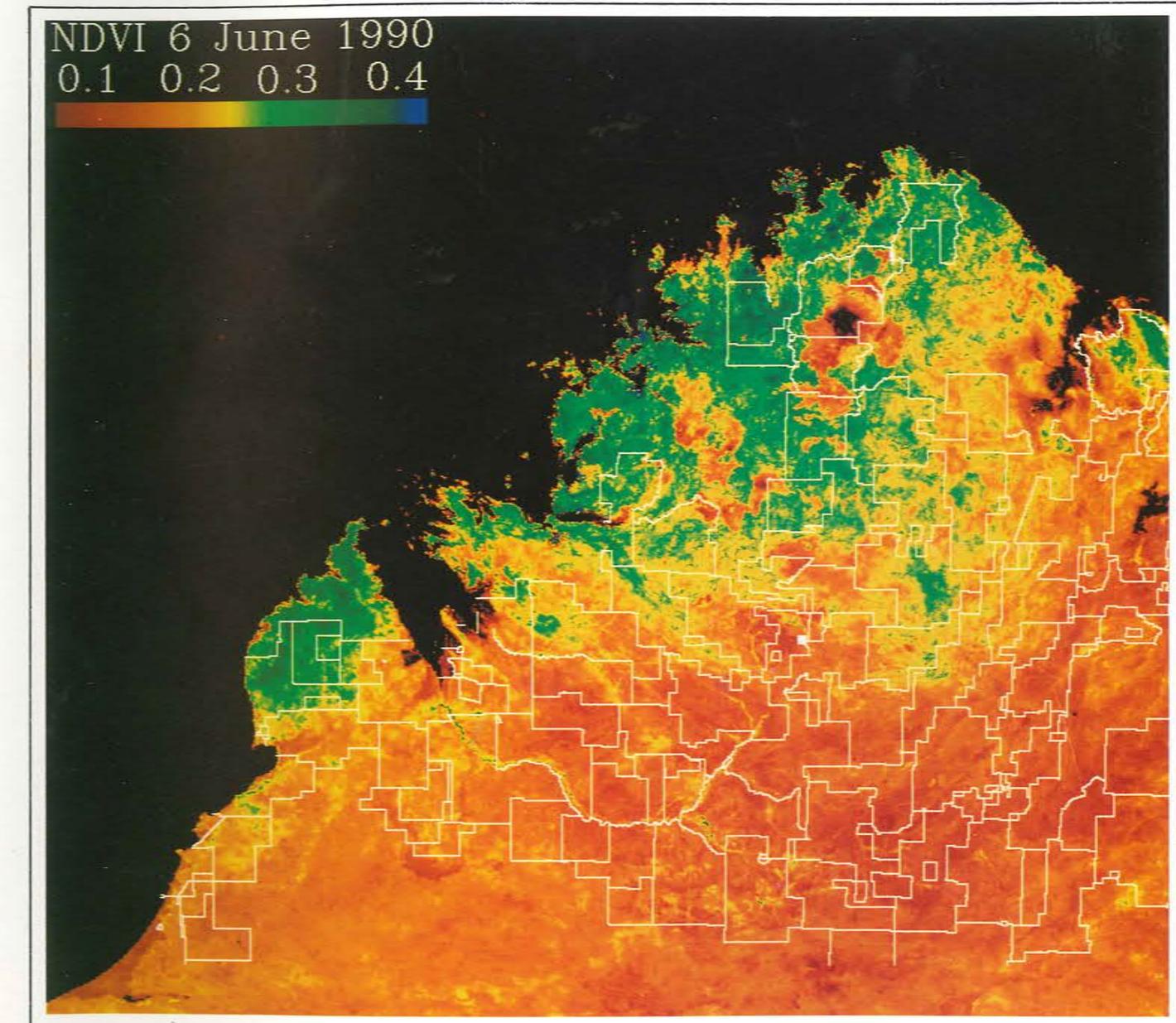
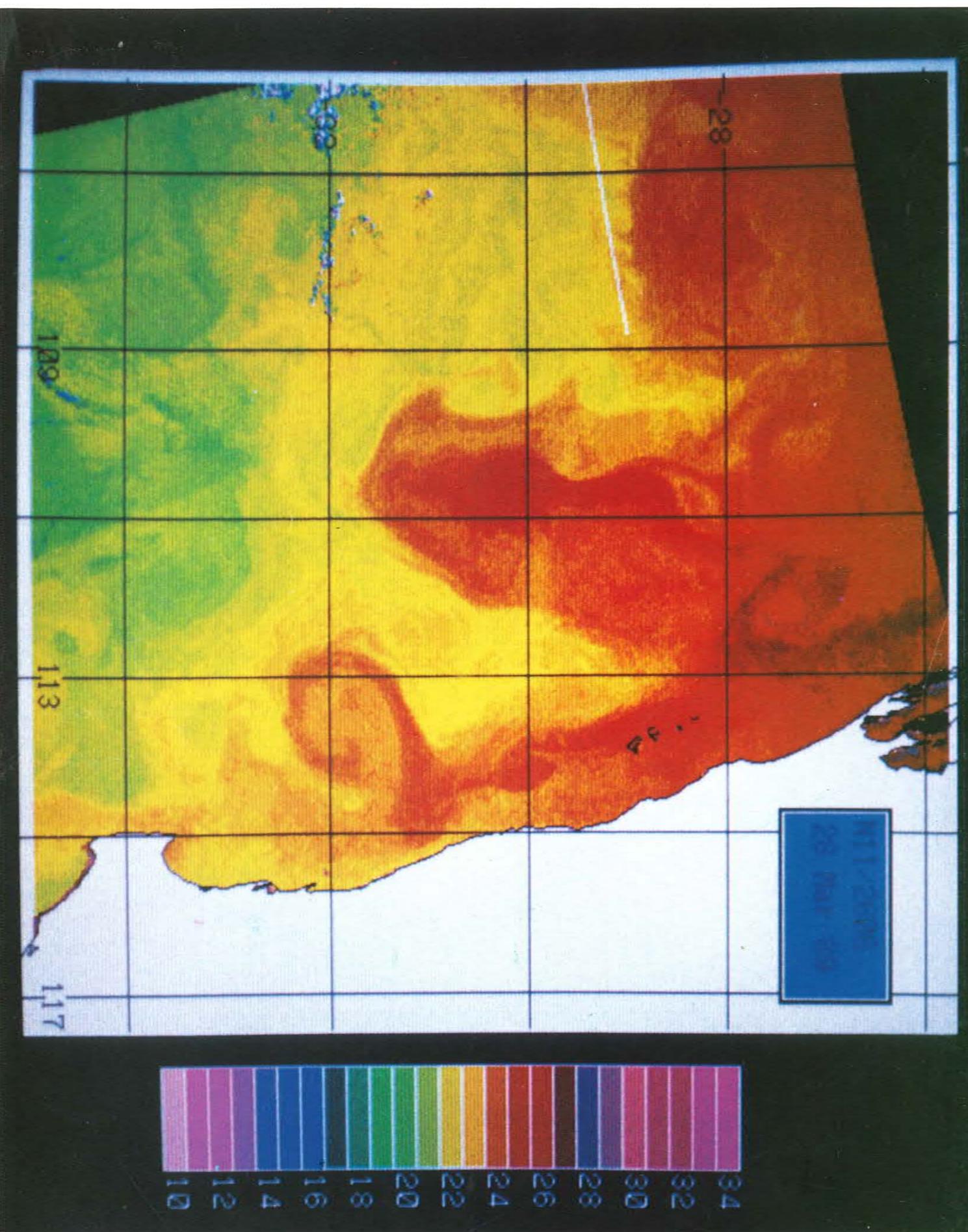


R 316-02

WASTAC

Western Australian Satellite Technology and Applications Consortium

ANNUAL REPORT 1990



WASTAC members

Bureau of Meteorology, G.P.O. Box 1289K, Melbourne, Vic. 3001

Western Australian Department of Land Administration, Jardine House
184 St. Georges Terrace, Perth, W.A. 6000

Curtin University of Technology, Kent Street, Bentley, W.A. 6102

CSIRO, Private Bag P.O., Wembley, W.A. 6014

REMOTE SENSING APPLICATIONS CENTRE

Front Cover

A NOAA/AVHRR scene of the Kimberley region of the north west of Western Australia on 6th June 1990 depicting the Normalised Vegetation Difference Index (NDVI) to quantify the amount of green vegetation present. The values of NDVI are colour coded to represent the different values. Values of less than 0.2 are coloured red and represent sparse senesced vegetation and large areas of exposed soil. Values between 0.2 and 0.3 are coloured yellow to green, representing areas going from sparse senesced to sparse green vegetation. Values from 0.3 to 0.4 range from green to blue to represent areas going from sparse to dense green vegetation. Pastoral station property boundaries have been embedded in the image. The black spot in the northern central part of the image is smoke from currently burning fires, with surrounding orange areas having previously been burnt.

ANNUAL REPORT 1990

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Membership:

- Department of Land Administration
- CSIRO
- Curtin University of Technology
- Bureau of Meteorology

The Western Australian Satellite Technology and Applications Consortium (WASTAC), formed during 1985, comprising the Department of Land Administration (DOLA), CSIRO, Curtin University of Technology (CUT) and Bureau of Meteorology has been specifically established to acquire and operate a satellite tracking station for the reception of National Oceanic and Atmospheric Administration (NOAA) satellite data.

Prime Objectives:

- Establish and maintain the NOAA facility
- Maintain an archive of remotely sensed data from the NOAA receiver, specifically Advanced Very High Resolution Radiometer Data (AVHRR) and TIROS Operational Vertical Sounder (TOVS) data.
- Provide data for operational requirements of the Commonwealth Bureau of Meteorology. Also, use the data for research, applications and education.
- Provide remotely sensed data to customers of the Consortium for operational uses.

Major Outcomes:

- Monitoring major bush fires in the Kimberley's by DOLA's Remote Sensing Applications Centre.
- Monitoring major bush fires in regions of the south-west.
- Studies of Leeuwin current using sea surface temperature (SST).
- Data supplied for SST for defence studies by CSIRO Division of Oceanography, Hobart.
- Studies of vegetation dynamics using compositing to generate cloud free images.
- Research studies by Curtin University on the atmosphere over Western Australia.

CONTENTS

	Page
1 Chairman's Report	1
2 WASTAC Board 1990	3
3 Finances/Budget	4
4 Operational Status	5
5 Data Archive	6
6 Products	6
7 Research/Application Reports	7
8 Equipment	14
9 WASTAC User Group	16
10 Operator's Workshop	16
11 Appendices	
A WASTAC Facility	17
B 1990 Archive	18
C Product Prices	43
D Order Form	44
E 1990 Financial Statement	45
F 1991 Budget	46
G Asset Register	47
H WASTAC Reception	48

CHAIRMAN'S REPORT

WASTAC initiatives during 1990 have concentrated on delivering a reliable source of NOAA-AVHRR Satellite data to Consortium members and the wider community in an acceptable format and timely manner. Specific activities have been directed at:

- ensuring data continuity for operational purposes
- maintaining a reliable and accessible archive
- developing, through applied research, operational use of value-added products
- encouraging participation in research programmes.

WASTAC has developed an upgrade plan for the existing facilities (installed 1986) to permit improved tracking of satellite passes and a hardware redundancy to allow reliable operational acquisition of data. This strategy includes the introduction of high capacity low cost storage devices, ie Exabyte 2 gigabyte magnetic tape units, to reduce archive overhead and encourage easier data transfer. Given the increased volume of data and identification of several value-added products in regular demand (Sea surface temperature and vegetation index and change images of the State) it was necessary to assess market needs and define a future direction. The formation of a User Group will address this important issue.

WASTAC also encouraged active participation in applied research by members, resulting in a number of projects: from "vegie watch" to bushfire monitoring, ocean consultation studies to atmospheric monitoring. These State-level projects are providing a valuable source of information to resource managers, and have led to a "system" approach to State-level and Continental-level change studies. The interaction of ocean, land and atmosphere combined with other Information Technologies, such as Geographic Information Systems, is generating new research initiatives.

Members were involved in the preparation of an Earth System Science Centre proposal which aimed to use WASTAC NOAA/AVHRR and other satellite data to study earth processes indicative of Global Change. A short report was published on this study late in 1990. Many ongoing projects rely on the continuous acquisition of WASTAC data. These include a major operational requirement by the Bureau of Meteorology to assist forecasting. Information from the Indian and Southern Oceans is providing valuable data to this important forecasting function.

During the year members attended and contributed to the 2nd International AVHRR Operator and User Meeting and the 1st National NOAA/AVHRR Station Operator's Workshop. Several papers were presented at the 5th Australasian Remote Sensing Conference during October in Perth, and WASTAC contributed to several specialist workshops.



1990 highlighted the need to ensure good continuous access to satellite data, and the development of strong multi-disciplinary research programmes. WASTAC now has the ability to build on this foundation, and will concentrate on developing operational applications for resource management and monitoring purposes.

This Annual Report reviews activities of Consortium members and contains a complete archive listing of NOAA/AVHRR satellite passes for the year.

H J Houghton
CHAIRMAN
23 May 1991

WASTAC Board 1990

Mr H J Houghton (Chairman)	DOLA
Mr R G H Stovold (Secretary)	DOLA
Assoc. Prof. M Lynch	Curtin
Dr D Myers	Curtin
Dr R Smith	CSIRO - Division of Exploration Geosciences
Mr A Pearce	CSIRO - Division of Oceanography
Mr L Broadbridge	Bureau of Meteorology
Mr D Ward	Bureau of Meteorology

FINANCE

Major revenue collected during the year was through data sales to clients and members' annual maintenance contributions.

Consortium expenditure during the year was primarily made on the upgrade of the old DUAL computer. The resolution to purchase 2 x IBM PS2 model 80 computers and exabyte tape storage was made at the 29th August 1990 meeting. Other expenditure includes tape purchase and maintenance costs, telecom rental, costs to maintain the 35mm quicklook archive and a new formatter board from SENCOM.

End of financial year statement to 31st December 1990 is attached in the APPENDICES with itemised income and expenditure detail contained in the monthly financial statements.

BUDGET

The budget for the period January - December 1991 based on existing and anticipated commitments for \$47,500 was presented at the 29th August 1990 meeting.

On the basis of present and future commitments it was decided to limit member contributions to \$10,000 per consortium member per annum.

An allowance was made for the hiring of consultants for archive and product generation assistance. It is essential that the WASTAC archive is copied to ensure long term storage of this valuable archive. Other items within the budget include provision for equipment replacement, ongoing running costs and conference travelling expenses (refer to attached appendix).

OPERATIONAL STATUS

WASTAC facilities consist of antenna and antenna controller at Curtin University of Technology, process computer, disk and magnetic tape drive at the Bureau of Meteorology with a microwave link and dial up link between the two sites for realtime satellite data relay and acquisition scheduling respectively. Photographic slides of each pass are recorded by Bureau staff and the digital record and slides passed to DOLA (Remote Sensing Applications Centre) for archive, indexing and distribution.

Continued problems with the Dual computer has prompted the development of a new AVHRR ingest and display system modelled on the Bureau of Meteorology's proposed facilities to be located at Casey in Antarctica and at Darwin. Two IBM PS/2 model 80 computers were delivered late in 1990 and in January 1991 ingest of AVHRR data was undertaken in parallel with the Dual system using a formatter board and software supplied by Sencom.

Resulting from equipment failures acquisitions were not possible for periods during March (21 days), June (3 days), July (3 days) and December (4 days). Despite these problems, and due to the dedicated efforts of Ron Craig, over 1100 passes were recorded for the year. As from early 1991 most NOAA passes were being tracked by the WASTAC facility.

