WASTAC

2017 Annual Report

Western Australian Satellite Technology and Applications Consortium

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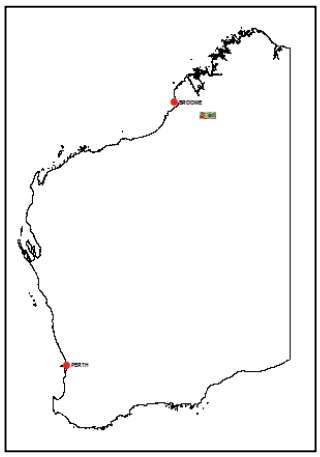
Front Cover: Fire in the Great Sandy Desert, Western Australia. Image is from Sentinel-2 LIC, taken 28 September 2017. Image is the combination of natural colours (4,3,2) and NIR/ SWIR (12,8,2). Image was created using a script developed to visualize wildfires from Sentinel-2 data with Sinergise EO Browser; the script was published by Pierre Markuse in August 2017.



Editor: W Thompson - Landgate

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Chairman's Report

What a whirlwind year 2017 turned out to be for WASTAC!

The X-band Deed members elected to and then signed an Agreement to extend the WASTAC X-band Consortium until 31 December 2018. Members from both the L-band and X-band Deeds also agreed to wind up WASTAC on 31 December 2018. As a consequence, there is a flurry of activity happening behind the scenes.

It is important to note that while WASTAC is winding down, its core function - the acquisition of satellite data via a ground station- continues. WASTAC has agreed to fund the cost of a new Orbital Systems reception capability to be located at Learmonth in Western Australia. This will be operated by the Bureau of Meteorology with guidance and advice on reception requirements being provided by the Australian Ground Segment Technical Team (ANGSTT).

In addition, WASTAC has chosen to support the aims of the Australian Space Utilisation Policy through the funding of a website to publish reception schedules from all government operated earth observation satellite receiving stations, a national scheduling system for all Tier 3 (generally 2.4m dishes for polar orbiting satellites) stations, and the stitching of data received by all Tier 3 stations into an whole of swath/orbit product. In addition, the Board has agreed to invest in a fund to support awareness and education of earth observations. The details of this fund are yet to be fully worked through, so watch this space in the 2018 Annual Report.

In the day-to-day business of WASTAC, the total number of passes received in 2017 was 8,054. This is approximately 1,800 less passes than 2016 and represents the maintenance issue that turned out to be the level cage motor that occurred between late February and April 2017 at the Murdoch facility. While no additional satellites were added to the reception list in 2017, WASTAC is hoping to trial downloading of both FY-3D and JPSS-1 during the 2018 year. Unfortunately, both satellites are in the same time slot as Aqua and Suomi NPP, so the opportunity for free reception time to capture FY-3D and JPSS-1 are limited. FY-3E is due for launch sometime in 2018 and will be in the morning orbit, so I am hopeful that we may be able to receive some FY-3E before WASTAC winds up. Some Landgate partners have had a standing interest in the FY-3 series as risk mitigation satellites for the aging sensors on Terra and Aqua.

2017 marked the end of the official end to the L-band dish at Curtin. It was hoisted down intact in December and donated to Australian Space Academy who reinstalled it at Meckering in Western Australia's wheatbelt (Kennewell, Australian Space Academy). I am hopeful that they will spend the voluntary effort to make the repairs necessary to make it a more useful monument to our ground station past than just a pile of rusting metal.

As the Operational Applications reports show, data sourced from WASTAC is contributing to a number of activities, including worldwide numerical weather forecasting, and tracking and monitoring cyclones (Bureau of Meteorology) and climate change in Australia

Landgate has partnered with the Department of Fire and Emergency Services (DFES) to utilise the MODIS sensor for estimating grassland curing – a critical factor in the determination of fire weather warnings – at a national scale (Santich et al., Landgate and DFES).

In addition, 2017 appeared to be a rather active fire year in the Great Sandy Desert with a fire burning 30,000 square kilometers and the duration of the fire increasing the proportion of fire hot spots detected in Western Australia relative to other States and Territories (McMillan, Landgate). 2017 also marked a milestone for the NOAA-15 satellite reached 100,000 orbits around the earth (Steber and Khokhar, Landgate).

WASTAC remains in a strong financial position with sufficient reserves to make modifications to existing systems, as needed, and to see it through the transition to ANGSTT.

The WASTAC partners have contributed generously to the efficient running of WASTAC. Jackie Marsden, Joe Cudmore, and Mike Steber (Landgate), along with Kelly Desker (BOM), have kept the stations and processing systems operating. Ed King (CSIRO) makes available state vectors for geolocation of AVHRR imagery, as well as production providing technical capability for the stitching project mentioned earlier. Our Secretary, Dr. Wendy Thompson, has been an invaluable resource to keep myself and the various processes moving that are required to keep WASTAC operating in the direction it has chosen to go in until 31 December 2018.

As Chairman, and despite that I know that WASTAC will be no more from 1 January 2019, I take pride in the major contributions WASTAC has made and is continuing to make to support the advancement of our understanding of land, ocean and atmospheric processes across Australia.

Dr Matthew Adams
Chairman, WASTAC 2017

WASTAC Board and Standing Committee

WASTAC Board for 2017

Dr Matthew Adams – Chairman
Landgate

Dr Wendy Thompson – Secretary
Landgate

Adjunct Prof. Merv Lynch
Curtin University (School of Science – Physics)

Prof. David Antoine
Curtin University (School of Science – Physics)

Dr Edward King
CSIRO

Ms Agnes Lane
Bureau of Meteorology

Mr Mike Bergin
Bureau of Meteorology

Dr Adam Lewis
Geoscience Australia

Dr Jatin Kala
Murdoch University

Dr Halina Kobryn
Murdoch University

Dr Margaret Andrew
Murdoch University

WASTAC Standing Committee and proxy to the Board

Dr Matthew Adams – Chairman
Landgate

Dr Wendy Thompson – Secretary
Landgate

Adjunct Prof. Merv Lynch
Curtin University (School of Science – Physics)

Dr Peter Fearns
Curtin University (School of Science – Physics)

Ms Kelly Desker
Bureau of Meteorology

Dr Jatin Kala
Murdoch University

Dr Halina Kobryn
Murdoch University

Dr Margaret Andrew
Murdoch University

Dr Peter Caccetta
CSIRO

Dr David Hudson
Geoscience Australia

Mr Guy Royal
Geoscience Australia

ANGSTT – Australian National Ground Segment Technical Team*

Dr David Hudson
Geoscience Australia

Mr Vincent Rooke
Geoscience Australia

Dr Jackie Marsden
Landgate

Mr Mike Steber
Landgate

Ms Kelly Desker
Bureau of Meteorology

Dr Edward King
CSIRO

*Replaced WASTAC Technical Committee January 2017.

WASTAC Strategic Plan

Vision:

Improve the economy, society and environment through the acquisition of satellite observations of Western Australia and its oceans for research and near real-time applications.

Mission:

- Provide high speed access to Aqua, Terra, National Oceanic and Atmospheric Administration (NOAA), Sea-Viewing Wide Field-of-View Sensor (SeaWiFS) and FengYun-1D FY-1D) satellite data to members on a non-profit basis.
- Contribute these data for national and international initiatives in remote sensing.
- Adopt recognised data formats to ensure wide access to WASTAC data.
- Maintain the integrity of archived data for research and operational applications.
- Promote the development and calibration of value-added products.
- Prepare for utilisation of information from new technically and scientifically advanced sensors.
- Promote educational and research uses of WASTAC data.
- Promote use of Aqua, Terra, NOAA, SeaWiFS and FY1D data in climate studies, environmental and renewable resource management.
- Encourage WASTAC to promote awareness of products.

Current strategies:

- Upgrade existing reception and processing capabilities and upgrade Meteorological Operational (METOP) geolocation processing to utilise CSIRO's CAPS software. FY3.
- Continue to improve the products derived from Moderate Resolution Imaging Spectroradiometer (MODIS), AVHRR, and VIIRS sensors.
- Advance the processing of AIRS data from Aqua and Terra.
- Improve the management and access of the WASTAC archive through collaboration with the Pawsey Centre.
- Provide network access to other Earth Observation Satellite receiving stations in Australia.

