTs | Amended FTs | Corrected FTs | TOTAL FTs |
|---|---|---|---|
| 38 | 19 | 0 | 57 |

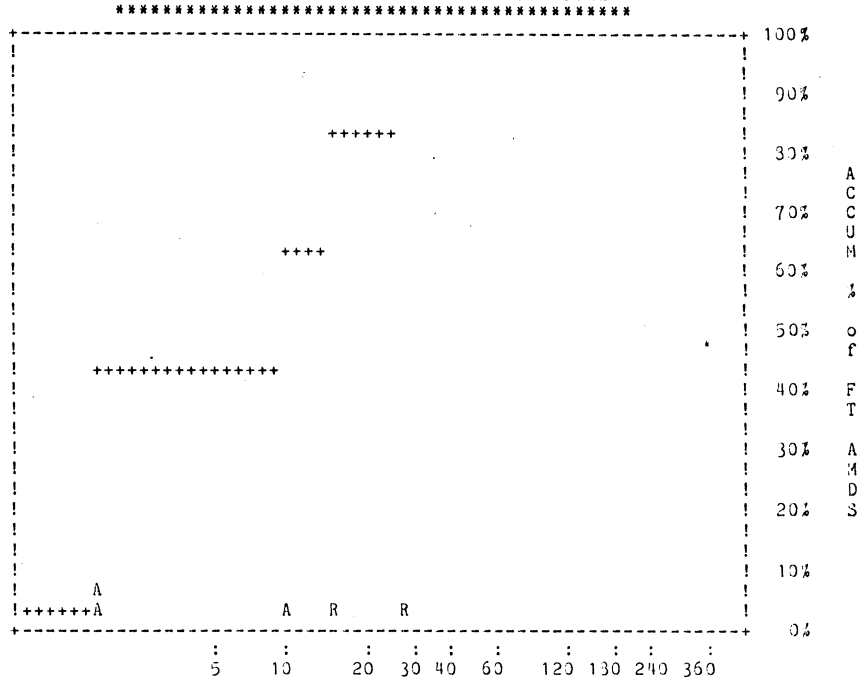
The following statistics are based on

** ALERTS issued 5 PRIMARY ALERTS 5

** ALERTS answered by Regular FTs 2
** ALERTS answered by Amended FTs 3
** ALERTS answered by Corrected FTs 0

** AMENDMENTS issued without ALERT 16

** Percent amendments within
20 minutes after an ALERT 80%



# APPENDIX III

## MARINE FORECAST VERIFICATION

Forecasts for: GEORGIA STRAIT

November 1 to 20, 1985. Time Period: 1 to 4.

FORECAST WINDS vs OBSERVED MEAN SUSTAINED WINDS

| | | FORECAST | | | |
|---|---|---|---|---|---|
| | | 0-34 | 35-47 | >=48 | |
| OBSERVED | 0-34 | 50 | 15 | 0 | 65 |
| | 35-47 | 3 | 11 | 0 | 14 |
| | >=48 | 0 | 0 | 0 | 0 |
| | | 53 | 26 | 0 | 79 |

Number of forecasts= 79 Percent correct= 77.22

FORECAST WINDS vs MAXIMUM OBSERVED GUSTS

| | | FORECAST | | | |
|---|---|---|---|---|---|
| | | 0-34 | 35-47 | >=48 | |
| OBSERVED | 0-34 | 46 | 15 | 0 | 61 |
| | 35-47 | 7 | 11 | 0 | 18 |
| | >=48 | 0 | 0 | 0 | 0 |
| | | 53 | 26 | 0 | 79 |

Number of forecasts= 79 Percent correct= 72.15

# APPENDIX IV
# PUBLIC FORECAST VERIFICATION

## POINT TEMPERATURE VERIFICATION

STATION MAX1, MIN2, MAX2
October 1985

| STATION | TEMP TYPE | BIAS | MEAN ABSOLUTE ERROR | NUMBER OF FORECASTS >3C | >5C | >10C | TOTAL FORECASTS |
|---|---|---|---|---|---|---|---|
| VANCOUVER | MAX1 | .13 | 1.35 | 1 | 0 | 0 | 31 |
| YVR | MIN2 | -.29 | 1.84 | 4 | 1 | 0 | 31 |
| | MAX2 | -.13 | 1.68 | 2 | 0 | 0 | 31 |
| VICTORIA | MAX1 | -.94 | 1.71 | 2 | 1 | 0 | 31 |
| YYJ | MIN2 | -.16 | 2.23 | 7 | 1 | 0 | 31 |
| | MAX2 | -1.23 | 2.06 | 4 | 2 | 0 | 31 |
| ABBOTSFORD | MAX1 | .42 | 1.71 | 4 | 0 | 0 | 31 |
| YXX | MIN2 | -1.00 | 2.16 | 4 | 2 | 0 | 31 |
| | MAX2 | .19 | 1.68 | 4 | 0 | 0 | 31 |
| PORT HARDY | MAX1 | -.16 | 1.52 | 3 | 0 | 0 | 31 |
| YZT | MIN2 | 0.00 | 2.13 | 4 | 2 | 0 | 31 |
| | MAX2 | -.45 | 1.61 | 5 | 0 | 0 | 31 |
| PRINCE RUPERT | MAX1 | -.03 | 1.00 | 0 | 0 | 0 | 31 |
| YPR | MIN2 | -.55 | 1.39 | 2 | 1 | 0 | 31 |
| | MAX2 | -.26 | 1.29 | 1 | 0 | 0 | 31 |