The archive is currently on 6250 b.p.i. magnetic tape, each tape containing two passes. DOLA is currently holding the archive and making extra copies upon request. EXABYTE (8mm) tapes will be the preferred storage media when the new system becomes operational during 1991. DOLA-RSAC maintain a "quick look" 35mm slide archive and database of acquisitions. Orders for digital data are provided on 6250 or 1600 b.p.i. magnetic tape in raw or SHARP (band interleaved or band sequential internationally compatible) format.

The WASTAC computer and peripheral upgrade is scheduled for implementation during the first half of 1991. The hardware will include IBM PS2 model 80 computers, one dedicated to data ingest and the other providing display, processing and backup facilities. The system will provide automated acquisition and archiving of raw data as well as MCIDAS software for the display and post processing of data into products such as NDVI and SST (sea surface temperatures). A hardcopy device (HP Inkjet printer) will provide high quality colour prints and replace the current 35mm slide archive.

RESEARCH / APPLICATION REPORT

DATA ARCHIVE

The archive of NOAA passes is stored and maintained at the Remote Sensing Application Centre (RSAC) of the Department of Land Administration. This data is stored on 6250 BPI magnetic tapes dating from the first acquisition on the 9th September 1987. Facilities for copying and formatting the data for clients or other consortium members can be undertaken on SUN 4/280S computers.

The NOAA archive previously acquired at the Curtin site has been absorbed by the WASTAC consortium. These passes date from 1981 up to the commissioning of the new facility in 1987. The magnetic tapes are currently stored at Curtin University or CSIRO. Copies of this valuable archive are currently being made onto EXABYTE tape.

Quicklook images in the form of 35mm colour slides for cloud and aerial coverage assessment purposes are catalogued at RSAC. Copies of this valuable visual archive are held by RSAC, Curtin and CSIRO.

A data base is maintained at RSAC, containing all acquisitions. A listing of all 1990 acquisitions is listed in the appendix.

The success of the WASTAC operation can be largely contributed to the dedicated effort of the staff from the Communications Branch of the Bureau of Meteorology and Remote Sensing Applications Centre.

PRODUCTS

WASTAC products can be ordered through the Remote Sensing Applications Centre, DOLA. The product price list attached is effective as of March 1991. The centre is able to copy, reformat and provide expert services for analysis and hardcopy of NOAA/AVHRR data. Storage mediums are available on both magnetic tape and exabyte in SHARP, BIL or raw HRPT format. Products can be rectified and analysed on the two SUN 4/280S computers and peripherals.

DOLA, Remote Sensing Applications Centre/CSIRO WA Remote Sensing Group Joint Project: Vegie Watch

Dr Richard Smith

The routine use of the WASTAC NOAA AVHRR data for the management of vegetation across the whole continent is limited by the presence of cloud, particularly during the growing season when the amount of green vegetation is changing rapidly. This limitation can be overcome by the combining of successive overpasses, screening out the cloud affected data and creating an image from the remaining cloud free data. To realise this potential an application to the Rural Industries Research and Development Corporation (RIRDC) has been made for \$406,901 over 3 years to process WASTAC NOAA AVHRR data in near real time to produce maximum value composites of the Normalised Difference Vegetation Index (NDVI). The NDVI will be presented as information products of the status of green vegetation across the continent for assisting the management of the vegetation resources of Western Australia.

The proposal includes comparison against the observations of collaborators in the field to determine the relationship between the NDVI and fractional green vegetation cover for different vegetation types across the state. The NDVI will also be incorporated into the Western Australian Land Information System (WALIS) to evaluate its usefulness in policy tasks such as drought assessment.

Funds are being sought from RIRDC to employ a computer programmer and acquire a dedicated SUN-SPARC2 workstation, large disk and exabyte drive with the CSIRO DISIMP software. Both are to be located at DOLA, Remote Sensing Applications Centre to conduct the large amount of data processing required.

Wide support for the project has been received from the Western Australian Department of Agriculture and Pastoral and Graziers Association of WA for application of the NDVI to rangeland monitoring and drought assessment. Support has also been received from the Bush Fires Board for application of the NDVI to the estimation of fuel load in the landscape for use in planning controlled burning strategies. Interest in a project has also been expressed by the Bureau of Rural Resources and Bureau of Agricultural and Resource Economics in Canberra to evaluate the use of the composite NDVI data for crop yield forecasting.

The project is timely if Australia is to stay abreast of its international competitors in the application of NOAA AVHRR data to the management of its vegetation resources. This processing technique had been in use for over three years in Canada and USA in crop yield forecasting of their own and Australia crops. In India it is used as part of a sophisticated system for drought assessment and management, allowing the Government to target aid to badly affected areas. Similar use is made by the FAO in Rome for the African Continent. The European Community is implementing a similar program for crop yield forecasting. It is therefore timely that Australia should make similar use of these data.

CSIRO Division of Oceanography : Satellite Remote Sensing of the Leeuwin Current

Mr A Pearce

Analysis of the mesoscale structure and behaviour of the Leeuwin Current (which was briefly described in the 1989 report) has continued, using the mNOAA image processing software. Raw HRPT-format datasets supplied by WASTAC on Exabyte tape are copied onto disc file, and subsets of various standard areas are read. These images are remapped to a transverse Mercator projection and the sea-surface temperature (SST) computed. Output products are in the form of 35 mm colour slides and prints, or (lower resolution) ink-jet plots.

The images show that mesoscale (order 100km) meanders associated with the Leeuwin Current are common. Although cloud cover is a problem during the winter months, so that lengthy sequences of images are rare, it appears that small undulations in the Current grow into large meanders which eventually "pinch-off" into free-rotating warmcore eddies by dynamic processes along the shelf-break (Pearce & Griffiths, submitted). Independent current measurements using satellite-tracked buoys indicate that onshore/offshore currents generated by such meanders can exceed 1 m/s (or 2 knots), and they can therefore represent an important mechanism for transporting fish and crustacean larvae towards or away from the continental shelf area (Pearce and Phillips 1990, Pearce et al. submitted). Near the coast, smaller billow-like features along the nearshore boundary of the Current indicate active cross-shelf advective/mixing processes which contribute to flushing of the coastal waters (Pearce & Griffiths, submitted; Pearce & Church, submitted).

It is planned that weekly or monthly images of the standard areas will be produced covering the period 1988 to 1992. During cloudy periods, more than one image per week may be required for compositing to reduce the cloud cover.

The image reading/subsetting program will be extended to read the earlier sets of data acquired by the CSIRO/Curtin University receiver between 1982 and 1987. It is planned that the Leeuwin Current analysis described above will also be extended to include this earlier data as well (as time permits), so that a decade of AVHRR images will be available for Western Australia - this represents the longest AVHRR archive in Australia.

A start has been made using AVHRR data to extract numerical SST estimates and hence infer some of the surface dynamics of the Leeuwin Current. Prata et al. (submitted) have defined an "index" of the Leeuwin Current based on SST data integrated along and across the flow, clearly showing seasonal and interannual variability on the gross scale. On finer length scales, Pearce and Prata (1990) used zonal SST transects to show seasonal fluctuations in the thermal gradients across the Current, these presumably being related to changes in the velocity structure.

AVHRR imagery is being used to examine the influence of the Leeuwin Current on the Abrolhos Islands (under a CSIRO/University of Western Australia grant with Dr B Hatcher and Dr K Wyrwol). Enhanced satellite images reveal that the Current sometimes flows closely along the island group (forcing warm tropical water through the inter-island gap into the shallower nearshore region), whereas on other occasions meanders carry the Leeuwin Current waters far offshore.

Concurrent thermal and colour data (from the CZCS scanner on the Nimbus satellite) have shown dynamic interchanges between the nutrient-poor Leeuwin Current and the more productive shelf waters along the Western Australian shelf (Pattiaratchi et al. 1990). Meanders in the Leeuwin Current can interactively transport shelf water away from the coast and replace it with less productive offshore water.

Acknowledgements: The mNOAA image processing package has been developed by Dr Fred Prata & Dr John Wells; Mr Jim Davies wrote the tape subsetting program. We are grateful to the West Australian Fisheries Department for ongoing interest and support.

References

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- Pearce, A.F. and R.W. Griffiths. The mesoscale structure of the Leeuwin Current. Accepted by Journal of Geophysical Research.
- Pearce, A.F. & J.A. Church. A coastal heat and salt budget using seasonal temperature and salinity data off Perth, Western Australia. Submitted to Continental Shelf Research.
- Pearce, A.F., B.F. Phillips & C.J. Crossland. Larval distributions across the Leeuwin Current: report on Franklin cruise FR 8/87. Submitted CSIRO Marine Laboratories Report.
- Prata, A.J., A.F. Pearce & J.B. Wells. An index for the Leeuwin Current from satellite derived sea surface temperatures. Submitted to Journal of Geophysical Research.

CURTIN UNIVERSITY OF TECHNOLOGY - RESEARCH:

Investigation of Least Squares Algorithms in Atmospheric Retrievals

Mr L E Gumley, Associate Professor M J Lynch and Mr B A White*

The retrieval of atmospheric profile information from satellite radiance measurements may be linearised and reduced to a least squares problem. This project has been evaluating the QR method of solution in an attempt to obtain improved solutions, particularly in cases where the problem is ill-conditioned.

This project is supported by DSTO, Salisbury, SA (\$10,000) and Curtin Research Infrastructure Funds (\$5,000).

* Department of Mathematics and Statistics

Use of Remote Sensing to Study the Degradation of Agricultural Land

Associate Professor M J Lynch, Dr N Campbell*, Mr C Rustana, Mr J Wallace*, and Mr G A Wheaton**

Soil salinity is a major cause of the loss of productive agricultural land. The detection of degraded regions, and the monitoring of possible recovery as a result of improved management practices, using multispectral remote sensing is the goal of the project.

The approach adopted applies information obtained from a series of training sites to a supervised statistical classifier procedure. Remote sensing data is from the LANDSAT Thermal Mapper.

* CSIRO

** Department of Agriculture

The Estimation of Aerosol Optical Depths from AVHRR Data

Associate Professor M J Lynch, Mr L E Gumley, Mr J Sandalone and Mr S Kalimuthu

Band 1 of the AVHRR instrument on the NOAA polar orbiting satellite is in the visible region. Aerosols in the atmosphere scatter solar radiation into the satellite field of view. Algorithms have been developed to estimate the aerosol loading. Currently verification of results is in progress.

This project is supported by DSTO, Salisbury, SA (\$19,996 over 1989-90) and satellite data was provided by WASTAC.

The Evaluation of Ozone Products from the NOAA/HIRS 9.6 Micrometre Channel

Associate Professor M J Lynch and Mr J Li

The NOAA HIRS instrument included a spectral channel in the ozone absorption band at 9.6 micrometres. We have been using the International TOVS Processing Package to evaluate ozone products and to refine algorithms. Data was processed for 1989 and compared with the Perth Dolson spectroradiometer data.

This project is supported by WASTAC providing satellite data and the Bureau of Meteorology provided Dolson data.

Aerosol and Moisture Corrections to the Remotely Sensed Normalised Difference Vegetation Index (NDVI)

Associate Professor M J Lynch, Dr R Smith* and Mr P Mathaha**

The NDVI is frequently used in monitoring the extent and state of vegetation. Satellite observations in the visible and near infrared are contaminated by atmospheric moisture and the presence of aerosols. This project examines the extent of these effects and will implement algorithms to make corrections to the NDVI.

This project is supported by Remote Sensing and Satellite Research Group (\$1,500).

* CSIRO/Department of Land Administration

** Recipient of an AIDAB scholarship

Use of MSU Microwave Data in Determining the Intensity of WA Tropical Cyclones

Associate Professor M J Lynch and Mr J L van Burge

The Microwave Sounding Unit (MSU) on the NOAA series of satellites has four channels in the oxygen band. MSU channel 3 has a peak response in the vicinity of 300 hPa and may be used to estimate the warm temperature anomaly in tropical cyclones. This anomaly is used to estimate tropical cyclone intensity.

This project is supported by WASTAC (satellite data).

Global Atmospheric Methane Sensing

Associate Professor M J Lynch, Mr P van Delst and Mr L E Gumley

High spectral resolution data in the 7-8 micrometre region contains a strong methane signal. This project produced a prototype design for an Australian Launch Vehicle Payload. It was ranked No 1 nationally and is currently under consideration by the Australian Space Board.

This project is supported by Curtin Infrastructure Funds (\$2,500).

The Retrieval of Atmospheric Trace Gas Profiles from High Spectral Resolution Infrared Data

Associate Professor M J Lynch, Mr P van Delst* and Mr B A White**

High spectral resolution data in the infrared is rich in information on atmospheric trace gases. Species detectable above noise include CH₄D, CO, NH₂DO, OH₃D and the freons. Current effort is directed at developing inversion algorithms to retrieve concentration profiles of these species.

This project is supported by CIMSS, University of Wisconsin, providing data.

* Supported by APRA PhD scholarship

** Department of Mathematics and Statistics

Precipitation Estimation from GMS Imagery

Dr W P Menzel*, Associate Professor M J Lynch, Mr D Foster and Dr B Goodman**

Cloud top temperatures from the Geostationary Meteorological Satellite (GMS) may be used to estimate precipitation rates. The World Climate Research Programme conducted on Algorithm Intercomparison Project (AIP) over Japan in 1990. Curtin participated in this project and provided an analysis of the data sets for the study period.

This project is supported by Infrastructure Funds (\$5,000). GMS data sets provided by NOAA/NESDIS, Washington DC.

* NOAA NESDIS, Satellite Applications Branch, Madison, Wisconsin, USA

** Space Science and Engineering Centre, University of Wisconsin, Madison, Wisconsin, USA

The Estimation of Cloud Parameters Using CO₂ Sounding Channels on the NOAA Polar Orbiting Satellite

Dr W P Menzel*, Associate Professor M J Lynch and Mr A Portelli

Cloud parameters, including cloud height and emissivity are important variables in the earth radiation budget. The CO₂ channels on the NOAA satellite are used to solve for the cloud parameters. The algorithms implemented are presently under evaluation.

This project is supported by WASTAC (Satellite Data).

* NOAA NESDIS, Satellite Applications Branch, Madison, Wisconsin, USA

DOLA, Remote Sensing Applications Centre

Bush Fire Monitoring

During the dry season in the Kimberley Region (April to October) in 1990 a number of bush fires were started by lightning and by man. As part of its responsibilities the Department of Land Administration, through its Remote Sensing Applications Centre, (RSAC), provided information to the Bush Fires Board of Western Australia on the coverage area of burnt land and the position of spot fires.

The data used to determine the location of the fires were the AVHRR data from the WASTAC NOAA receiving system. The data were analysed in near real time by transforming the data directly from the DUAL hard disk onto magnetic tape and transporting to the RSAC. The tape information was loaded onto the Centre's SUN computer system and analysed using the International Imaging System (IIS) image analysis software. The AVHRR imagery was warped to fit a latitude-longitude projection. The area of interest, as requested by the Bush Fires Board's staff at Kununurra, was selected and the imagery colour enhanced to show either burn areas and smoke from day time data, or spot fire (hot spots) from the night time imagery. This enhanced imagery was plotted out on a Tektronix colour inkjet plotter. Areas of fire and current fire fronts were interpreted from these plots then faxed to the Kununurra office.

This information provided to the Bush Fires Board, helped in the fighting of the bush fires. It assisted location of fire fronts under large smoke clouds, pinpointing the sight of start of the fire and choosing back burn regions.

Other major fires in the south west of Western Australia have been monitored in near real time by RSAC during the year.