Operations

WASTAC maintained an L-band reception facility at Curtin University and still maintains a dual X- and L-band facility at Murdoch University. The L-band facility was operational from 1983-2016, although satellite tracking at Curtin (then the WA Institute of Technology) began in the late 1970s. The X-band facility has been operating since 2001. WASTAC members make use of the satellite data for weather prediction, vegetation and fire monitoring, and research. WASTAC maintains an archive of L-band images beginning in 1983, and an ongoing near real-time archive of X-band images from 2001.

Curtin University – L-band

The L-band facility at Curtin University in Bentley consisted of a 2.4m antenna and an antenna controller supplied by Environmental Systems and Services (ES&S) and dual ingestor computers running an AVHRR ingest and display system developed by the Bureau of Meteorology (Bureau). This data was ingested into the central processing computers at the Bureau's Head Office.

In February 2016, critical equipment failure resulted in the L-band facility brought offline permanently. In December 2017, the L-band facility was dismantled and donated to the Australian Space Academy with the assistance of Curtin University.

Murdoch University – X- and L-band

The X- and L-band reception facility was supplied by SeaSpace Corporation in 2001. It consists of a 3.6m antenna in a fiberglass dome, and an antenna controller computer. This facility receives data from the Aqua, Terra, MetOp, Suomi-NPP, FY3-B and FY3-C, as well as the L-band satellites such as NOAA-15, NOAA-18 and NOAA-19. The dual band reception capability at Murdoch is particularly beneficial following the L-band facility at Curtin having been brought offline.

The Murdoch University satellite reception facility is maintained by Landgate and Murdoch University staff.

Applications

Sea Surface Temperature (SST) products are produced by Landgate. Landgate also produces vegetation indices, fire scar mapping and agricultural applications in real-time.

WASTAC Data Archive

The WASTAC archive of satellite passes continues to be managed and maintained by Landgate's Imagery Team. The Imagery Team is based at the Landgate's main offices in the Perth suburb of Midland. The Imagery Team actively manages the daily archive and management systems that have been installed to ensure rapid and reliable delivery of WASTAC satellite data for research and wider community use.

The archive forms the basis for the development, processing and delivery of a range of products listed in the Operational and Research Applications sections of this report.

A total of 8,054 passes were archived at Murdoch in 2017.

The near real-time quick-look archive of VIIRS, MODIS and NOAA-AVHRR data continues to be maintained on the web. This digital archive extends back to 1983 (for NOAA-AVHRR). A similar archive of SeaWiFS quick-look data is also held on the web. The archive of MODIS, NOAA, VIIRS and SeaWiFS data can be viewed at:

www.rss.landgate.wa.gov.au/noaaql

www.rss.landgate.wa.gov.au/modisql

www.rss.landgate.wa.gov.au/seawifsql

www.rss.landgate.wa.gov.au/viirsql

Landgate currently holds the archive on 8mm Exabyte and 4mm DAT tapes. 20Gb DLT tapes were introduced as the archive medium in late 2000 for the L-band data and since the commissioning of the facility in 2001, X-band data has been archived on DLT 35Gb tapes and more recently LTO5 tapes.

Duplicate copies of the raw data archive are produced for a national archive program hosted at the National Computing Infrastructure (NCI) in Canberra that is coordinated by CSIRO.

Total Archived Passes 1981-2017

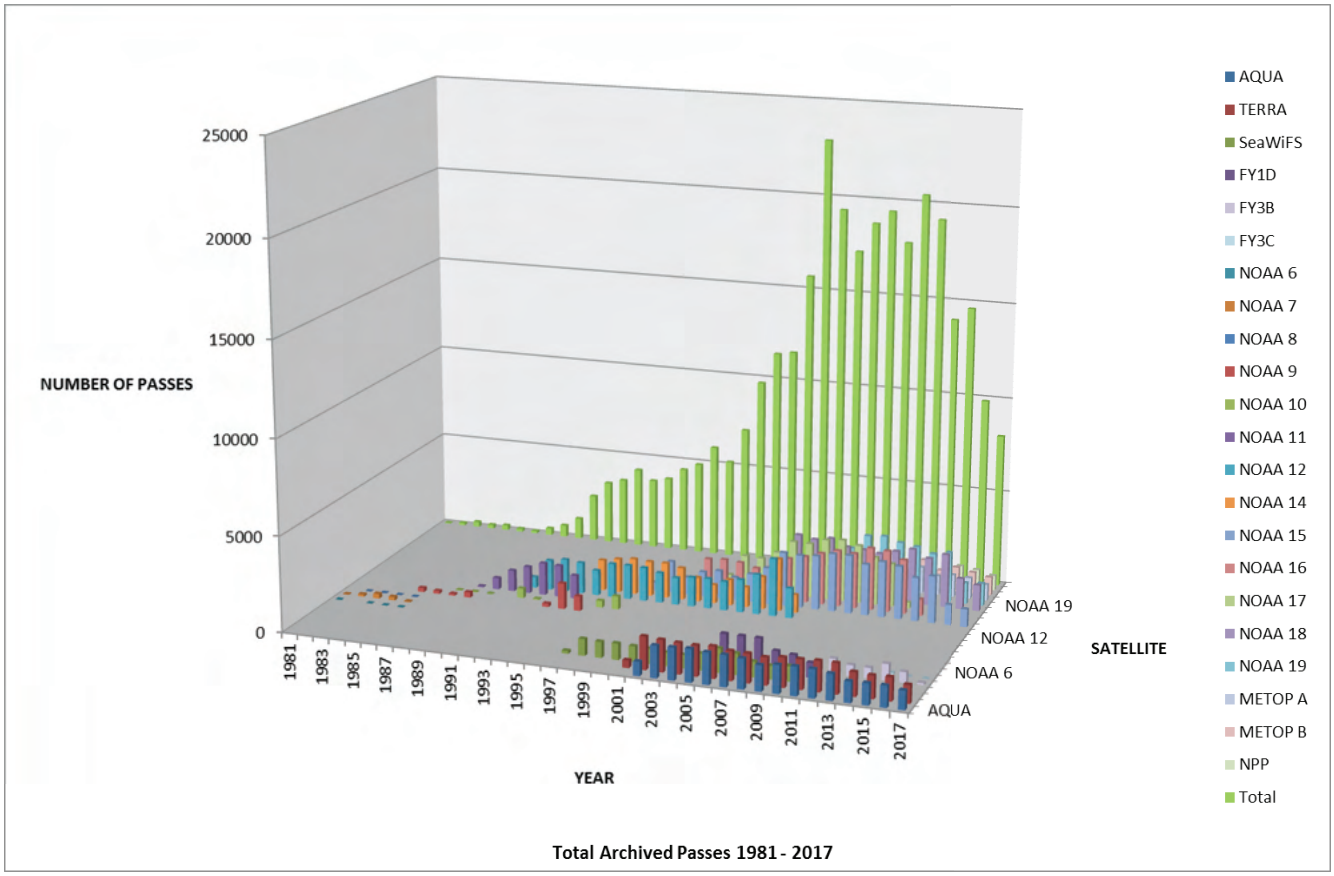


Figure 1: *Summary of archived passes recorded by year and by satellite from 1981-2017.*

	AQUA	TERRA	FY3B	FY3C	METOP A	METOP B	NPP	SeaWiFS	FY1D	NOAA 6	NOAA 7	NOAA 8	NOAA 9	NOAA 10	NOAA 11	NOAA 12	NOAA 14	NOAA 15	NOAA 16	NOAA 17	NOAA 18	NOAA 19	Total
1981										5	22												27
1982											115	1											116
1983										12	244	12											268
1984										7	179	4											190
1985										7	33	4	212										256
1986													151										151
1987													97	18									115
1988													280	25	53								358
1989														21	601								622
1990															1103								1103
1991														506	1399	575							2480
1992														47	1693	1571							3311
1993													183		1656	1720							3559
1994													1362		1227	1641							4230
1995													770			1326	1615						3711
1996														354		1780	1776						3910
1997								142						694		1797	1876						4509
1998								859								1763	1828	432					4882
1999								822								1589	1839	1663					5912
2000								843								1427	1681	905	341				5197
2001		390						811								1548	1271	1292	1733				7045
2002	734	1710						780								1579	976	1455	1789	709			9732
2003	1651	1645						696								1521	1351	1200	1728	1827			11388
2004	1665	1602						680								1727	1058	1481	1524	1797			11534
2005	1705	1577						863	553							2101	1706	1904	1743	2212	1339		15703
2006	1635	1639						1239	1683							3030	2761	2823	2240	2883	2989		22922
2007	1615	1512						1092	1678							1571	952	2777	2442	2869	2839		19347
2008	1553	1495						787	1673									2844	2711	3165	2985		17213
2009	1327	1411						687	1132									3055	2951	3254	2622	2306	18745
2010	1454	1516						793	1040									3061	2895	3054	2567	3058	19438
2011	1485	1537							751									2692	3282	2527	2453	3128	17855
2012	1465	1571	775		1118	316	924		255									2923	3223	2278	2677	2880	20405
2013	1349	1569	557		1383	1503	1243											2781	2845	316	2883	2752	19181
2014	1085	1232	536		1021	1044	987											2282	866		2484	2473	14010
2015	1101	1179	845	82	1161	1300	1106											2463			2790	2642	14669
2016	1096	1203	545	0	1102	1123	999											1059			1612	1112	9851
2017	971	931	99	0	841	962	781											934			1360	1175	8054