## PUBLIC FORECAST VERIFICATION

Vancouver Statistics
October 1985

| | TODAY | % | TOMORROW | % | TEMP | % | TOTAL % | PROG ANALYST |
|---|---|---|---|---|---|---|---|---|
| 1 | 18/36 | 50 | 18/26 | 69 | 15/15 | 100 | 66 | SS |
| 2 | 28/40 | 70 | 23/24 | 96 | 10/10 | 100 | 82 | SS |
| 3 | 36/36 | 100 | 23/24 | 96 | 15/15 | 100 | 99 | BH |
| 4 | 30/36 | 83 | 16/24 | 67 | 10/10 | 100 | 80 | BH |
| 5 | 28/36 | 78 | 18/24 | 75 | 2/10 | 20 | 69 | HB |
| 6 | 32/36 | 89 | 24/26 | 92 | 7/10 | 70 | 88 | HB |
| 7 | 36/40 | 90 | 18/24 | 75 | 15/15 | 100 | 87 | LC |
| 8 | 36/36 | 100 | 19/24 | 79 | 4/10 | 40 | 84 | PM |
| 9 | 34/36 | 94 | 22/24 | 92 | 15/15 | 100 | 95 | IB |
| 10 | 36/36 | 100 | 16/24 | 67 | 7/10 | 70 | 84 | IB |
| 11 | 28/36 | 78 | 15/24 | 63 | 4/10 | 40 | 67 | IB |
| 12 | 28/36 | 78 | 23/24 | 96 | 10/10 | 100 | 87 | PM |
| 13 | 32/36 | 89 | 16/24 | 67 | 4/10 | 40 | 74 | BH |
| 14 | 22/36 | 61 | 17/26 | 65 | 4/10 | 40 | 60 | BH |
| 15 | 30/48 | 63 | 19/28 | 68 | 10/10 | 100 | 69 | RD |
| 16 | 20/36 | 56 | 22/24 | 92 | 10/10 | 100 | 74 | RD |
| 17 | 32/36 | 89 | 20/24 | 83 | 10/10 | 100 | 89 | IB |
| 18 | 28/36 | 78 | 16/24 | 67 | 10/10 | 100 | 77 | IB |
| 19 | 20/36 | 56 | 21/26 | 81 | 10/10 | 100 | 71 | HB |
| 20 | 40/44 | 91 | 22/28 | 79 | 10/10 | 100 | 88 | HB |
| 21 | 28/40 | 70 | 19/26 | 73 | 10/10 | 100 | 75 | SS |
| 22 | 29/48 | 58 | 16/26 | 62 | 10/10 | 100 | 64 | SS |
| 23 | 22/36 | 61 | 12/24 | 50 | 7/10 | 70 | 59 | BH |
| 24 | 34/40 | 85 | 15/26 | 58 | 10/10 | 100 | 78 | BH |
| 25 | 16/36 | 44 | 21/26 | 81 | 7/10 | 70 | 61 | SS |
| 26 | 36/44 | 82 | 20/24 | 83 | 10/10 | 100 | 85 | HB |
| 27 | 32/36 | 89 | 19/24 | 79 | 10/10 | 100 | 87 | LC |
| 28 | 24/36 | 67 | 14/30 | 47 | 5/10 | 50 | 57 | BH |
| 29 | 20/48 | 42 | 16/28 | 57 | 7/10 | 70 | 50 | IB |
| 30 | 26/40 | 65 | 16/24 | 67 | 10/10 | 100 | 70 | RD |
| 31 | 28/40 | 70 | 25/32 | 78 | 10/10 | 100 | 77 | RD |
| AVERAGE | | 74 | | 74 | | 84 | 76 | |

# APPENDIX V

# SATELLITE ACCOUNTING

## Statistics

For the Month of October/85

| | FAX1 | FAX2 | FAX3 |
|---|---|---|---|
| Transmissons Scheduled | 2976 | 2945 | 2418 |

Totals

| | |
|---|---|
| Transmissons Scheduled | 8339 |
| Transmissons Missed due to WIPS malfunction | 0 |
| Transmissons Completed | 8339 |
| Percent Reliability | 100% |
| No of WIPS Crashes | 0 |
| Total Downtime (hours) | 0 |