CURTIN UNIVERSITY OF TECHNOLOGY

LISTING OF EQUIPMENT BY COST CENTRE AND ITEM (6TH MARCH - 1991)

COST CENTRE: 1010 OFFICE OF DIV. OF ENGINEER AND SCIENCE
SUB CENTRE: 01 W.A. SATELLITE TECHNOLOGY APPLICATION CENTRE

ITEM NUMBER	DESCRIPTION	SERIAL NUMBER	QTY	COST	ORDER NUMBER SRC C/C	FND ALS NUMBER SRC C/C	DATE RECORDED	LOCATION	GROUP
13587.00	SATELLITE STATION TRACKING	00	1	140000	000000DON	---	22-JULY-1987	204ROF	043/00
13587.01	SATELLITE STATION ACC ANTENNA PARABOLIC 2.6M	0	1	0	000000DON	---	22-JULY-1987	204ROF	043/00
13587.02	SATELLITE STATION PRE-AMP MICROWAVE 1.7 GHZ	0	1	0	000000DON	---	22-JULY-1987	204ROF	043/00
13587.03	SATELLITE STATION ACC LOW NOISE CONVERTER 1.7 GHz/10MHz	0	1	0	000000DON	---	22-JULY-1987	204ROF	043/00
13587.04	SATELLITE STATION ACC ANTENNA DRIVE UNIT MANUAL	0	1	0	000000DON	---	22-JULY-1987	204ROF	043/00
13587.05	SATELLITE STATION ACC ANT. DRV SYS PLUS ELEVATION & AZIMUTH DRV MTR	00	1	0	000000DON	---	22-JULY-1987	204ROF	043/00
13587.06	SATELLITE STATION ACC EQUIPMENT RACK	0	1	0	000000DON	---	22-JULY-1987	204500	043/00
13587.07	SATELLITE STATION ACC ANTENNA CONTROLLER MODULE	0	1	0	000000DON	---	22-JULY-1987	204500	043/00
13587.08	SATELLITE STATION ACC ANTENNA MANUAL OVERRIDE MODULE	00	1	0	000000DON	---	22-JULY-1987	204500	043/00
13587.09	SATELLITE STATION ACC SIGNAL DECODER MODULE	0	1	0	000000DON	---	22-JULY-1987	204500	043/00
13587.10	SATELLITE STATION ACC DRIVE MOTORS (SPARES)	0	1	0	000000DON	---	22-JULY-1987	204500	043/00
13587.11	SATELLITE STATION ACC LOW NOISE CONVERTER (SPARE)	0	1	0	000000DON	---	22-JULY-1987	204500	043/00
13588.00	COMPUTER SYSTEM SATELLITE TRACKING STATION CHAPPAREL IV	-----	1	110000	000000DON	---	22-JULY-1987	204500	043/00
13588.01	COMPUTER SYSTEM ACC MEMORY IMB DUAL	CH.4.4103	1	0	000000DON	---	22-JULY-1987	204500	043/00
13588.02	COMPUTER SYSTEM ACC D/DRIVE DUAL 8" 327 MB (WINCHESTER) FUJITSU	CH.4.4104	1	0	000000DON	---	22-JULY-1987	204500	043/00
13588.03	COMPUTER SYSTEM ACC TAPE DRIVE 1600/6250 BPI CONTROL DATA	13363	1	0	000000DON	---	22-JULY-1987	204500	043/00

CURTIN UNIVERSITY OF TECHNOLOGY
LISTING OF EQUIPMENT BY COST CENTRE AND ITEM

COST CENTRE: 1010 OFFICE OF DIV. OF ENGINEER AND SCIENCE
SUB CENTRE: 01 W.A. SATELLITE TECHNOLOGY APPLICATION CENTRE

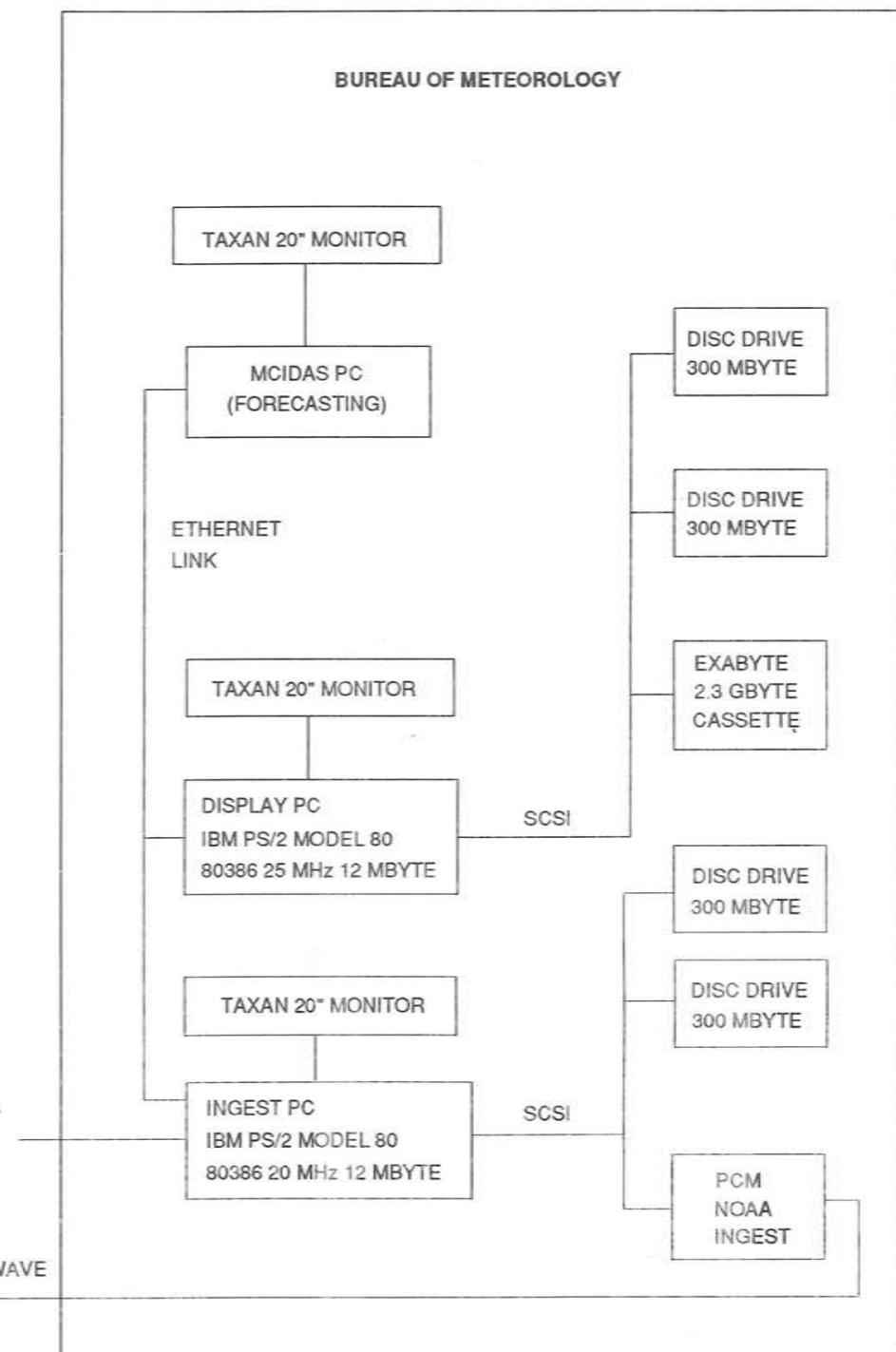
ITEM NUMBER	DESCRIPTION	SERIAL NUMBER	QTY	COST	ORDER NUMBER SRC C/C	FND ALS NUMBER SRC C/C	DATE RECORDED	LOCATION	GROUP
13588.04	COMPUTER SYSTEM ACC PRINTER PINWRITER CP7 NEC	581103588	1	0	000000DON	---	22-JULY-1987	204500	079/00
13588.05	COMPUTER SYSTEM ACC V.D.U. TURB. FREEDOM ONE	702220477	1	0	000000DON	---	22-JULY-1987	204500	079/00
13588.06	COMPUTER SYSTEM ACC MONITOR COLOUR MULTISYNC NEC	699800162T	1	0	000000DON	---	22-JULY-1987	204500	079/00
13588.07	COMPUTER SYSTEM ACC CARD GRAPHICS IRONICS	-----	1	0	000000DON	---	22-JULY-1987	204500	079/00
16854.00	CAMERA FM2 36MM BLACKBODY NIKON LENS STANDARD 105MM F2.5	87390838	1	705	012650SPE	1198	9-JUNE-1988	204500	068/01
16855.00	RACKS TAPE FP.122 FREESTANDING RACKS TAPE FP.112 FREESTANDING	L1007216	1	565	012650SPE	1198	9-JUNE-1988	204500	068/05
17154.00	AIR CONDITION UNIT 2HP REVERSE CYCLE MODEL CW-2070K PANASONIC POWER CONDITIONER	-----	1	438	014159SPE	1198	24-AUG-1988	GEOTCE	072/00
17155.00	TRANSMITTER MA 23 CC TRANSMITTER ACC TRANSMITTER DISH	313200833	1	1057	016115SPE	1198	24-AUG-1988	GEOTCE	072/00
18057.00	TRANSMITTER ACC RECEIVER DISH	7/83/132	1	2000	000000DON	0000	23-NOV-1988	204500	029/00
19485.00	TRANSMITTER ACC RECEIVER MONITOR MA 23CC	8910	1	20365	017235SPE	1198	26-JUNE-1989	204500	047/00
20090.00	TRANSMITTER ACC TRANSMITTER DISH	4278	1	0	017235SPE	1198	17-AUG-1989	204500	043/00
20090.01	TRANSMITTER ACC RECEIVER DISH	4278	1	0	017235SPE	1198	17-AUG-1989	CIM...	043/00
20090.02	TRANSMITTER ACC RECEIVER MONITOR MA 23CC	1841478-3	1	0	017235SPE	1198	17-AUG-1989	CIM...	043/00
24788.00	TAPE DRIVE 2.3 GB 8MM EXABYTE	802548	1	6272	038600SPE	1198	19-DEC-1990	CITY	079/10
24945.00	MICROCOMPUTER PS2 25MHZ 4/320MBHD & MONITOR VGA	90-3300463	1	16686	038539SPE	1198	19-DEC-1990	CITY	079/01
24946.00	MEMORY EXPANSION BOARD 4MB	-----	1	1911	038539SPE	1198	19-DEC-1990	CITY	079/00
1010/01	****SUB CENTRE TOTAL****						\$300,437		
1010	***COST CENTRE TOTAL***						\$362,224		

WASTAC User Group

A WASTAC user group was convened in late 1990 to plan the advance of WASTAC's performance in the generation of derived products by members.

The group, chaired by Assoc. Professor M Lynch is presently in the first stage of defining the steps required to achieve processing and a range of deliverable products. A statement of needs has been compiled by present consortium users.

WASTAC NOAA-AVHRR FACILITY PROPOSED CONFIGURATION 1991



First Australian AVHRR Station Operators Workshop:

The workshop was held in Canberra on the 4th of June 1990 and attended by the Chairman Mr H Houghton.

Summaries of station operations or product uses were given by ACRES, Bureau of Meteorology, CSIRO Aspendale and Hobart, NASIS (Queensland) Macquarie University and WASTAC.

Issues discussed at the meeting and recommendations are to be prepared by COSSA.

Items of discussion:

PRICING: No uniform policy, varies from \$100 - \$200

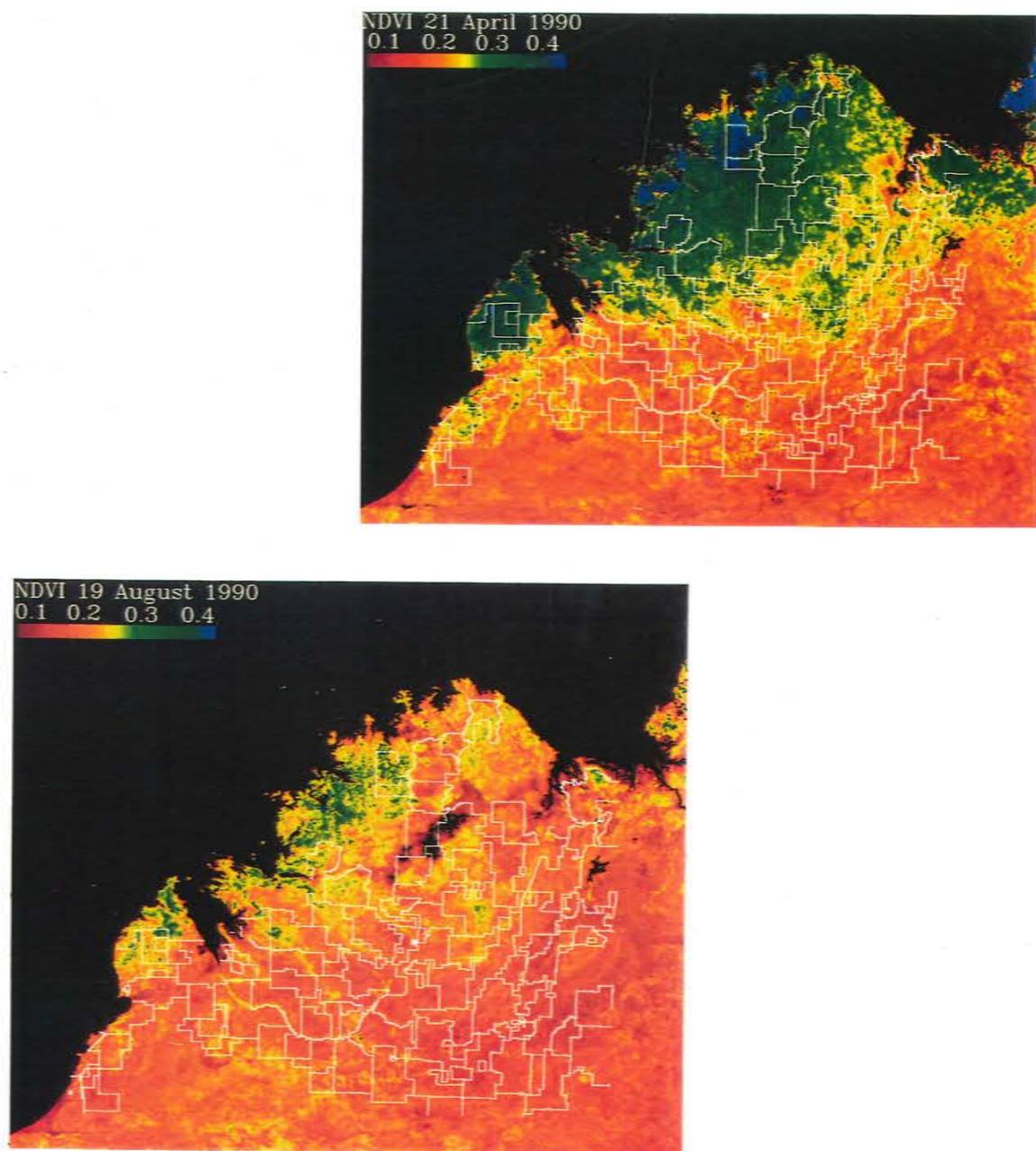
COPYRIGHT: "No third party disclosure" was the consensus.

ARCHIVE: No conclusion, except to ensure communication to operators on a regular basis. It was agreed to endorse the recommendations of both the report to ALCORSS (1989) and those of the 2nd International NOAA/AVHRR Workshop.