Table 1: *Total number of archived passes recorded by year and by satellite for 1981-2017.*

Total Archived Passes for 2017

		NOAA 15	NOAA 18	NOAA 19	FY3B	FY3C	METOP A	METOP B	TERRA	AQUA	NPP	TOTAL
JAN												
	M	63	111	93	0	0	70	79	66	49	35	566
												566
FEB												
	M	59	98	76	0	0	51	67	36	33	14	434
												434
MAR												
	M	35	34	20	0	0	10	21	4	4	2	130
												130
APR												
	M	68	81	59	21	0	53	60	51	50	41	484
												484
MAY												
	M	92	128	120	69	0	100	103	100	116	92	920
												920
JUN												
	M	69	130	90	9	0	94	90	98	111	87	778
												778
JUL												
	M	103	123	115	0	0	73	84	95	100	83	776
												776
AUG												
	M	82	129	124	0	0	81	91	99	102	83	791
												791
SEP												
	M	80	133	114	0	0	75	95	96	106	85	784
												784
OCT												
	M	92	141	126	0	0	72	95	99	114	84	823
												823
NOV												
	M	97	124	121	0	0	77	88	96	97	90	790
												790
DEC												
	M	94	128	117	0	0	85	89	91	89	85	778
												778
	Murdoch	934	1360	1175	99	0	841	962	931	971	781	8054

Table 2: *Summary of number of passes archived each month by satellite and by receiving dish during 2017.*

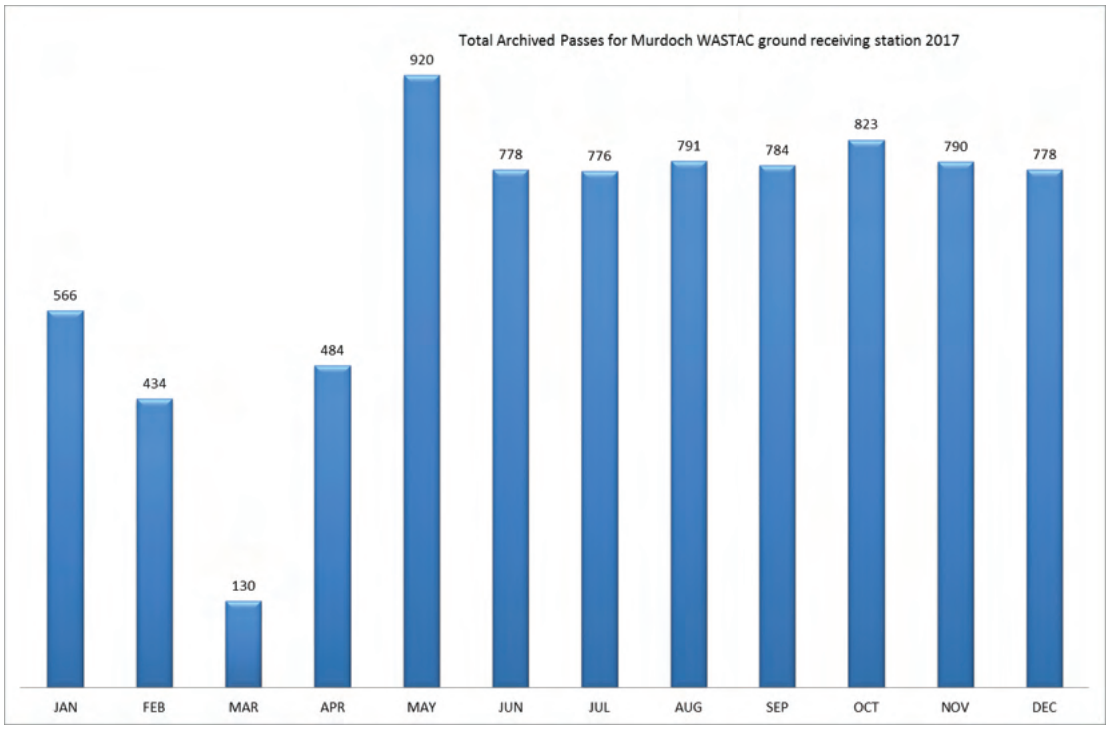


Figure 2: *Total number of archived passes for both Curtin and Murdoch dishes in 2017.*

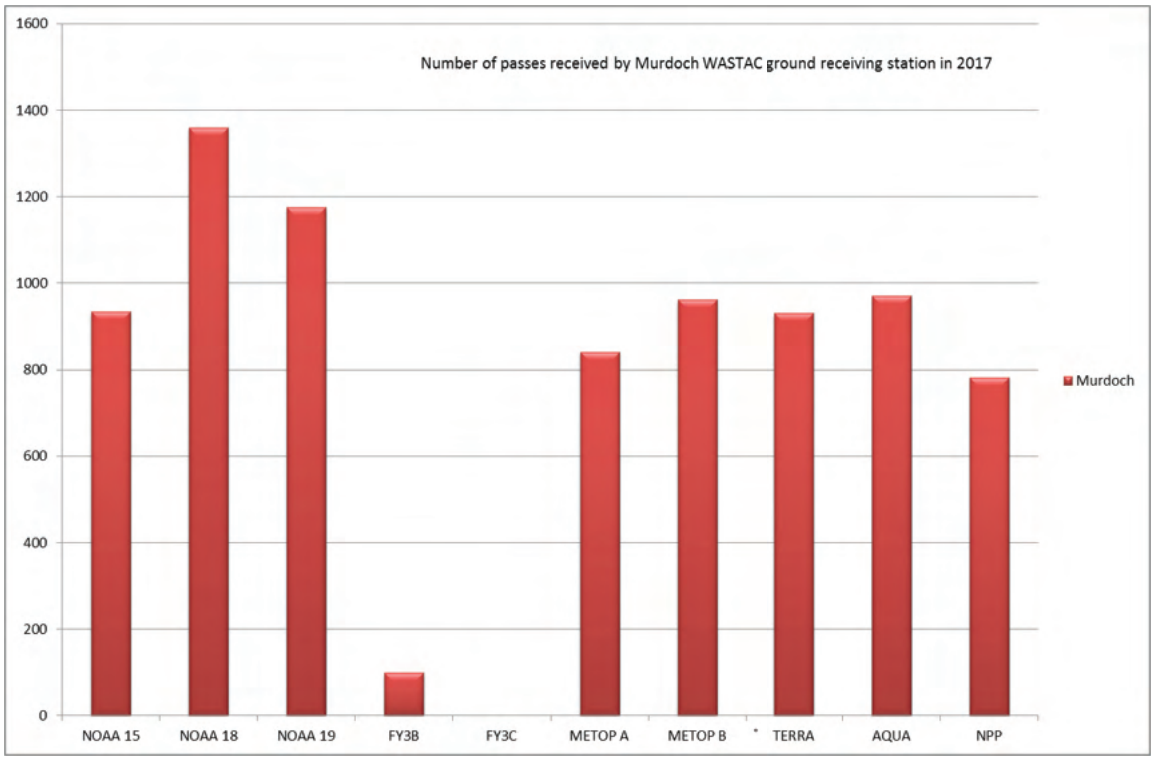


Figure 3: *Total number of passes archived for each satellite per WASTAC receiving dish in 2017.*

Curtin Dish Removal

On 15 December 2017, a team from Radio Communications Technology and Curtin University removed the WASTAC L-Band receiver antenna, base and support beams from the rooftop at Curtin University. This marked the end of more than three decades of satellite data reception at Curtin University. A detailed summary of the L-band receiver at Curtin was provided in the WASTAC 2016 Annual Report.