WASTAC NOAA/AVHRR 1990 ARCHIVE

TAPE NO.	PASS NO.	DATE	TIME UTC	ELEVATION	NUMBER LINES	NUMBER OVER LENGTH LINES	PARITY ERRORS							
W521	N11 6569	03/01/90	0637	67 W	4600	0		W542	N11 6794	19/01/90	0527	25 E	4600	0
	N11 6576	03/01/90	1759 night	57 W	4600	0			N11 6795	19/01/90	0708	34 W	4600	0
	N11 6583	04/01/90	0626	83 W	4600	0		W543	N11 6801	19/01/90	1649 night	30 E	4600	0
W522	-----1 line file-----							W544	N11 6802	19/01/90	1830 night	29 W	4600	0
	N11 6590	04/01/90	1748 night	75 W	4600	0		W545	N11 6809	20/01/90	0657	42 W	4600	0
W523	N11 6597	05/01/90	0616	72 E	4600	0		W546	N11 6815	20/01/90	1639 night	24 E	4599	0
	N11 6604	05/01/90	1737 night	80 E	4603	0		W547	N11 6816	20/01/90	1819 night	36 W	4600	0
W524	N11 6611	06/01/90	0605	59 E	4600	0		W548	N11 6823	21/01/90	0646	54 W	4600	0
	N11 6618	06/01/90	1727 night	68 E	4580	0		W546	N11 6830	21/01/90	1808 night	46 W	4600	0
W525	-----1 line file-----							W547	N11 6837	22/01/90	0635	67 W	4600	0
	N11 6625	07/01/90	0554	45 E	4600	0		W548	N11 6844	22/01/90	1757 night	59 W	4600	2
W526	-----1 line file-----							W547	N11 6851	23/01/90	0625	84 W	4600	0
	N11 6632	07/01/90	1716 night	54 E	4600	0		W548	N11 6858	23/01/90	1746 night	71 W	4600	0
W527	N11 6639	08/01/90	0544	36 E	4598	0		W548	N11 6865	24/01/90	0614	73 E	4600	0
	N11 6640	08/01/90	0725	24 W	4596	0		-----1 line file-----						
W528	N11 6646	08/01/90	1706 night	42 W	4598	0		-----1 line file-----						
	N11 6647	08/01/90	1847 night	20 W	4600	0		-----1 line file-----						
W529	N11 6653	09/01/90	0533	28 E	4595	1		-----2 line file-----						
	N11 6654	09/01/90	0714	30 W	4600	0		-----1 line file-----						
W530	N11 6660	09/01/90	1655 night	34 E	4600	0		-----1 line file-----						
	N11 6661	09/01/90	1836 night	26 W	4600	0		-----1 line file-----						
W531	-----0 line file-----							-----2 line file-----						
	N11 6667	10/01/90	0523	22 E	4529	0		-----1 line file-----						
W532	N11 6668	10/01/90	0703	37 W	4600	0		-----1 line file-----						
	N11 6674	10/01/90	1645 night	27 E	4600	0		-----1 line file-----						
W533	-----1 line file-----							-----1 line file-----						
	N11 6675	10/01/90	1825 night	32 W	4600	0		-----1 line file-----						
W534	N11 6682	11/01/90	0652	48 W	4605	0	10P	-----1 line file-----						
	N11 6688	11/01/90	1635 night	22 E	4494	0		-----1 line file-----						
W535	N11 6689	11/01/90	1814 night	41 W	4600	0		-----1 line file-----						
	N11 6696	12/01/90	0642	60 W	4600	0		-----1 line file-----						
W536	N11 6703	12/01/90	1803 night	52 W	4600	0		-----1 line file-----						
	N11 6710	13/01/90	0631	76 W	4600	0		-----1 line file-----						
W537	N11 6717	13/01/90	1753 night	64 W	4600	0		-----1 line file-----						
	N11 6731	14/01/90	1742 night	84 W 2 headers	4600	0		-----1 line file-----						
W538	N11 6738	15/01/90	0609	65 E	4600	0		-----1 line file-----						
	N11 6745	15/01/90	1731 night	73 E	4600	0		-----1 line file-----						
W539	N11 6752	16/01/90	0559	52 E	4600	2		-----1 line file-----						
	N11 6759	16/01/90	1721 night	61 E	4600	1		-----1 line file-----						
W540	N11 6766	17/01/90	0548	40 E	4600	0		-----1 line file-----						
	N11 6767	17/01/90	0729	22 W	4566	0		-----1 line file-----						
W541	N11 6773	17/01/90	1710 night	47 E	4600	0		-----1 line file-----						
	N11 6780	18/01/90	0538	32 E	4600	0	10P	-----1 line file-----						
W541	N11 6781	18/01/90	0718	27 W	4600	0		-----1 line file-----						
	N11 6787	18/01/90	1700 night	38 E	4600	0		-----1 line file-----						
W541	N11 6788	18/01/90	1841 night	23 W	4600	0		-----1 line file-----						
	N11 6794	19/01/90	0527	25 E	4600	0		-----1 line file-----						
W542	N11 6795	19/01/90	0708	34 W	4600	0		-----1 line file-----						
	N11 6801	19/01/90	1649 night	30 E	4600	0		-----1 line file-----						
W543	N11 6802	19/01/90	1830 night	29 W	4600	0		-----1 line file-----						
	N11 6809	20/01/90	0657	42 W	4600	0		-----1 line file-----						
W544	N11 6815	20/01/90	1639 night	24 E	4599	0		-----1 line file-----						
	N11 6816	20/01/90	1819 night	36 W	4600	0		-----1 line file-----						
W545	N11 6823	21/01/90	0646	54 W	4600	0		-----1 line file-----						
	N11 6830	21/01/90	1808 night	46 W	4600	0		-----1 line file-----						
W546	N11 6837	22/01/90	0635	67 W	4600	0		-----1 line file-----						

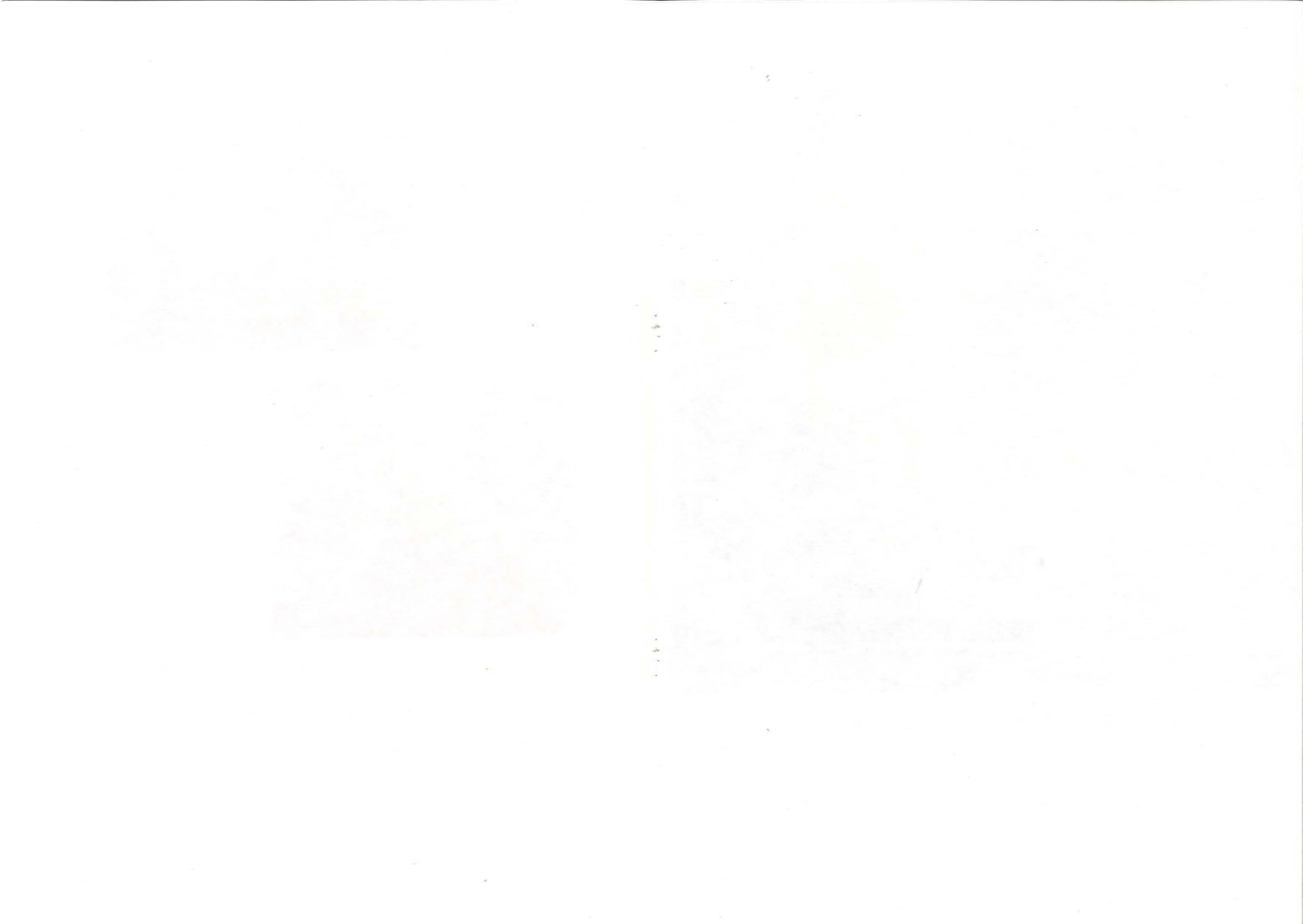
	N11 7048	06/02/90	0535	28 E	4600	0
W565	N11 7049	06/02/90	0716	30 W	4600	0
	-----1 line file-----					
	-----1 line file-----					
	N11 7055	06/02/90	1657 night	34 E	4600	0
W566	N11 7056	06/02/90	1838 night	25 W	4600	0
	-----1 line file-----					
	N11 7063	07/02/90	0705	38 W	4600	0
W567	-----1 line file-----					
	N11 7077	08/02/90	0655	48 W	4600	2
	N11 7083	08/02/90	1637 night	22 E	4468	0
W568	-----1 line file-----					
	-----1 line file-----					
	-----1 line file-----					
	-----1 line file-----					
	N11 7084	08/02/90	1816 night	41 W	4596	0
	-----1 line file-----					
	-----1 line file-----					
	N11 7091	09/02/90	0644	60 W	4514	0
W569	N11 7098	09/02/90	1806 night	51 W	4600	0
	N11 7105	10/02/90	0633	78 W	4600	0
W570	N11 7112	10/02/90	1755 night	67 W	4600	0
	N11 7119	11/02/90	0622	76 E	4600	0
W571	N11 7126	11/02/90	1744 night	83 W	4600	0
	N11 7133	12/02/90	0611	65 E	4600	0
W572	-----1 line file-----					
	N11 7140	12/02/90	1733 night	71 E	4600	0
	-----1 line file-----					
	N11 7147	13/02/90	0601	51 E	corrupt?	
W573	N11 7154	13/02/90	1723 night	60 E	4600	0
	N11 7161	14/02/90	0550	39 E	4600	0
W574	N11 7162	14/02/90	0731	22 W	4600	0
	N11 7168	14/02/90	1712 night	47 E 2 headrs	4600	0
W575	N11 7175	15/02/90	0539	31 E	4600	0
	-----1 line file-----					
	N11 7176	15/02/90	0720	27 W	4600	0
W576	-----1 line file-----					
	N11 7183	15/02/90	1842 night	23 W	4600	0
	N11 7189	16/02/90	0529	25 E	4600	0
W577	-----1 line file-----					
	-----1 line file-----					
	-----1 line file-----					
	-----1 line file-----					
	N11 7190	16/02/90	0709	34 W	4600	0
	N11 7196	16/02/90	1651 night	30 E	4600	0
W578	N11 7197	16/02/90	1831 night	29 W	4600	0
	N11 7204	17/02/90	0658	43 W	4600	0
W579	N11 7210	17/02/90	1640 night	24 E	4566	0
	N11 7211	17/02/90	1820 night	37 W	4600	0
W580	N11 7218	18/02/90	0647	54 W	4600	0
	N11 7246	20/02/90	0626	77 W	4600	0
W581	N11 7260	21/02/90	0615	72 E	4600	0
	N11 7267	21/02/90	1737 night	75 W	4600	0
W582	N11 7274	22/02/90	0604	57 E	4600	0
	N11 7281	22/02/90	1726 night	66 E	4600	0
W583	N11 7316	25/02/90	0533	28 E	4600	0
	N11 7323	25/02/90	1655 night	32 E	4600	0
W584	N11 7324	25/02/90	1836 night	26 W	4600	0
	N11 7331	26/02/90	0703	39 W	4600	0
W585	N11 7338	26/02/90	1825 night	33 W	4600	0
	N11 7345	27/02/90	0652	49 W	4600	0

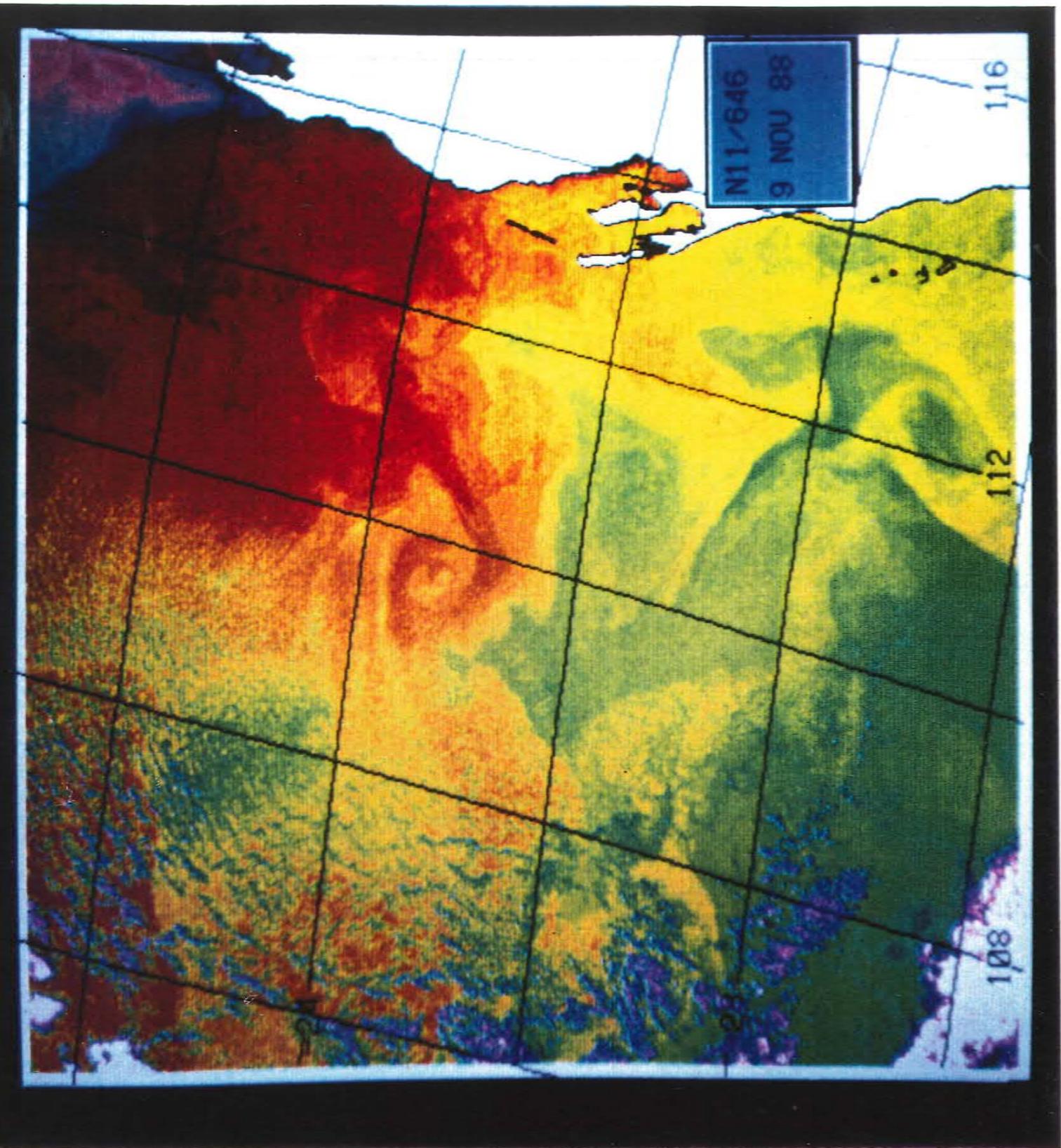


Normalised Difference Vegetation Index (NDVI) Images:

The NDVI (Channel 2 - Channel 1) / (Channel 2 + Channel 1) is used to quantify the amount of green vegetation present. The two images dated 21 April and 19 August 1990 depict the changing greenness of vegetation due to rainfall. As the greenness diminishes in August due to warmer dryer conditions the areas represented in green also decrease. The areas of value from 0.2 to 0.3 represented in yellow to green correspond to areas going from sparse senesced to sparse green vegetation. Sparse to dense green vegetation has a range of NDVI of 0.3 - 0.4 in colours of green to blue. Pastoral property boundaries are shown in white.