Photos below illustrate the removal process that took place on 15 December 2017. All photo credits are Carolyn McMillan, Landgate.

Figure 4: *WASTAC L-band receiver dish being prepared for removal from the rooftop at Curtin University. This dish was installed in 1987.*

Figure 5: *WASTAC L-band receiver dish being prepared for removal.*

Figure 6: *WASTAC L-band receiver dish being lowered off of the rooftop at Curtin University.*

Figure 7: *WASTAC L-band dish support frame being lowered off of the building.*

Figure 8: *WASTAC L-band receiver dish base being prepared for removal. The dish and base were donated to Australian Space Academy.*

A New Future for the WASTAC Curtin L-Band Dish

John A. Kennewell,
Australian Space Academy

The Australian Space Academy (ASA) approached WASTAC after learning that the L-Band satellite receiver dish at Curtin University was destined for scrap metal disposal. WASTAC approved the donation of the receiver dish and base to the ASA and plans were put in place host the equipment at the Australian Space Academy site at Meckering, about 150 km ENE of Perth.

The Australian Space Academy was established in 2000 to provide education in space matters (which is delivered primarily via the web site <www.spaceacademy.net.au>) and to host monitoring equipment for space environmental research. Currently the ASA monitor the geosphere, with seismic, electric and ionospheric monitors. The ASA hosts an astronomical robotic telescope for the University of North Carolina and will shortly install some solar radio receivers to support our space weather program. The ASA maintains a watch on the GPS constellation of satellites, and have developed a non-tracking satellite ground station for low resolution VHF meteorological data (refer to Figure 9). The ASA have also developed a low cost automated cloud cover sensor and are involved in a program that is used to help others choose appropriate Western Australian sites for optical astronomy and satellite laser ground stations.

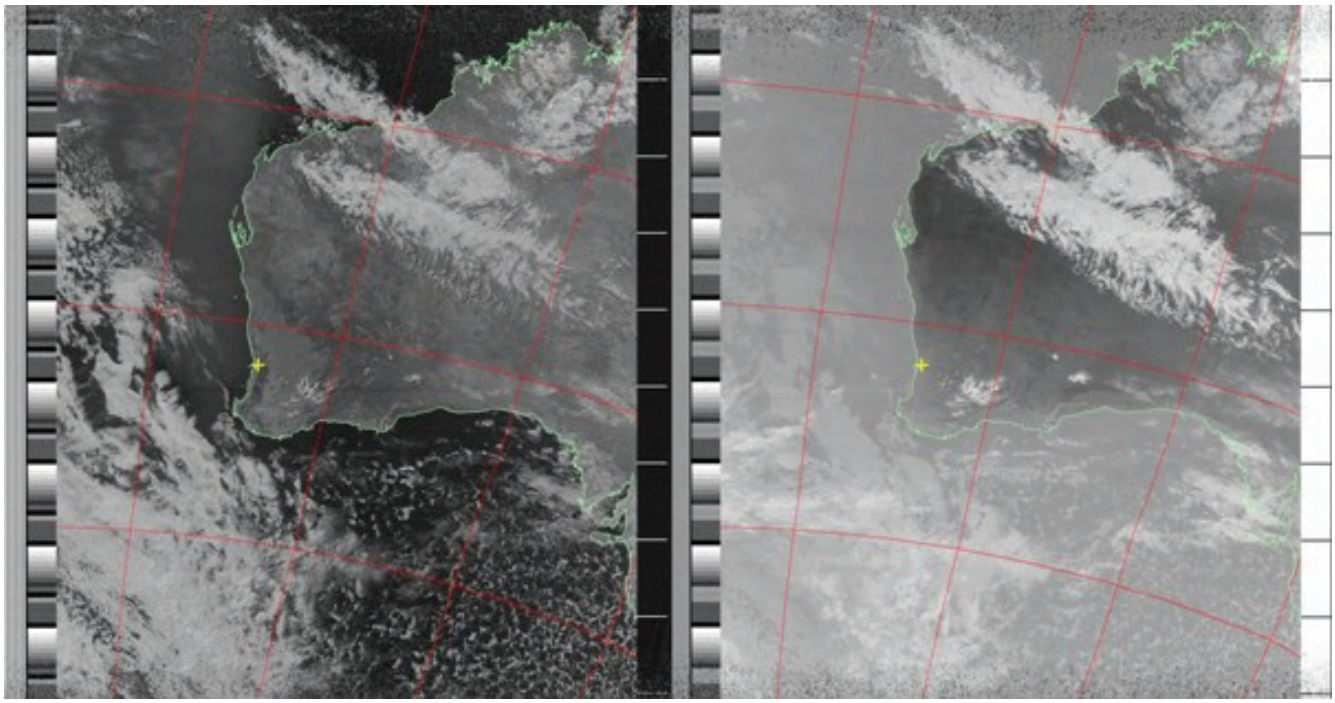


Figure 9: *An image from the ASA VHF satellite ground station.*

The WASTAC dish and related equipment was removed from Curtin University by the firm Radio Communication Technologies (RCT; Figure 10). ASA took possession of the equipment from there and transported it to the 40 hectare ASA site at Meckering. The equipment removal from the roof-top position required disassembly of the dish and base into several major components.

As all equipment at ASA is run on solar power, the equipment, after reassembling the individual components, will be converted to run on a 24/12 VDC system. The main change that this will involve will be to change the azimuth and elevation motors.

It is currently envisaged that the equipment will not be run in an automated mode, but scheduled for satellite passes on a limited basis to provide educational opportunities to work with a tracking satellite system and gain experience in processing high resolution data. If restoral of the L-band (1700 MHz) is successful, we would like to look at adding an S-band antenna feed system and appropriate receiver to work with the many small earth observation satellites that are currently being launched or that are in the pipeline.

Current indications are that the expert panel working on a review of the Australian Space Industry has indicated that the provision of an indigenous remote sensing Earth observation satellite will be given the highest priority for the mooted national space agency. ASA look forward to possible participation in such a venture.

Acknowledgements: Our many thanks to Dr Wendy Thompson (Landgate) and Dr Mervyn Lynch (Curtin) who helped greatly in the donation and transfer of the WASTAC satellite equipment.

Figure 10: *The WASTAC L-band dish and mount on the rooftop at Curtin University prior to removal.*

Landgate, Satellite Remote Sensing Services, Midland

An Improved Approach to Grassland Curing in Australia

Norm Santich, Adrian Allen, Landgate; Agnes Kristina, Department of Fire and Emergency Services

The Western Australian Satellite Technology and Applications Consortium's (WASTAC) archive of historical Moderate Resolution Imaging Spectroradiometer (MODIS) Normalised Difference Vegetation Index (NDVI) data is now being used to produce grassland curing data on a daily basis at a continental scale.

Grassland curing provides a measure of the seasonal process of grasses drying out and dying. The percent of Grassland Curing is an important input into grassland fire spread models. These models are used by fire managers to determine fire behaviour variables, such as the potential rate of fire spread.

Newnham et al. 2010 have developed four different algorithms that use satellite remote sensing data for the estimation of grassland curing. Given the availability of NDVI data in the WASTAC archive and interest from State government agencies Department of Fire and Emergency Services (DFES) and Department of Biodiversity, Conservation and Attractions (DBCA), an evaluation of the four algorithms was conducted. Assessed against available ground-truth data, algorithms A and C were found to be the most suitable for certain areas, with C displaying the potential for application across Western Australia. The Grassland Curing Index (GCI) algorithm-C developed by Newnham et al. 2010 is given by the equation:

$$GCI_C = 93.274 - 61.826 \times \frac{NDVI - NDVI_{min}}{NDVI_{max} - NDVI_{min}}$$

Where $NDVI$ is the current NDVI of a pixel, $NDVI_{min}$ is the minimum NDVI value of a pixel over a given time period and $NDVI_{max}$ is the maximum NDVI value of a pixel over a given time period. Better accuracy in the estimates of curing has been realised by working in close collaboration with DFES and modifying the above equation to better fit the observed ground conditions. The algorithm has also been further optimised by investigating different compositing methods and durations to maximise the likelihood of cloud-free, timely information.

An example of the grassland curing imagery is shown below (Figure 11); green represents curing levels ≤ 50%, yellow is 50% < curing ≤ 70%, orange is 70% < curing ≤ 85% and red represents curing > 85%. The most current enhancements to the methodology include masking recent fire-affected areas and standing water, as these have the effect of reducing the curing in the imagery. White regions in the image below are due to cloud, fire-affected areas and standing water. Future enhancements to the methodology will include examining ways to improve the estimated curing reported in bush and forested regions.

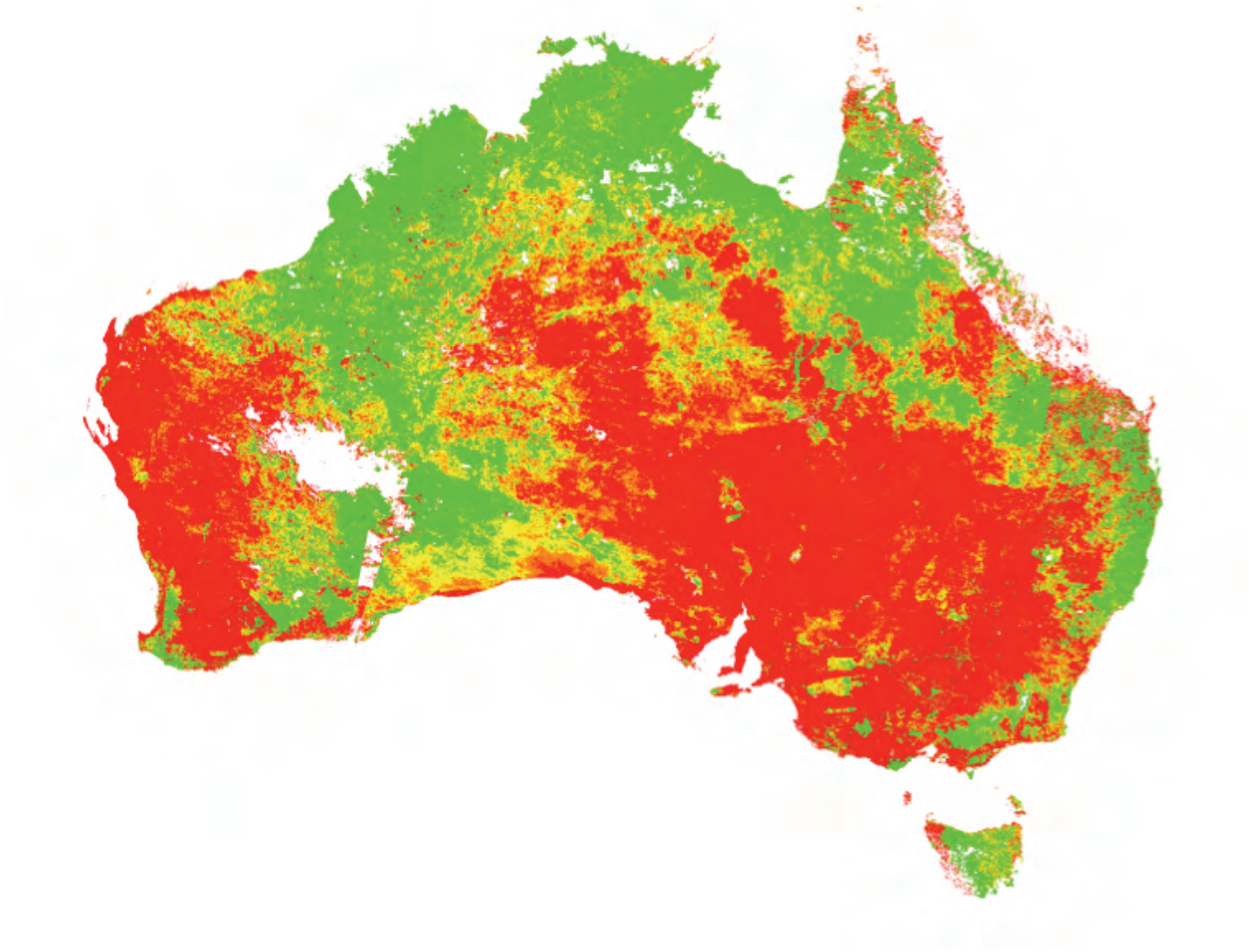


Figure 11: *A sample image showing grassland curing for Australia. Green represents curing levels ≤ 50%; yellow is 50% < curing ≤ 70%; orange is 70% < curing ≤ 85%; red represents curing > 85%. White represents cloud, fire-affected or standing water areas.*

References

Newnham, G. J., Grant, I. F., Martin, D. N. and Anderson, S. A. J. (2010). Improved Methods For Assessment And Prediction Of Grassland Curing. Final Report: Project A1.4. Bushfire CRC.

Australian Fire 2017

Carolyn McMillan, Landgate

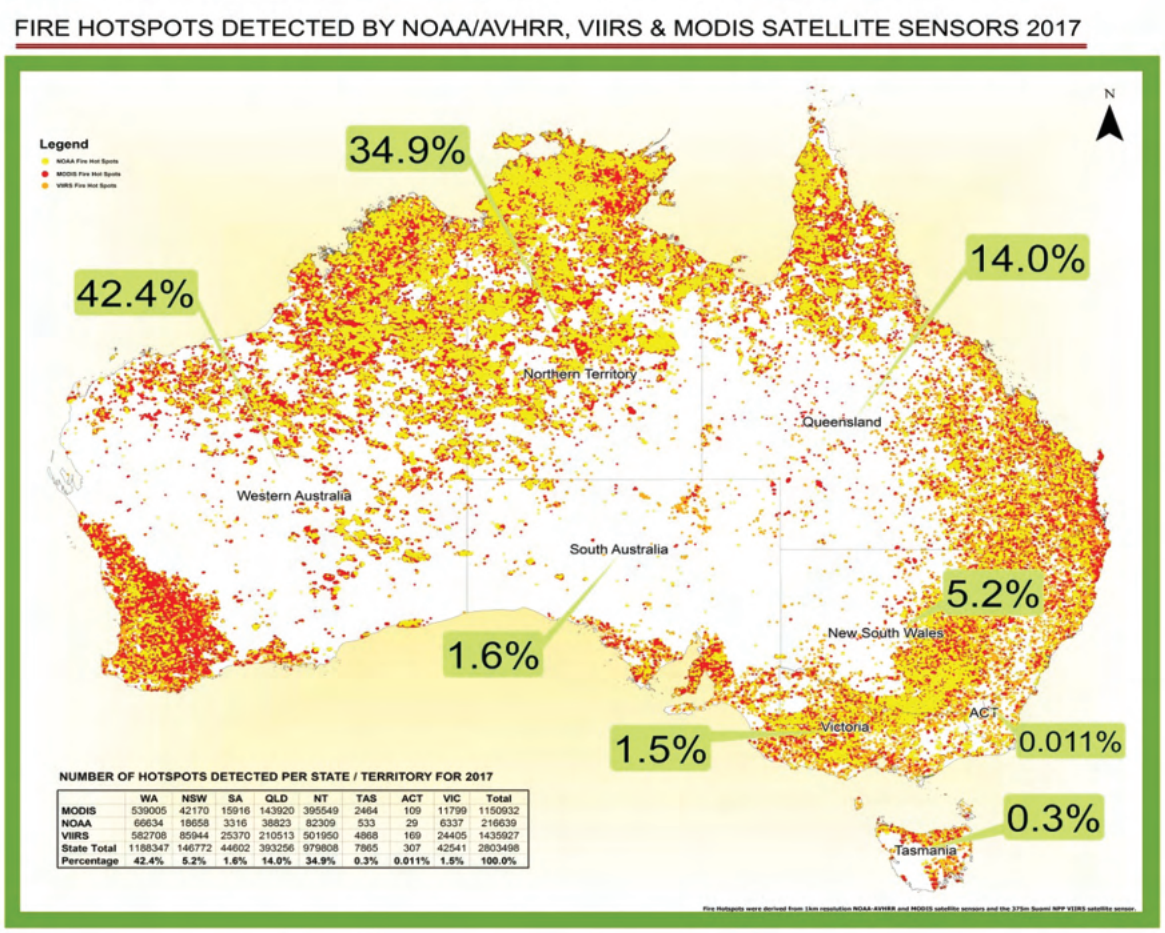
Australian Fire Hotspots 2017

Landgate actively monitors fire Australia wide.