These images are particularly useful in drought and biomass monitoring.





LEEUWIN CURRENT IMAGES

Image 1:

The Leeuwin Current between Exmouth and Geraldton on 9 November 1988. Land is white, clouds are blue/white on the left of the image, and the Current is the band of warm (red-yellow) water down the coast. Note the two clockwise eddies, one WNW of Shark Bay, the other off the Abrolhos Islands.

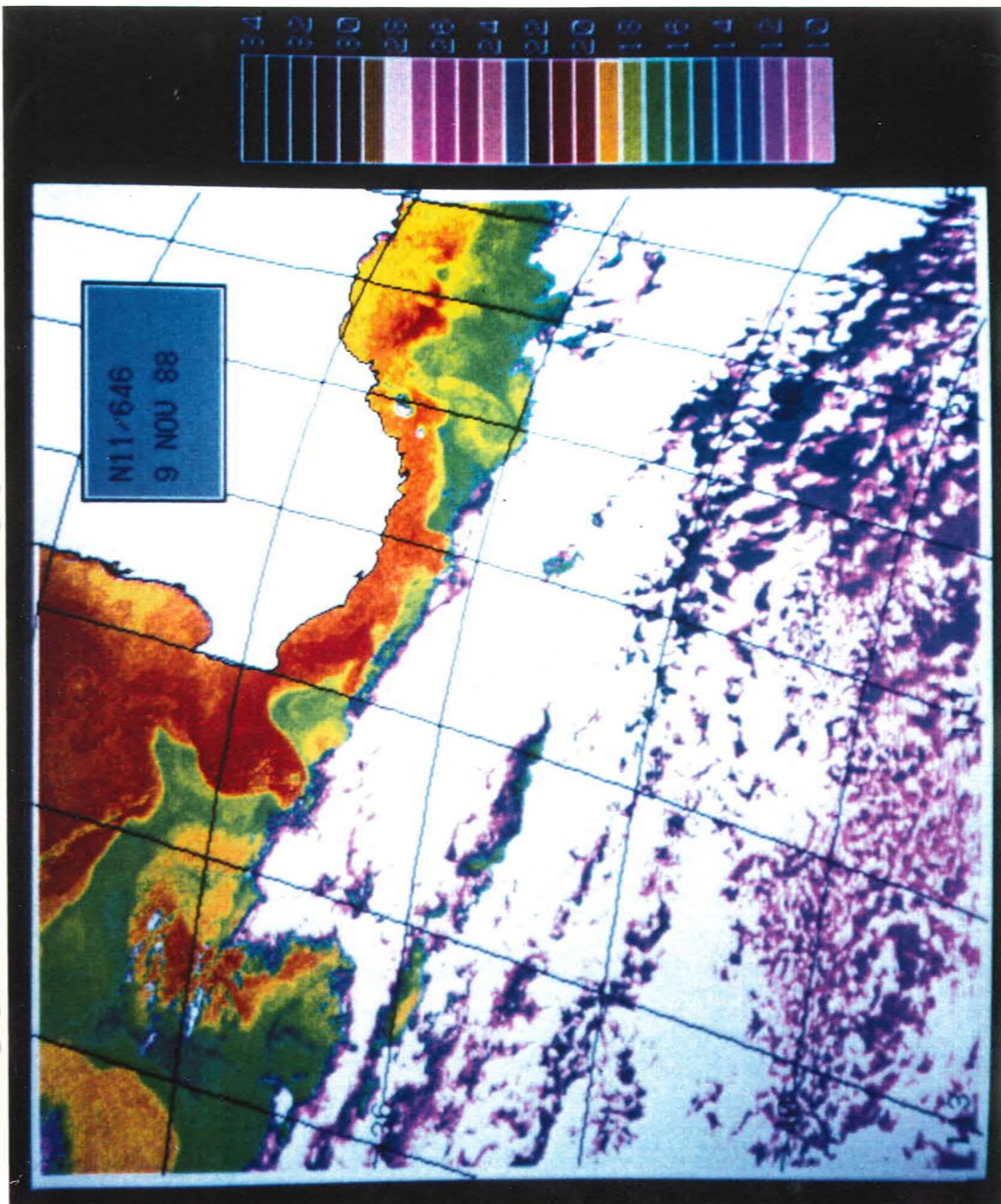
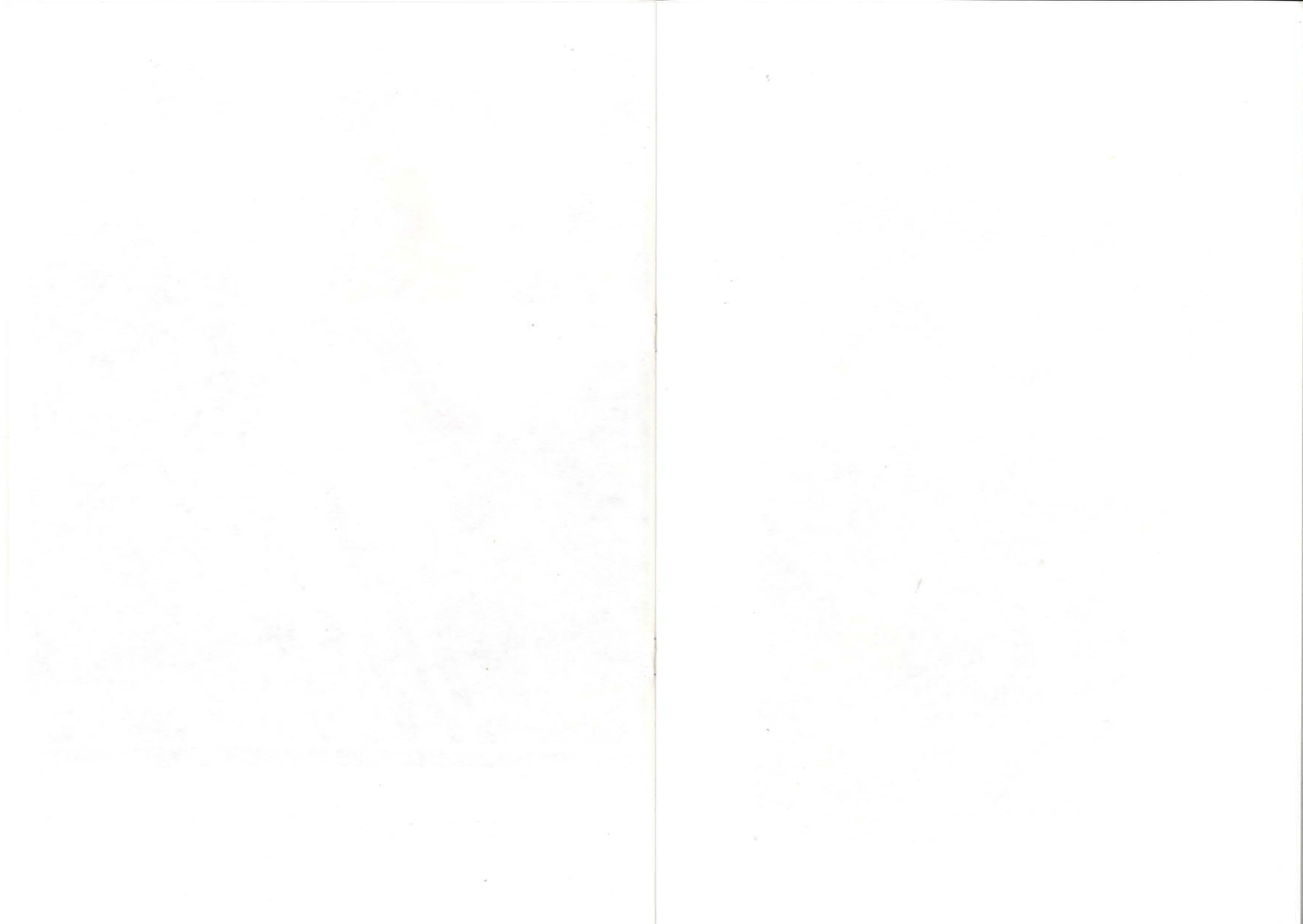


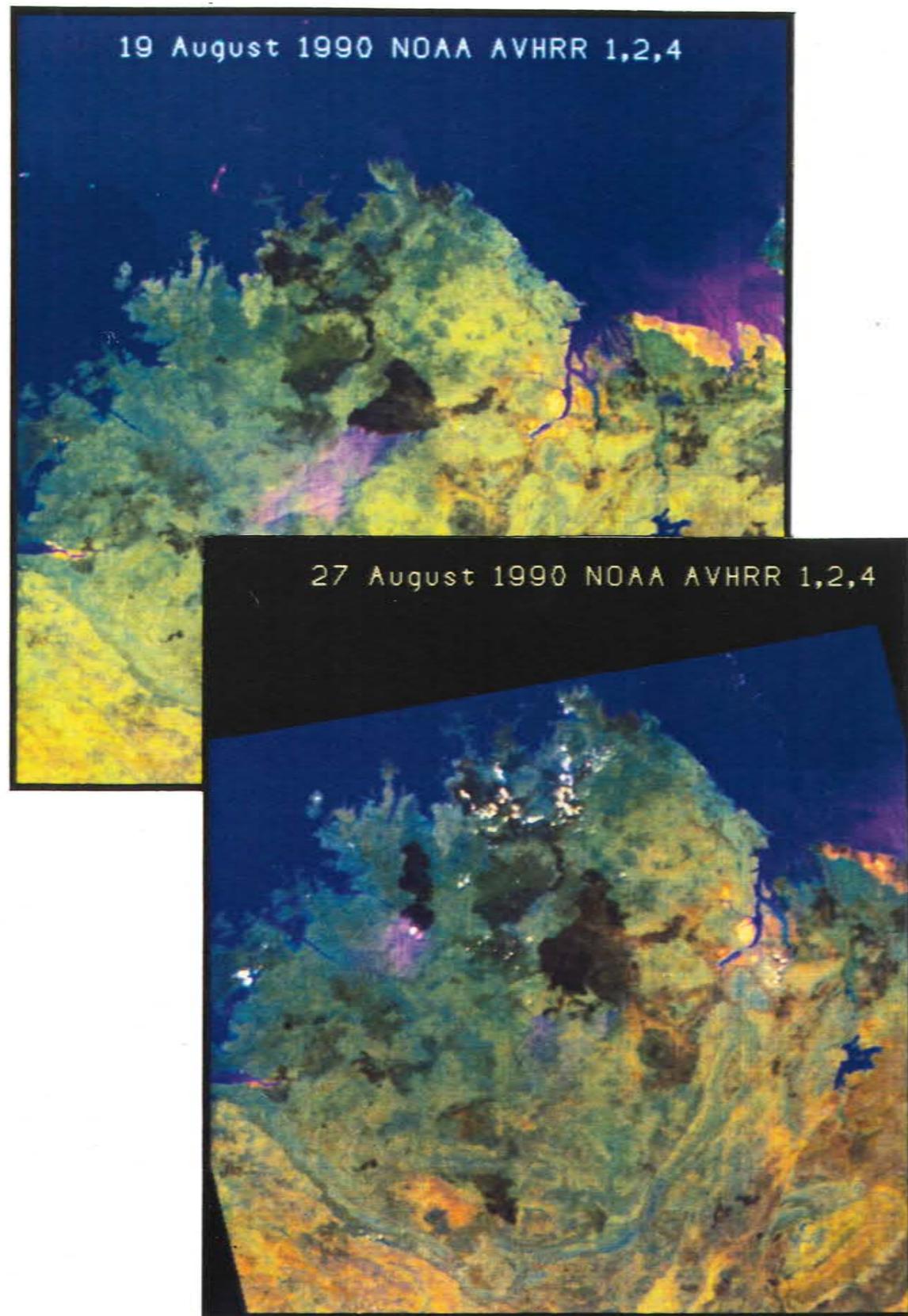
Image 2:

South coast on 9 November 1988. Further meanders and warm offshoots are evident as the Leeuwin Current moves eastwards.



Kimberley Bush Fires

The NOAA/AVHRR rectified images dated 19th and 27th August 1990 depict the changing shape of current bush fires in brown. Using bands 1,2,4, Red, Green, Blue current burning firefronts are visible with smoke in pink streaming away to the south west.



W586	-----1 line file----- N11 7352	27/02/90	1814 night	42 W	4600	0
	-----1 line file-----					
W587	N11 7359	28/02/90	0641	64 W	4600	0
	N11 7365	28/02/90	1624 night	15 E	4099	0
	N11 7366	28/02/90	1803 night	58 W	4600	0
W588	N11 7372	01/03/90	0451	9 E	3393	0
	-----1 line file-----					
	N11 7373	01/03/90	0630	79 W	4600	0
W589	N11 7380	01/03/90	1752 night	71 W	4600	0
	-----1 line file-----					
	N11 7387	02/03/90	0619	76 E	4600	0
W590	N11 7394	02/03/90	1741 night	80 E	4600	0
	N11 7401	03/03/90	0608	59 E	4600	0
W591	N11 7408	03/03/90	1730 night	69 E	4600	0
	N11 7415	04/03/90	0558	46 E 2 hdr	4600	0
W592	-----1 line file-----					
	N11 7416	04/03/90	0739	19 W	4507	0
	N11 7422	04/03/90	1719 night	53 E	4600	1
W593	N11 7725	26/03/90	0522	21 E	4547	0
	N11 7726	26/03/90	0703	40 W	4600	0
W594	N11 7732	26/03/90	1645 night	25 E	4600	0
	N11 7733	26/03/90	1825 night	32 W	4600	0
W595	N11 7727	26/03/90	0846	2 W	2010	0
	N11 7739	27/03/90	0512	17 E	4228	0
W596	N11 7740	27/03/90	0652	51 W	4600	0
	N11 7746	27/03/90	1634 night	20 E	4382	0
W597	N11 7747	27/03/90	1814 night	44 W	4600	0
	N11 7753	28/03/90	0502	13 E	3803	0
W598	N11 7754	28/03/90	0641	63 W	4600	0
	N11 7760	28/03/90	1624 night	16 E	4097	0
W599	N11 7761	28/03/90	1803 night	55 W	4600	0
	N11 7768	29/03/90	0630	82 W	4600	0
W600	N11 7769	29/03/90	0813	9 W	3693	3
	N11 7774	29/03/90	1614 night	12 E	3662	0
W601	N11 7775	29/03/90	1752 night	68 W	4600	0
	N11 7782	30/03/90	0620	76 E	4600	0
W602	N11 7783	30/03/90	0801	12 W	4045	0
	N11 7789	30/03/90	1741 night	87 E	4600	0
W603	N11 7796	31/03/90	0609	60 E	4600	0
	N11 7797	31/03/90	0750	15 W	4356	0
W604	N11 7803	31/03/90	1731 night	65 E	4045	0
	N11 7804	31/03/90	1913 night	12 W	4600	0
W605	N11 7810	01/04/90	0558	43 E	4600	0
	N11 7811	01/04/90	0739	21 W	4598	0
W606	N11 7817	01/04/90	1720 night	51 E	4600	0
	N11 7818	01/04/90	1902 night	16 W	4275	0
W607	N11 7824	02/04/90	0547	34 E	4600	0
	N11 7825	02/04/90	0728	26 W	4600	0
W608	-----1 line file-----					
	-----1 line file-----					
	N11 7831	02/04/90	1709 night	39 E	4600	0
	N11 7832	02/04/90	1851 night	21 W	4600	0
W609	N11 7839	03/04/90	0537	27 E	4600	1
	N11 7839	03/04/90	0717	32 W 2 hrs	4600	0
W610	N11 7845	03/04/90	1659 night	32 E	4600	0
	N11 7846	03/04/90	1839 night	27 W	4600	0
W611	N11 7852	04/04/90	0526	21 E	4554	0
	N11 7853	04/04/90	0706	41 W	4600	0
W612	-----1 line file-----					