NOAA-19, Suomi-NPP, AQUA and TERRA satellite data from the WASTAC receiving station at Murdoch University plus data from other satellite receiving stations at Crib Point, Alice Springs, Darwin, Townsville, and Hobart and also the Himawari-8 satellite Imagery sourced from the BoM are processed to detect active fires (fire hotspots).

All the fire hotspot data, including the imagery used to map the fires appears on the Firewatch website (http://firewatch-pro.landgate.wa.gov.au) within one (1) hour of the pass being received at Landgate. This information is collated in a GIS so the data can be analysed and interpreted along with other data such as fire burnt areas, lightning and vegetation curing.

Analysis of the 2017 data has found that 92% of detected fire hotspots occur in Western Australia, Northern Territory and Queensland, with the remaining 8% all other states combined (Figure 12).



	WA	NSW	SA	QLD	NT	TAS	ACT	VIC	Total
MODIS	539005	42170	15916	143920	395549	2464	109	11799	1150932
NOAA	66634	18658	3316	38823	82309	533	29	6337	216639
VIIRS	582708	85944	25370	210513	501950	4868	169	24405	1435927
State Total	1188347	146772	44602	393256	979808	7865	307	42541	2803498
Percentage	42.4%	5.2%	1.6%	14.0%	34.9%	0.3%	0.011%	1.5%	100.0%

Figure 12: *Fire hotspots detected by AVHRR/NOAA, VIIRS and MODIS satellite sensors for 2017 across Australia*

In 2017, Western Australia did experience a large increase in the total number of fire hotspots detected as proportion of total hotspots Australia wide, from 29% in 2016 to 42% of total fires across Australia. The majority of these fires occurred in the months September to November. A summary of number of fire hotspots per month for all Australian states and territories is provided in Figure 13.

A series of fires in the Great Sandy Desert during September to November burnt over 30,000 square kilometers and contributed to the large increase in fire hotspots detected in Western Australia.

The fire hotspots data is used by a variety of land managers and government organisations (e.g. Department of Fire and Emergency Services; Department of Biodiversity, Conservation and Attractions) to plan and assess controlled burning activities, active firefighting and fire prediction modeling.

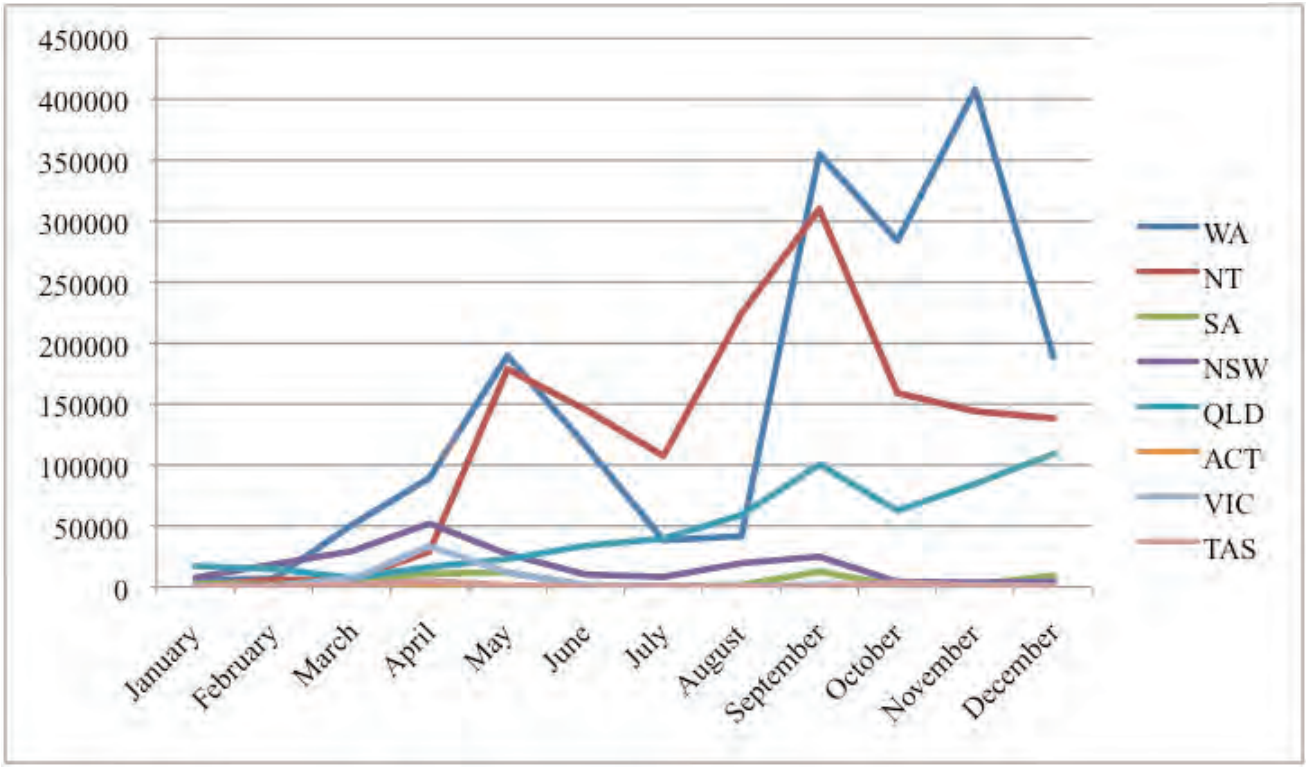


Figure 13: *Monthly breakdown of fire hotspots per state. These statistics include Himawari-8 fire hotspots.*

NOAA-15 Clocks up 100,000 Orbits

Mike Steber and Ifra Khokhar, Landgate

During August 2017, NOAA-15 reached a rare milestone: 100,000 orbits around the earth and still producing useable data. Landgate, through its involvement in WASTAC (Western Australian Satellite Technology and Applications Consortium), has been using NOAA-15 data since its commissioning in December 1998 (sample image in Figure 14). This is the first NOAA satellite of the 20 NOAA polar orbiting satellites that has been launched to have successfully clocked over 100,000 orbits and still been operational. However, it still has a long way to go to exceed Landsat 5 which clocked up over 150,000 orbits during its 28 years and 10 months life. For many years, the Landgate Imagery Team was able to use NOAA-15 to detect fire hotspot information but over the last few years the amount of systematic noise in the data from NOAA-15 has made that unreliable. Nowadays the NOAA-15 imagery is just used as a backdrop. The change from five to six digits in the orbit number did cause some of the stations to knock off the leading one, so Landgate had to modify their code to take this into account.

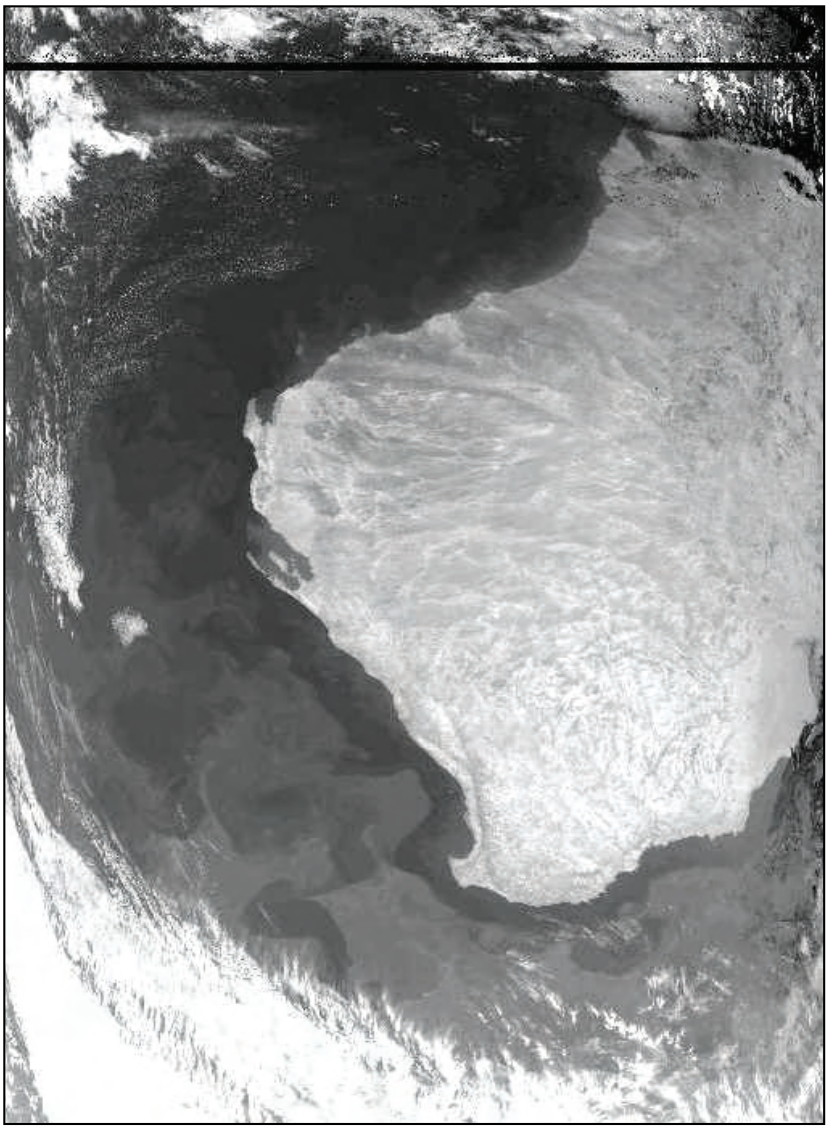


Figure 14: *Sample NOAA-15 pass over Western Australia.*

Notable Events for Western Australia 2017

1. Severe Tropical Cyclone Ernie

Severe Tropical Cyclone Ernie was a very small and intense tropical cyclone that underwent one of the most rapid intensification cycles documented in the Australian Area of Responsibility.

A low formed near the Indonesian Islands on 4 April 2017 and tracked southwest. Initially the development of the tropical low appeared to be hindered by moderate to strong vertical wind shear, this decreased during 6 April and Ernie underwent a period of rapid intensification (as tracked in Figure 15). The tropical cyclone reached a 10-minute mean wind peak intensity of 115 knots (215 kilometres per hour (km/h)) between 1200 and 1800 Universal Time Coordinated (UTC) 7 April, only twenty four hours after becoming a tropical cyclone. Early on 8 April Ernie was steered to the west southwest as a combination of drier mid-level air and increased wind shear caused Ernie to begin to weaken. The system decreased below cyclone strength by 0600 UTC 10 April 2017. Ernie's small size played a part in the tropical cyclone undergoing an unusually rapid intensification and then subsequent rapid weakening (NASA image provided in Figure 16). Ernie had no impact on mainland Australia or Island territories.

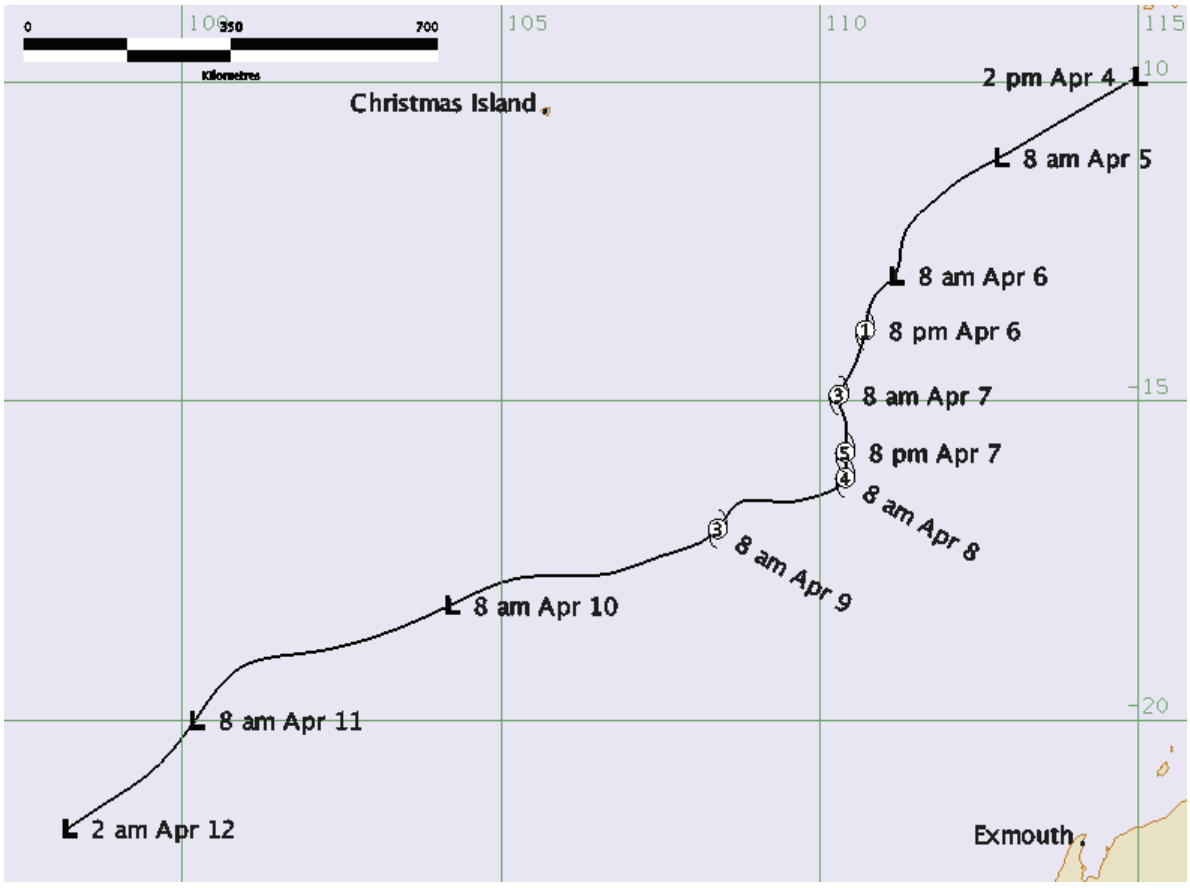


Figure 15: *Severe Tropical Cyclone Ernie Track, off the north-west coast of Western Australia.*

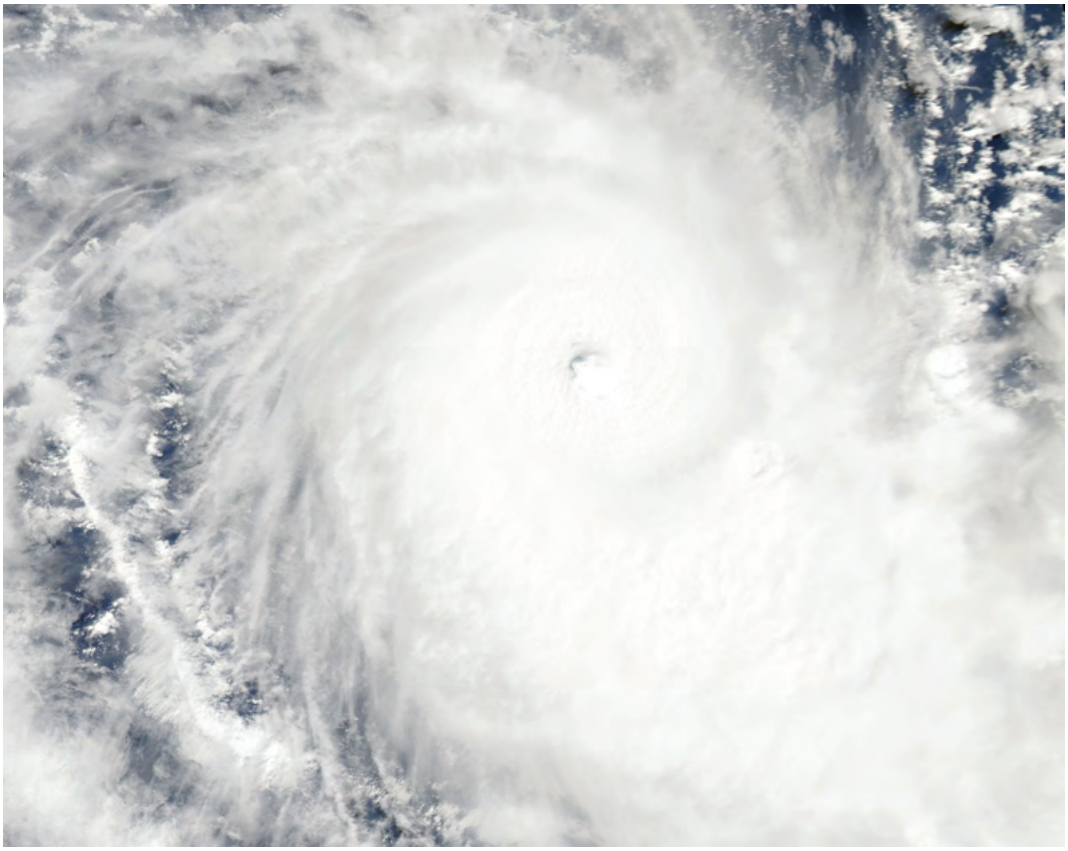


Figure 16: *NASA Worldview image of Severe Tropical Cyclone Ernie on 7 April 2017.*

2. Fires over Southwest Western Australia

Smoke from numerous fires over southwest WA was evident on 31 March 2017 on weather forecasting (Figure 17) and imagery (Figure 18). A general easterly flow pushed the smoke towards the west.