	N11 8248	02/05/90	0705	44 W	4600	0		-----1 line file-----	N11 8423	15/05/90	0806	12 W	3897	3
W662	N11 8254	02/05/90	1647 night	23 E	4600	2		N11 8438	15/05/90	1746 night	84 E	4600	0	
	N11 8255	02/05/90	1827 night	38 W	4600	0		-----0 line file-----	N11 8445	16/05/90	0613	56 E	4600	0
W663	N11 8261	03/05/90	0514	15 E	4144	2		N11 8446	16/05/90	0755	16 W	4181	0	
	N11 8262	03/05/90	0654	55 W	4598	0		N11 8452	16/05/90	1735 night	67 E	4600	7	
W664	N11 8268	03/05/90	1636 night	19 E	4358	4		N11 8453	16/05/90	1918 night	12 W	3801	3	
	-----1 line file-----							N11 8459	17/05/90	0603	44 E	4600	2	
	-----1 line file-----							N11 8460	17/05/90	0744	20 W	4414	0	
	-----1 line file-----							-----1 line file-----	N11 8466	17/05/90	1724 night	52 E	4600	0
W665	N11 8269	03/05/90	1815 night	49 W	4600	0		-----1 line file-----	N11 8467	17/05/90	1906 night	16 W	4296	0
	N11 8275	04/05/90	0503	11 E	3764	2			N11 8473	18/05/90	0552	35 E	4600	1
W666	N11 8276	04/05/90	0643	71 W	4600	0			N11 8474	18/05/90	0733	25 W	4600	0
	-----1 line file-----								N11 8480	18/05/90	1714 night	41 E	4600	0
	N11 8282	04/05/90	1626 night	15 E	4118	0			N11 8481	18/05/90	1855 night	21 W	4580	0
	-----1 line file-----								N11 8487	19/05/90	0541	27 E	4600	0
	-----1 line file-----								N11 8488	19/05/90	0721	31 W	4600	0
W667	N11 8283	04/05/90	1804 night	63 W	4600	0			N11 8494	19/05/90	1703 night	33 E	4600	7
	-----1 line file-----								N11 8495	19/05/90	1844 night	26 W	4600	0
	N11 8290	05/05/90	0632	86 E	4600	0			N11 8501	20/05/90	0531	21 E	4527	0
	N11 8291	05/05/90	0814	10 W	3676	0		-----1 line file-----	N11 8502	20/05/90	0711	39 W	4600	0
W668	N11 8296	05/05/90	1616 night	11 E	3715	0			N11 8508	20/05/90	1653 night	26 E	4600	0
	N11 8297	05/05/90	1753 night	75 W	4600	0			N11 8509	20/05/90	1833 night	33 W	4600	0
W669	N11 8304	06/05/90	0621	70 E	4600	0			N11 8515	21/05/90	0520	17 E	4281	0
	-----1 line file-----								N11 8516	21/05/90	0659	50 W	4600	0
W670	N11 8305	06/05/90	0803	13 W	4009	0			N11 8522	21/05/90	1642 night	21 E	4493	0
	-----1 line file-----								N11 8523	21/05/90	1821 night	43 W	4600	0
	N11 8311	06/05/90	1743 night	75 E	4598	1			N11 8529	22/05/90	0509	13 E	3921	0
	N11 8318	07/05/90	0610	54 E	4600	0			N11 8530	22/05/90	0649	64 W	4600	0
W671	N11 8319	07/05/90	0752	17 W	4316	2			N11 8536	22/05/90	1632 night	16 E	4236	4
	N11 8325	07/05/90	1732 night	63 E	4600	2		-----1 line file-----	N11 8537	22/05/90	1811 night	55 W	4600	0
W672	N11 8353	09/05/90	1711 night	39 E	4600	0			N11 8544	23/05/90	0638	76 W	4600	9
	N11 8354	09/05/90	1852 night	22 W	4583	0			N11 8550	23/05/90	1621 night	13 E	3880	0
W673	N11 8360	10/05/90	0538	26 E	4600	0			N11 8551	23/05/90	1800 night	71 W	4600	0
	N11 8361	10/05/90	0719	33 W	4600	0			N11 8558	25/05/90	0627	73 E	4600	0
W674	N11 8367	10/05/90	1700 night	31 E	4600	2			N11 8559	24/05/90	0809	11 W	3776	0
	N11 8368	10/05/90	1841 night	28 W	4600	0			N11 8565	24/05/90	1748 night	85 E	4600	0
W675	N11 8374	11/05/90	0528	20 E	4530	0			N11 8572	25/05/90	0616	61 E	4600	0
	N11 8375	11/05/90	0708	41 W	4600	0			N11 8573	25/05/90	0757	15 W	4099	0
W676	-----1 line file-----								N11 8579	25/05/90	1737 night	69 E	4600	0
	N11 8381	11/05/90	1650 night	25 E	4600	0			N11 8580	25/05/90	1920 night	11 W	3762	0
	-----1 line file-----								N11 8586	26/05/90	0605	48 E	4600	3
	N11 8382	11/05/90	1830 night	36 W	4600	0			N11 8587	26/05/90	0746	19 W	4309	0
W677	N11 8388	12/05/90	0517	16 E	4234	2			N11 8593	26/05/90	1727 night	55 E	4600	1
	N11 8389	12/05/90	0657	53 W	4600	0			N11 8594	26/05/90	1909 night	15 W	4259	0
W678	N11 8395	12/05/90	1639 night	20 E	4468	0			N11 8600	27/05/90	0554	37 E	4600	0
	N11 8396	12/05/90	1818 night	45 W	4600	0			N11 8601	27/05/90	0735	23 W	4562	0
W679	N11 8402	13/05/90	0506	12 E	3875	1			N11 8607	27/05/90	1716 night	44 E	4600	0
	N11 8403	13/05/90	0646	68 W	4600	0		-----1 line file-----						
W680	N11 8409	13/05/90	1629 night	15 E	4205	0		-----1 line file-----						
	N11 8410	13/05/90	1808 night	57 W	4600	0		-----1 line file-----						
W681	N11 8417	14/05/90	0635	85 W	4600	0			N11 8608	27/05/90	1857 night	19 W	4513	0
	N11 8423	14/05/90	1618 night	12 E	3823	0			N11 8614	28/05/90	0543	29 E no header	4368	0
W682	N11 8424	14/05/90	1757 night	73 W	4600	0			N11 8615	28/05/90	0724	29 W	4600	0
	N11 8431	15/05/90	0624	72 E	4600	0			-----7 line file-----					
W683	-----1 line file-----								N11 8621	28/05/90	1705 night	35 E	4600	2
	-----1 line file-----								N11 8622	28/05/90	1846 night	25 W	4600	0

W749	N11 8910	18/06/90	0517	14 E	4135	2		W795	N11 9312	16/07/90	1635 night	16 E	4201	0	
	N11 8911	18/06/90	0657	55 W	4600	0			N11 9320	17/07/90	0641	79 W	4600	0	
W750	N11 8917	18/06/90	1639 night	18 E	4298	6		W796	N11 9326	17/07/90	1624 night	12 E	3854	0	
	N11 8918	18/06/90	1818 night	49 W	4600	0			N11 9327	17/07/90	1803 night	69 W	4600	0	
W751	N11 8924	19/06/90	0506	11 E	3760	0		W797	N11 9334	18/07/90	0630	78 E	4600	0	
	N11 8925	19/06/90	0646	69 W	4600	0			N11 9335	18/07/90	0812	11 W	3891	0	
W752	N11 8931	19/06/90	1629 night	14 E	4006	1		W798	N11 9341	18/07/90	1752 night	77 E	4600	0	
	N11 8932	19/06/90	1807 night	62 W	4600	0			N11 9348	19/07/90	0619	61 E	4600	0	
W753	N11 8939	20/06/90	0635	81 E	?			W799	N11 9349	19/07/90	0801	15 W	4200	0	
	N11 8940	20/06/90	0817	10 W	3624	1			N11 9355	19/07/90	1741 night	67 E	4600	0	
W754	N11 8945	20/06/90	1618 night	11 E	3600	2		W800	N11 9356	19/07/90	1924 night	11 W	3661	0	
	N11 8946	20/06/90	1756 night	77 W	4600	0			N11 9362	20/07/90	0608	48 E	4600	0	
W755	N11 8953	21/06/90	0623	69 E	4600	0		W801	N11 9363	20/07/90	0749	19 W	4465	0	
	N11 8954	21/06/90	0805	13 W	3984	0			N11 9369	20/07/90	1730 night	54 E	4600	5	
W756	N11 8960	21/06/90	1745 night	74 E	4600	0		W802	-----1 line file-----						
	N11 8967	22/06/90	0612	54 E	4600	0			N11 9370	20/07/90	1912 night	15 W	4160	2	
W757	N11 8968	22/06/90	0745	17 W	4300	1			-----1 line file-----						
	N11 8974	22/06/90	1734 night	61 E	4600	0			N11 9376	21/07/90	0557	37 E	4599	1	
W758	N11 9010	25/06/90	0721	33 W	?			W803	-----1 line file-----						
	N11 9016	25/06/90	1702 night	30 E	4600	0			-----1 line file-----						
W759	N11 9017	25/06/90	1842 night	28 W	4600	0			-----1 line file-----						
	N11 9023	26/06/90	0529	20 E	4511	0			N11 9377	21/07/90	0738	24 W	4593	10	
W760	N11 9024	26/06/90	0710	42 W	4600	0			N11 9383	21/07/90	1719 night	43 E	4600	1	
	N11 9030	26/06/90	1651 night	24 E	4600	0			W804	N11 9384	21/07/90	1901 night	19 W	4508	0
W761	N11 9058	28/06/90	1631 night	15 E	4094	0			N11 9390	22/07/90	0547	29 E	4600	0	
	N11 9059	28/06/90	1810 night	60 W	4600	0			W805	N11 9391	22/07/90	0727	30 W	4593	1
W762	N11 9066	29/06/90	0637	76 E	4600	0			N11 9397	22/07/90	1709 night	34 E	4600	1	
	N11 9072	29/06/90	1621 night	12 E	3692	0			W806	N11 9398	22/07/90	1849 night	25 W	4600	7
W763	N11 9073	29/06/90	1759 night	76 W	4600	0			N11 9404	23/07/90	0536	23 E	4583	0	
	N11 9080	30/06/90	0626	71 E	4600	0			W807	N11 9405	23/07/90	0716	38 W	4600	1
W764	N11 9081	30/06/90	0808	12 W	3966	1			-----1 line file-----						
	N11 9087	30/06/90	1748 night	81 E	4600	3			-----1 line file-----						
W765	N11 9094	01/07/90	0615	55 E	?				W808	N11 9411	23/07/90	1658 night	27 E	4600	0
	N11 9095	01/07/90	0757	16 W	4261	5			N11 9412	23/07/90	1838 night	32 W no eof	4600	0	
W766	N11 9101	01/07/90	1737 night	64 E	4600	1			N11 9418	24/07/90	0525	18 E	4355	0	
	N11 9102	01/07/90	1920 night	12 W	3782	2			W809	N11 9419	24/07/90	0705	48 W	4600	0
W767	-----1 line file-----								-----1 line file-----						
	N11 9108	02/07/90	0604	43 E	4600	0			N11 9425	24/07/90	1647 night	21 E 2 hrs	4494	0	
	N11 9109	02/07/90	0745	21 W	4503	0			W810	N11 9426	24/07/90	1827 night	41 W	4600	0
W768	-----1 line file-----								-----1 line file-----						
	N11 9115	02/07/90	1726 night	49 E	?				W811	N11 9432	25/07/90	0515	13 E	4031	5
	N11 9116	02/07/90	1908 night	16 W	?				N11 9433	25/07/90	0654	61 W no eof	4600	6	
W769	-----1 line file-----								N11 9439	25/07/90	1637 night	17 E 2 hrs	4207	0	
	N11 9122	03/07/90	0553	34 E	4600	0			W812	N11 9440	25/07/90	1816 night	53 W	4600	0
	N11 9123	03/07/90	0734	26 W	4600	0			N11 9447	26/07/90	0643	74 W	4600	0	
W770	-----1 line file-----								W813	N11 9453	26/07/90	1627 night	13 E	3935	0
	N11 9129	03/07/90	1715 night	39 E	4600	0			N11 9454	26/07/90	1805 night	68 W	4600	0	
	N11 9130	03/07/90	1857 night	21 W	4561	0			W814	N11 9461	27/07/90	0632	74 E	4600	2
W771	-----1 line file-----								N11 9462	27/07/90	0814	11 W	3838	0	
	N11 9136	04/07/90	0543	26 E	4600	0			W815	N11 9468	27/07/90	1754 night	86 W	4600	0
	N11 9137	04/07/90	0723	32 W	4600	0			N11 9504	30/07/90	0741	23 W	4600	0	
W772	N11 9143	04/07/90	1705 night	31 E	4600	0			W816	N11 9511	30/07/90	1903 night	18 W	4524	0
	N11 9144	04/07/90	1845 night	27 W	4600	0			N11 9517	31/07/90	0549	30 E	1711	0	
W773	N11 9150	05/07/90	0532	21 E	4526	0			W817	-----1 line file-----					
	N11 9151	05/07/90	0712	41 W	4600	0			N11 9518	31/07/90	0729	29 W	4600	0	
W774	N11 9157	05/07/90	1654 night	25 E	4600	0			N11 9524	31/07/90	1711 night	35 E	4600	0	
	N11 9158	05/07/90	1834 night	34 W	4600	0			W818	N11 9525	31/07/90	1852 night	25 W	4600	1
W775	N11 9164	06/07/90	0521	16 E	4275	0			N11 9531</						

	N11 9545	02/08/90	0528	18 E	4437	0		N11 9778	18/08/90	1715 night	38 E	4600	0		
W821	N11 9546	02/08/90	0708	47 W	4512	0		N11 9779	18/08/90	1856 night	23 W	4600	0		
	N11 9552	02/08/90	1650 night	22 E	4558	0		N11 9785	19/08/90	0543	25 E	4600	2		
W822	N11 9553	02/08/90	1830 night	40 W	4600	0		N11 9786	19/08/90	0723	35 W	4600	0		
	N11 9559	03/08/90	0517	14 E	4155	0		N11 9792	19/08/90	1705 night	30 E	4600	0		
W823	N11 9560	03/08/90	0657	59 W	4600	0		N11 9793	19/08/90	1845 night	29 W	4600	0		
	N11 9566	03/08/90	1640 night	17 E	4310	0		N11 9806	20/08/90	1654 night	24 E	4600	0		
W824	N11 9567	03/08/90	1819 night	52 W	4600	0		N11 9807	20/08/90	1833 night	37 W	4600	0		
	N11 9574	04/08/90	0646	71 W	4600	0		N11 9814	21/08/90	0659	56 W	4600	0		
W825	N11 9580	04/08/90	1629 night	13 E	3981	0		N11 9828	22/08/90	0649	70 W	4600	0		
	N11 9581	04/08/90	1808 night	67 W	4600	1		-----1 line file-----							
W826	N11 9588	05/08/90	0635	76 E	4600	0		N11 9834	22/08/90	1633 night	15 E	4148	0		
	N11 9589	05/08/90	0817	11 W	3812	0		N11 9835	22/08/90	1811 night	62 W	4600	0		
W827	N11 9594	05/08/90	1619 night	10 E	3579	0		N11 9842	23/08/90	0639	78 E	4600	0		
	N11 9595	05/08/90	1757 night	85 W	4600	0		N11 9843	23/08/90	0821	10 W	3535	0		
W828	N11 9602	06/08/90	0624	64 E	4600	0		N11 9848	23/08/90	1623 night	11 E	3729	0		
	N11 9603	06/08/90	0806	14 W	4149	1		N11 9849	23/08/90	1800 night	79 W	4600	2		
W829	N11 9616	07/08/90	0613	50 E	4600	0		N11 9856	24/08/90	0628	67 E	4600	2		
	N11 9617	07/08/90	0754	18 W	4413	0		N11 9857	24/08/90	0810	13 W	3975	0		
W830	N11 9623	07/08/90	1735 night	58 E	4600	1		N11 9863	24/08/90	1750 night	81 E	4600	0		
	N11 9624	07/08/90	1917 night	14 W	4075	0		N11 9870	25/08/90	0617	53 E	4600	14		
W831	N11 9630	08/08/90	0602	39 E	4600	2		N11 9871	25/08/90	0759	17 W	4295	1		
	N11 9631	08/08/90	0743	23 W	4600	0		N11 9878	25/08/90	1921 night	13 W	3993	1		
W832	N11 9637	08/08/90	1724 night	45 E	4600	0		N11 9884	26/08/90	0606	42 E	4600	2		
	N11 9638	08/08/90	1905 night	18 W	4452	1		N11 9885	26/08/90	0747	21 W	4544	1		
W833	N11 9644	09/08/90	0551	31 E	4600	1		N11 9891	26/08/90	1728 night	50 E	4600	0		
	N11 9645	09/08/90	0732	28 W	4595	0		N11 9892	26/08/90	1910 night	17 W	4461	9		
W834	N11 9651	09/08/90	1713 night	35 E	4600	0		N11 9898	27/08/90	0555	33 E	4600	1		
	N11 9652	09/08/90	1854 night	24 W	4600	0		N11 9905	27/08/90	1717 night	39 E	4600	4		
W835	N11 9658	10/08/90	0540	24 E no eof	285	0		N11 9906	27/08/90	1858 night	22 W	4504	1		
	N11 9659	10/08/90	0721	35 W	4600	1		N11 9920	28/08/90	1847 night	28 W	4600	0		
W836	N11 9665	10/08/90	1702 night	28 E	4600	1		-----1 line file-----							
	N11 9666	10/08/90	1843 night	30 W	4600	3		N11 9926	29/08/90	0534	20 E	4530	2		
W837	N11 9672	11/08/90	0529	19 E	4487	0		W866	-----1 line file-----						
	N11 9673	11/08/90	0710	45 W	4600	0		N11 9927	29/08/90	0714	41 W	4600	0		
W838	N11 9679	11/08/90	1651 night	23 E	4579	4		N11 9933	29/08/90	1656 night	25 E	4600	2		
	-----1 line file-----							N11 9934	29/08/90	1836 night	36 W	4600	4		
	N11 9680	11/08/90	1831 night	39 W	4600	0		N11 9940	30/08/90	0523	16 E	4249	1		
W839	N11 9686	12/08/90	0519	14 E	4173	5		W868	N11 9941	30/08/90	0703	53 W	4600	3	
	N11 9687	12/08/90	0658	58 W	4600	0		N11 9947	30/08/90	1645 night	20 E	4441	0		
W840	N11 9693	12/08/90	1641 night	18 E	4315	0		W869	N11 9948	30/08/90	1824 night	46 W	4600	1	
	N11 9694	12/08/90	1820 night	49 W	4600	0		-----1 line file-----							
W841	N11 9700	13/08/90	0508	11 E	3754	0			N11 9954	31/08/90	0521	12 E	3866	1	
	N11 9701	13/08/90	0647	75 W	4600	0			N11 9955	31/08/90	0651	68 W	4600	0	
W842	N11 9707	13/08/90	1631 night	14 E	4060	0			N11 9961	31/08/90	1634 night	15 E	4141	0	
	N11 9708	13/08/90	1809 night	63 W	4600	1			N11 9962	31/08/90	1813 night	61 W	4600	0	
W843	N11 9715	14/08/90	0636	86 E	4600	0			N11 9969	01/09/90	0640	78 E	4600	0	
	N11 9716	14/08/90	0819	10 W	3747	0			N11 9975	01/09/90	1624 night	12 E	3740	0	
W844	N11 9721	14/08/90	1620 night	11 E	3677	0			N11 9989	02/09/90	1614 night	9 E	3338	0	
	N11 9722	14/08/90	1758 night	75 W	4600	0			N11 9990	02/09/90	1751 night	82 W	4600	0	
W845	N11 9729	15/08/90	0625	68 E	4600	0			-----1 line file-----						
	N11 9730	15/08/90	0808	14 W	4077	0			N11 9996	03/09/90	0442	2 E	1595	0	
W846	N11 9736	15/08/90	1748 night	73 E	4600	0			N11 9997	03/09/90	0618	54 E	4600	0	
	N11 9737	15/08/90	1931 night	10 W	3492	0			N11 9998	03/09/90	0800	16 W	4300	0	
W847	N11 9750	16/08/90	1737 night	60 E	4600	0			W875	N11 10003	03/09/90	1604 night	6 E	2812	2
	N11 9757	17/08/90	0604	41 E	4600	0			N11 10004	03/09/90	1740 night	65 E	4600	0	
W848	N11 9758	17/08/90	0745	22 W	4591	1			W876	N11 10005	03/09/90	1923 night	13 W	3843	0
	N11 9764	17/08/90	1726 night	48 E	4600	0			N11 10018	04/09/90	1729 night	50 E	4600</		

	N11 10032	05/09/90	1719 night	39 E	4600	0		N11 10294	24/09/90	0730	30 W	4600	0			
W879	N11 10040	06/09/90	0727	33 W	4600	0	W908	N11 10300	24/09/90	1711 night	33 E	4600	0			
	N11 10046	06/09/90	1708 night	31 E	4600	0		N11 10301	24/09/90	1852 night	26 W	4600	0			
W880	N11 10053	07/09/90	0536	20 E	4510	0	W909	N11 10307	25/09/90	0539	22 E	4468	0			
	N11 10054	07/09/90	0716	41 W	4600	0		N11 10308	25/09/90	0719	38 W	4600	0			
W881	N11 10095	10/09/90	0504	8 E	3409	1	W910	N11 10314	25/09/90	1700 night	27 E	4600	0			
	N11 10096	10/09/90	0643	78 E	4600	0		N11 10315	25/09/90	1841 night	33 W	4600	0			
W882	N11 10109	11/09/90	0454	5 E	2584	1	W911	N11 10321	26/09/90	0528	17 E	4278	0			
	N11 10110	11/09/90	0632	71 E	4600	0		N11 10322	26/09/90	0708	49 W	4600	0			
W883	N11 10111	11/09/90	0814	12 W	4973	2	W912	-----1 line file-----								
	N11 10116	11/09/90	1616 night	9 E	3382	0		N11 10328	26/09/90	1650 night	21 E	4503	0			
W884	N11 10117	11/09/90	1753 night	84 E	4600	0		N11 10329	26/09/90	1830 night	42 W	4600	0			
	N11 10123	12/09/90	0444	3 E	1673	0	1P	W913	N11 10335	27/09/90	0518	13 E	3912	2		
W885	N11 10124	12/09/90	0621	57 E	4600	4	1P		N11 10336	27/09/90	0657	63 W	4600	4		
	N11 10125	12/09/90	0802	16 W	4293	1		W914	N11 10342	27/09/90	1640 night	17 E	4253	0		
W886	N11 10130	12/09/90	1606 night	6 E	2849	1			N11 10343	27/09/90	1819 night	54 W	4600	0		
	N11 10131	12/09/90	1742 night	66 E	4600	0		W915	N11 10349	28/09/90	0507	9 E	3424	0		
W887	N11 10132	12/09/90	1925 night	12 W	3799	0			N11 10350	28/09/90	0646	81 W	4600	0		
	N11 10138	13/09/90	0610	44 E	4600	1		W916	N11 10356	28/09/90	1629 night	13 E	3872	0		
W888	N11 10139	13/09/90	0751	20 W	4490	0			N11 10357	28/09/90	1808 night	67 W	4600	0		
	N11 10146	13/09/90	1913 night	16 W	4289	0		W917	N11 10363	29/09/90	0457	6 E	2791	0		
W889	N11 10152	14/09/90	0600	34 E	4600	1			N11 10364	29/09/90	0635	79 E	4600	0		
	N11 10153	14/09/90	0740	25 W	4600	0		W918	N11 10365	29/09/90	0817	11 W	3843	0		
W890	N11 10159	14/09/90	1721 night	40 E	4600	0			N11 10370	29/09/90	1619 night	10 E	3480	1		
	N11 10160	14/09/90	1902 night	21 W	4600	0		W919	N11 10371	29/09/90	1757 night	76 W	4600	0		
W891	N11 10166	15/09/90	0548	27 E	4600	1			N11 10377	30/09/90	0447	3 E	238	0		
	N11 10167	15/09/90	0729	31 W	4600	0		W920	N11 10378	30/09/90	0624	62 E	4600	0		
W892	N11 10173	15/09/90	1710 night	32 E	4600	0		-----1 line file-----								
	N11 10174	15/09/90	1851 night	27 W	4600	0			N11 10379	30/09/90	0806	15 W	4123	0		
W893	N11 10180	16/09/90	0538	21 E	4512	0			N11 10385	30/09/90	1746 night	67 E	4600	4		
	N11 10181	16/09/90	0718	39 W	4600	0			N11 10386	30/09/90	1928 night	11 W	3744	0		
W894	N11 10187	16/09/90	1659 night	26 E	4600	0			N11 10392	01/10/90	0613	46 E	4600	2		
	N11 10188	16/09/90	1839 night	34 W	4600	0			N11 10393	01/10/90	0754	19 W	4387	0		
W895	N11 10194	17/09/90	0526	16 E	4273	0			N11 10399	01/10/90	1735 night	54 E	4600	8		
	-----1 line file-----								N11 10400	01/10/90	1917 night	15 W	4302	3		
	N11 10195	17/09/90	0706	50 W	4600	0			W924	N11 10406	02/10/90	0602	36 E	4600	0	
W896	N11 10201	17/09/90	1649 night	20 E	4501	0				N11 10413	02/10/90	1724 night	42 E	4600	0	
	N11 10202	17/09/90	1828 night	44 W	4501	0			W925	N11 10420	03/10/90	0551	28 E	4600	1	
W897	N11 10208	18/09/90	0516	12 E	3907	0				N11 10421	03/10/90	0732	30 W	4600	0	
	N11 10209	18/09/90	0655	65 W	4600	0			W926	N11 10427	03/10/90	1713 night	34 E	4600	1	
W898	N11 10222	19/09/90	0505	9 E	3429	0				N11 10428	03/10/90	1854 night	25 W	4600	0	
	N11 10223	19/09/90	0645	81 W	4600	0			W927	N11 10434	04/10/90	0540	22 E	4410	3	
W899	N11 10230	19/09/90	1805 night	72 W	4600	1				N11 10435	04/10/90	0721	38 W	4600	2	
	N11 10237	20/09/90	0633	76 E	4600	2			W928	N11 10441	04/10/90	1702 night	27 E	4600	0	
W900	N11 10238	20/09/90	0815	12 W	3916	0				N11 10442	04/10/90	1842 night	32 W	4600	0	
	N11 10244	20/09/90	1754 night	80 W	4600	1			W929	N11 10448	05/10/90	0530	17 E	4275	0	
W901	N11 10252	21/09/90	0803	15 W	4206	2				N11 10449	05/10/90	0709	49 W	4600	0	
	N11 10257	21/09/90	1607 night	7 E	2944	0			W930	N11 10455	05/10/90	1652 night	21 E	4498	8	
W902	-----1 line file-----										N11 10456	05/10/90	1831 night	41 W	4600	0
	N11 10258	21/09/90	1744 night	67 E	4600	3			W931	N11 10462	06/10/90	0519	13 E	3920	13	
	N11 10259	21/09/90	1926 night	12 W	3779	1				N11 10463	06/10/90	0658	63 W	4600	6	
W903	-----1 line file-----									W932	N11 10469	06/10/90	1641 night	17 E	4231	1
	N11 10265	22/09/90	0611	46 E	4600	2					N11 10470	06/10/90	1820 night	53 W	4600	0
	N11 10266	22/09/90	0752	19 E	4444	3				W933	N11 10477	07/10/90	0647	81 W	4600	0
W904	N11 10271	22/09/90	1558 night	4 E	2256	0					N11 10483	07/10/90	1631 night	13 E		

	N11 11021	14/11/90	1935 night	10 W	3576	2		N11 11330	06/12/90	1710 night	28 E	4600	0	
W998	N11 11027	15/11/90	0619	50 E	4600	3		N11 11331	06/12/90	1850 night	31 W	4600	0	2P
	N11 11028	15/11/90	0800	18 W	4405	2		N11 11337	07/12/90	0537	18 E	4440	0	
W999	N11 11034	15/11/90	1741 night	58 E 2 headers	4600	1		N11 11338	07/12/90	0716	46 W	4600	0	
	N11 11035	15/11/90	1923 night	14 W	4083	0		N11 11344	07/12/90	1659 night	22 E	4576	0	
W1000	N11 11042	16/11/90	0749	23 W	4600	1		N11 11345	07/12/90	1839 night	40 W	4600	0	
	N11 11048	16/11/90	1730 night	45 E	4600	1		N11 11351	08/12/90	0526	14 E	4170	0	
W1001	N11 11049	16/11/90	1911 night	18 W	4444	0		N11 11352	08/12/90	0706	59 W	4600	0	
	N11 11055	17/11/90	0557	30 E	4600	1		N11 11358	08/12/90	1649 night	18 E	4319	0	1P
W1002	N11 11056	17/11/90	0738	28 W	4600	2		N11 11359	08/12/90	1827 night	51 W no header	4600	0	
	N11 11062	17/11/90	1719 night	36 E	4600	0		N11 11365	09/12/90	0515	10 E	3686	0	
W1003	N11 11063	17/11/90	1900 night	24 W	4600	1		N11 11366	09/12/90	0654	73 W	4600	0	
	N11 11069	18/11/90	0546	24 E	4493	1		N11 11372	09/12/90	1637 night	14 E	3932	0	
W1004	N11 11070	18/11/90	0726	36 W	4600	0		N11 11373	09/12/90	1816 night	67 W	4600	0	
	N11 11077	18/11/90	1848 night	30 W	4600	1		N11 11380	10/12/90	0643	76 E	4600	0	
W1005	N11 11083	19/11/90	0535	18 E	4447	0		N11 11381	10/12/90	0825	11 W	3797	0	
	N11 11084	19/11/90	0715	46 W	4600	19		N11 11386	10/12/90	1627 night	10 E	3516	0	
W1006	N11 11090	19/11/90	1657 night	22 E	4526	3		N11 11387	10/12/90	1805 night	85 W	4600	0	
	N11 11091	19/11/90	1837 night	38 W	4600	13		N11 11394	11/12/90	0632	62 E	4600	0	
W1007	N11 11097	20/11/90	0525	14 E	4088	4		N11 11395	11/12/90	0813	14 W	4104	0	
	N11 11098	20/11/90	0704	59 W	4600	1		N11 11401	11/12/90	1754 night	75 E	4600	0	
W1008	N11 11104	20/11/90	1647 night	18 E	4284	0		N11 11402	11/12/90	1937 night	10 W	3614	0	
	N11 11105	20/11/90	1826 night	50 W	4600	0	1P	N11 11408	12/12/90	0621	50 E	4600	0	
W1009	N11 11112	21/11/90	0653	75 W	4600	0		N11 11409	12/12/90	0803	18 W	4392	0	
	N11 11118	21/11/90	1636 night	14 E	1842	0		N11 11415	12/12/90	1743 night	59 E	4600	0	
W1010	N11 11119	21/11/90	1814 night	64 W	4600	0		N11 11416	12/12/90	1925 night	14 W	4115	0	
	N11 11126	22/11/90	0641	82 E	4600	9		N11 11422	13/12/90	0610	39 E	4600	0	2P
W1011	-----1 line file-----							N11 11423	13/12/90	0751	23 W	4600	0	1P
	N11 11127	22/11/90	0833	10 W	3827	0		N11 11429	13/12/90	1732 night	46 E	4600	0	7P
	N11 11133	22/11/90	1803 night	79 W	4600	1		N11 11430	13/12/90	1913 night	18 W	4410	0	
W1012	N11 11140	23/11/90	0630	66 E	4600	2		N11 11436	14/12/90	0601	31 E	4600	0	
	N11 11141	23/11/90	0812	14 W	4152	1		N11 11437	14/12/90	0740	29 W	4600	0	
W1013	N11 11147	23/11/90	1752 night	74 E	4600	2		N11 11443	14/12/90	1721 night	36 E	4600	0	
	N11 11148	23/11/90	1935 night	10 W	3564	4		N11 11450	15/12/90	0548	24 E	4497	0	
W1014	N11 11154	24/11/90	0619	51 E	4600	0		N11 11451	15/12/90	0729	36 W	4600	0	
	N11 11155	24/11/90	0801	18 W	4397	0		W1045	----- no data -----					
W1015	N11 11161	24/11/90	1741 night	59 E	4600	0		N11 11457	15/12/90	1710 night	28 E	4600	0	
	N11 11162	24/11/90	1923 night	14 W	4067	0		N11 11458	15/12/90	1851 night	30 W	4600	0	
W1016	N11 11175	25/11/90	1730 night	46 E	4600	0		N11 11465	16/12/90	0717	46 W	4600	0	
	N11 11176	25/11/90	1912 night	18 W	4449	3	1P	N11 11471	16/12/90	1700 night	22 E	4577	0	
W1017	N11 11182	26/11/90	0557	31 E	4600	0	1P	N11 11472	16/12/90	1839 night	39 W	4600	0	2P
	N11 11183	26/11/90	0738	28 W	4600	0		N11 11478	17/12/90	0527	14 E	4158	0	
W1018	N11 11189	26/11/90	1719 night	36 E	4600	5		N11 11479	17/12/90	0706	59 W	4600	0	9P
	N11 11190	26/11/90	1900 night	23 W	4600	3		N11 11485	17/12/90	1649 night	18 E	4325	0	1P
W1019	N11 11197	27/11/90	0727	35 W	4600	0	5P	N11 11486	17/12/90	1828 night	50 W	4600	0	
	N11 11203	27/11/90	1708 night	28 E	338	0		N11 11493	18/12/90	0655	75 W	4600	0	4P
W1020	N11 11224	29/11/90	0525	14 E	4132	1		N11 11499	18/12/90	1638 night	14 E	4020	0	
	N11 11225	29/11/90	0704	57 W	4600	2		N11 11500	18/12/90	1817 night	66 W	4600	0	1P
W1021	N11 11231	29/11/90	1647 night	18 E	4266	0	1P	N11 11507	19/12/90	0643	80 E	4600	0	
	N11 11232	29/11/90	1826 night	50 W	4600	0	2P	N11 11508	19/12/90	0825	10 W	3829	0	
W1022	N11 11281	03/12/90	0620	50 E	4600	0	2P	N11 11513	19/12/90	1627 night	10 E	3578	0	
	N11 11282	03/12/90	0803	18 W	4378	0	3P	N11 11514	19/12/90	1805 night	80 W	4600	0	
W1023	N11 11288	03/12/90	1742 night	58 E 2 headers	4600	0	4P	N11 11521	20/12/90	0632	65 E	4600	0	1P
	N11 11289	03/12/90	1924 night	14 W	3975	0		N11 11522	20/12/90	0814	14 W	4117	0	
W1024	N11 11295	04/12/90	0609	39 E	4600	0		N11 1						

W1059	N11 11557	22/12/90	1914 night	18 W	4446	0
	N11 11563	23/12/90	0559	31 E	4600	0
	N11 11564	23/12/90	0740	28 W	4600	0
W1060	N11 11570	23/12/90	1721 night	36 E	4600	0
	N11 11571	23/12/90	1902 night	24 W	4600	0
W1061	N11 11577	24/12/90	0548	24 E	4468	0
<hr/> <p>-----1 line file-----</p>						
	N11 11578	24/12/90	0729	36 W	4600	0
W1062	N11 11584	24/12/90	1710 night	29 E	4600	0
	N11 11585	24/12/90	1851 night	30 W 2 headers	4600	0
W1063	N11 11591	25/12/90	0538	19 E	4430	0
	N11 11592	25/12/90	0717	46 W	4600	0
W1064	N11 11598	25/12/90	1700 night	23 E	4568	0
	N11 11599	25/12/90	1839 night	38 W	4600	0
W1065	N11 11605	26/12/90	0527	14 E	4068	0
	N11 11606	26/12/90	0707	59 W	4600	0
W1066	N11 11612	26/12/90	1649 night	18 E	4333	0
	N11 11613	26/12/90	1828 night	49 W	4600	0
W1067	N11 11626	27/12/90	1639 night	14 E	3994	400
	N11 11627	27/12/90	1817 night	64 W	1537	200
W1068	N11 11634	28/12/90	0644	84 E	4600	0
<hr/> <p>-----1 line file-----</p>						
	N11 11635	28/12/90	0826	10 W	3741	0
W1069	N11 11640	28/12/90	1628 night	11 E	3578	0
	N11 11641	28/12/90	1806 night	80 W	4600	0
W1070	N11 11648	29/12/90	0633	66 E	4600	0
	N11 11649	29/12/90	0815	14 W	4134	0
W1071	N11 11655	29/12/90	1755 night	76 E	4600	0
	N11 11656	29/12/90	1938 night	10 W	3624	0
W1072	N11 11662	30/12/90	0622	51 E	4600	0
	N11 11663	30/12/90	0804	18 W 2 headers	4379	0
W1073	N11 11669	30/12/90	1744 night	60 E	4600	0
	N11 11670	30/12/90	1926 night	14 W	4095	0
W1074	N11 11676	31/12/90	0611	40 E	4600	0
	N11 11677	31/12/90	0752	22 W	4599	0
W1075	N11 11683	31/12/90	1733 night	45 E	4600	0
	N11 11684	31/12/90	1914 night	19 W	4519	0

4P

2P

PRODUCT PRICE LIST (Effective March 1991)

A Standard NOAA/AVHRR Digital Products

Product
Code

- | | | |
|----|---|-------------------------|
| A1 | *CCT SHARP HRPT format 9 track 6250 BPI | \$200 (incl. tape cost) |
| A2 | CCT SHARP HRPT format 9 track 1600 BPI | \$280 (incl. tape cost) |
| A3 | *CCT BIL format 9 track 6250 BPI | \$200 (incl. tape cost) |
| A4 | CCT BIL format 9 track 1600 BPI | \$280 (incl. tape cost) |
| A5 | *CCT RAW HRPT format 9 track 6250 BPI | \$200 (incl. tape cost) |
| A6 | CCT RAW HRPT format 9 track 1600 BPI | \$280 (incl. tape cost) |

*available on EXABYTE also (replace product code A with an E)

B NOAA/AVHRR Rectified Digital Products

- | | | |
|----|--------------------------|---------------------------|
| B1 | *CCT BIL format 6250 BPI | \$200 + CPU computer time |
| B2 | CCT BIL format 1600 BPI | \$280 + CPU computer time |

OPTION 1 = using satellite ephemeris data

OPTION 2 = using ground control points

*available on EXABYTE (replace product code B with F).

C Standard Photographic Products

Refer to Remote Sensing Applications Centre Price List.

- Note • Freight and Handling Fees are applicable in addition to above costs.
 • 50% surcharge on orders with 3 day turnaround ex office.
 • Multiple copies by quotation

All orders addressed to:

Secretary
WASTAC

ORDER FORM

WASTAC

Western Australian Satellite Technology and Applications Consortium

Postal
 The Secretary, WASTAC
 C/- Remote Sensing Applications Centre
 8th Floor, Jardine House
 184 St George's Terrace
 PERTH WA 6000

Telephone: (09) 323 1520
 Fax: (09) 321 8576
 Telex: Lands AA 93784

F	Title _____
R	Name _____
O	Company _____
M	Address _____
T	City _____ State _____
O	Telephone _____

D	Title _____
E	Name _____
S	Company _____
P	Address _____
A	City _____ State _____
T	Telephone _____

PRODUCT #	DESCRIPTION	UNIT PRICE	QUAN.	TOTAL

Cheque or Money Order Payable to: WASTAC

W.A. Satellite Technology and Applications Consortium

Financial Statement: Year Ended 31 December 1990

A provisional end-of-year financial statement has been issued by the Accounts Branch and the position may be summarized as follows:

Income	\$ 35,845
Interest	15,735
TOTAL REVENUE	51,580
Expenditure	82,912
Excess of Expenditure Over Income	\$31,332

However, at the commencement of 1990, the Consortium account was \$119,179 in credit and the excess expenditure of \$31,332 in 1990 has been set against that accumulated surplus.

Thus, a sum of \$87,847 has been carried forward from 1990. There are outstanding commitments for equipment and consumables totalling \$34,746 and when the invoices for these items are passed for payment the carried forward balance will be reduced accordingly.

The effective balance in hand at the commencement of the 1991 financial year was therefore, \$53,101. Subject to the approval of the Management Committee, I will arrange for invoices to be raised for contributions of \$10,000 from Consortium members to cover the on-going costs of the facility for the current year.

Expenditure commitments to date total \$2,580 on the following items ordered since 1 January 1991.

Magnetic tapes (Graphic Business Supplies)	\$ 2,480
Slide Pockets (Jaylong Industries Pty Ltd)	\$ 100

N H Buckingham
 Administrative Officer
 Division of Engineering and Science

WASTAC BUDGET 1991

Estimated expenditure financial year January 1991 - December 1991:

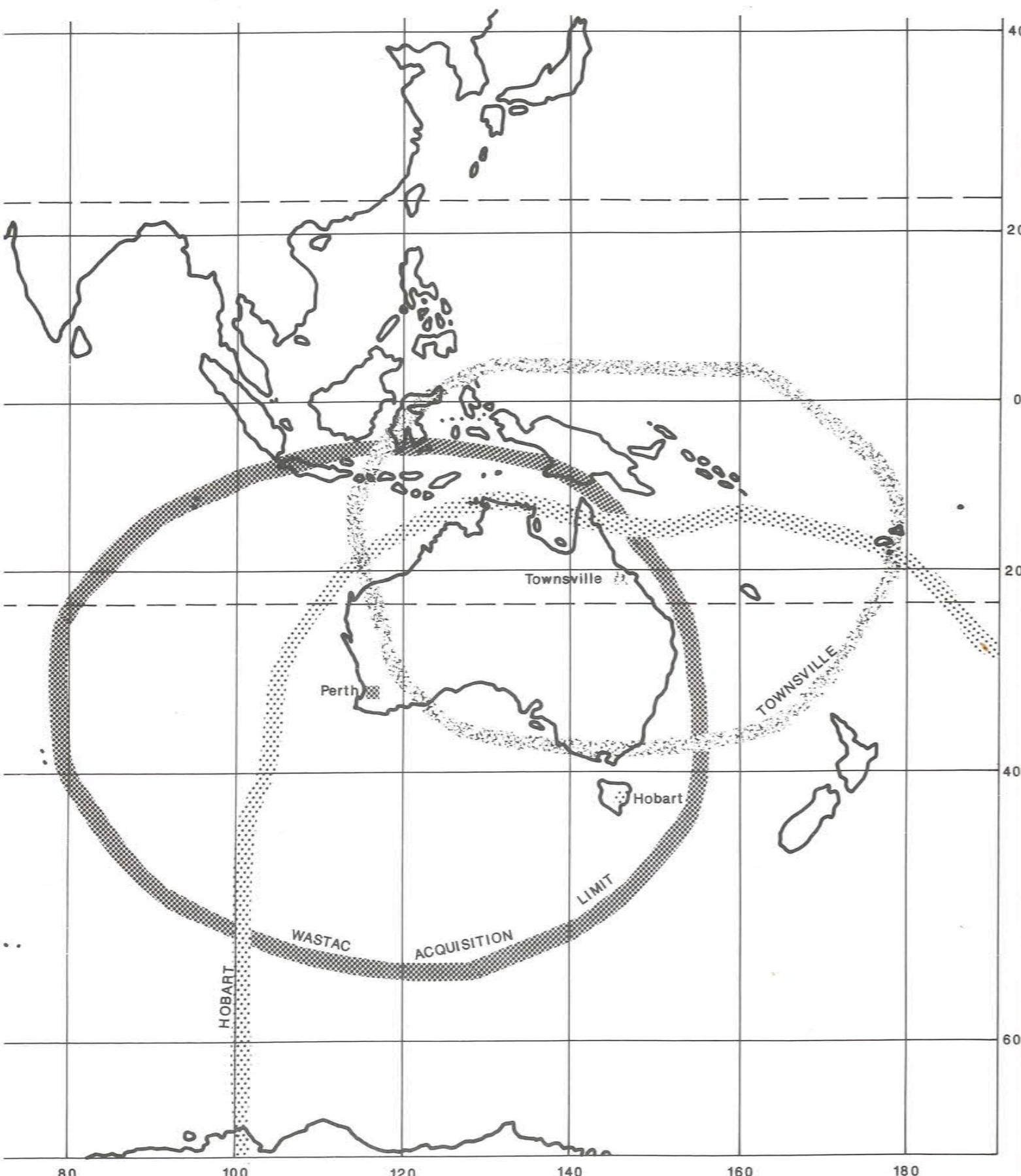
	Per Annum
	\$
1 Telecom rental	2000
2 Exabyte tapes \$30 tape 15 passes per tape Maximum 12 passes/day 50 weeks/year 4200 passes/year	8500
3 Tape drive maintenance	2500
4 System maintenance (new) based on 10% of equipment costs (\$75,000)	7500
5 Telecommunications - licence of facility	500
6 Photographic/Ink jet quicklook costs 7000 prints (4 passes/day) at 50 cents each 5 copies	3500
7 Consultants - Archive/product generation assistance	5000
8 Sundries, consumables	5000
9 Travelling - airfares	5000
10 Provision for equipment replacement	8000
 Total	 \$47,500

ASSETS REGISTER

At the beginning of 1990 all equipment held by WASTAC was included in the Curtin University "Asset Register".

An updated printout dated 6th March 1991 is included at page 14. Additional items in the process of either purchase or testing and not shown on the list include:

- 1 x 25MHz IBM PS2 model 80 and TAXAN monitor
- 5.25 diskette drive
- 1 SUN 2.0 gb exabyte

**Back Cover:**

NOAA sea surface temperature image dated 28th March 1989. The Leeuwin Current (in red-yellow) is flowing past the Abrolhos Islands, and off Perth it meanders offshore and forms an ant-clockwise eddy. There is also a large tongue of warm water much further offshore.