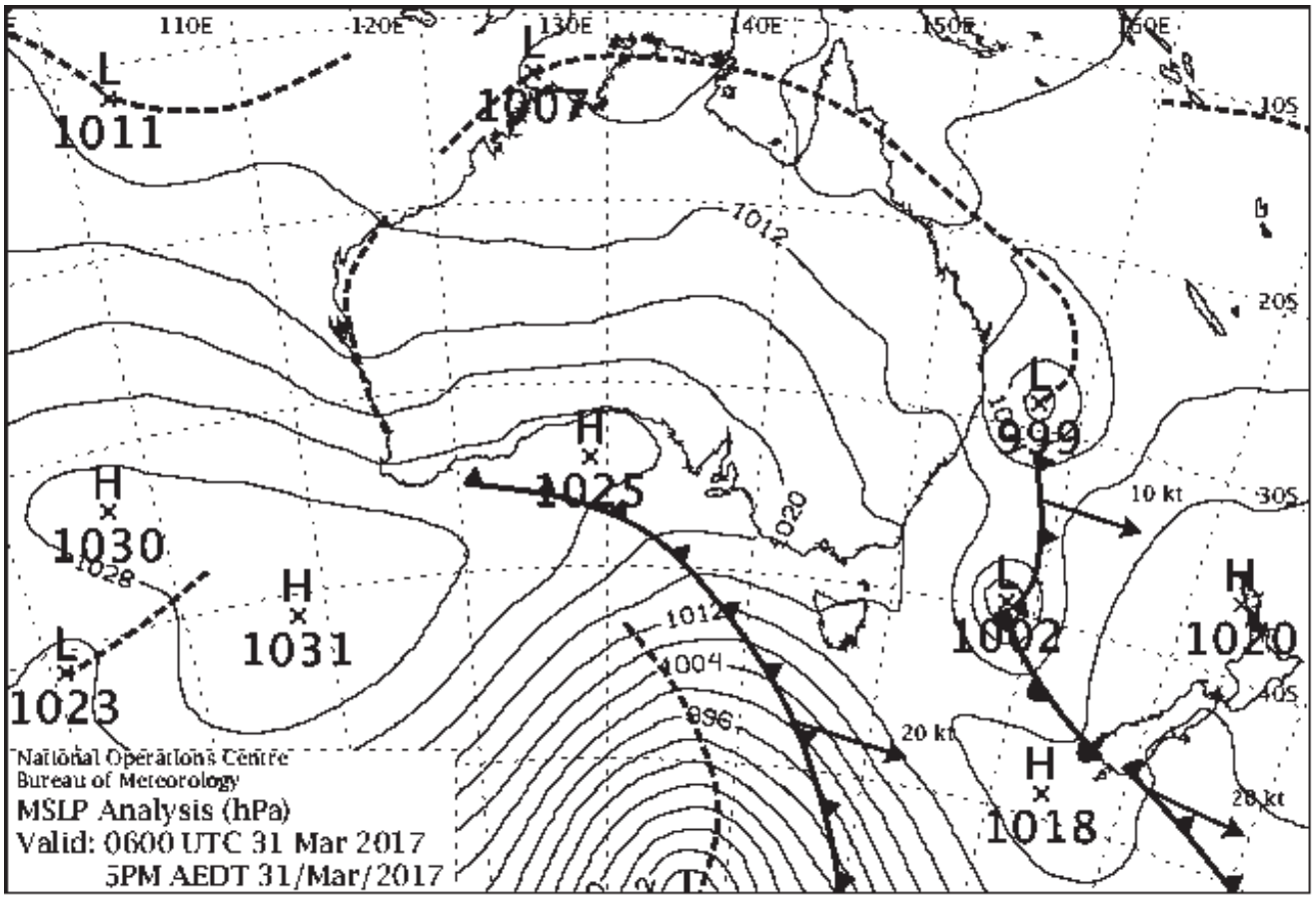


***Figure 17**: Mean Sea Level Pressure Analysis at 0600 UTC 31 March 2017.*

Figure 18: *NASA Worldview image of smoke from fires over southwest Western Australia on 31 March 2017.*

Independent auditor's report - L band

Liability limited by a scheme approved under Professional Standards Legislation

AUDITOR'S INDEPENDENCE DECLARATION

Auditor's independence declaration to the Members of the Board of the Western Australian Satellite Technology and Application Consortium (WASTAC) L Band.

In relation to my audit of the special purpose financial report of the Western Australian Satellite Technology and Application Consortium (WASTAC) L Band for the period ended 31 December 2017, to the best of my knowledge and belief, there have been no contraventions of the auditor independence requirements of Australian Professional Accounting Bodies.

Santo Casilli FCPA

Date: 28 March 2018

Suite 8 – 336 Churchill Avenue Subiaco WA 6008; PO Box 617 Subiaco WA 6904
Mobile: 0409 104 929 - **Phone:** 9388 3678 **Fax:** (08) 9388 3860; **Email:** scasilli@westnet.com.au;
Web: www.avantedgeconsulting.com.au

Liability limited by a scheme approved under Professional Standards Legislation

INDEPENDENT AUDITOR'S REPORT

The Members of the Board

Opinion

We have audited the special purpose financial report of the Western Australian Satellite Technology and Application Consortium (WASTAC) L Band, which comprises the balance sheet as at 31 December 2017, the income statement and the statement of cash flows for the year then ended, notes to the financial report and including a summary of significant accounting policies and other explanatory information. Our audit opinion is provided in order to satisfy the reporting requirements of the Board and its Joint venture participants.

In our opinion, the accompanying special purpose financial report of the Western Australian Satellite Technology and Application Consortium (WASTAC) L Band for the year ended 31 December 2017 is prepared, in all material respects, in accordance with the financial reporting provisions as outlined in Note 1 of the financial statements.

Basis for Opinion

We conducted our audit in accordance with Australian Auditing Standards. Our responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Financial Report* section of our report. We are independent of the Western Australian Satellite Technology and Application Consortium (WASTAC) L Band in accordance with the ethical requirements of the Accounting Professional and Ethical Standards Board's APES 110 *Code of Ethics for Professional Accountants* (the Code) that are relevant to our audit of the financial report in Australia, and we have fulfilled our other ethical responsibilities in accordance with the Code. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Emphasis of Matter - Basis of Accounting and Restriction on Distribution and Use

We draw attention to Note 1 to the special purpose financial report, which describes the basis of accounting. The financial report is prepared to assist the Western Australian Satellite Technology and Application Consortium (WASTAC) L Band to meet its reporting obligations between the Board and its Joint Venture participants. As a result, the financial report may not be suitable for another purpose. Our report is intended solely for the Board and its joint venture participants and should not be distributed to or used by other parties. Our opinion is not modified in respect of this matter.

Responsibilities of Management and Those Charged with Governance for the Financial Report

Curtin University management, on behalf of the Board, is responsible for the preparation of the special purpose financial report and for establishing such internal control as Curtin University management determines is necessary to enable the preparation of a special purpose financial report that is free from material misstatement, whether due to fraud or error.

In preparing the special purpose financial report, Curtin University management with the Board is responsible for assessing the Western Australian Satellite Technology and Application Consortium (WASTAC) L Band's ability to continue as a going concern, disclosing, as applicable, matters relating to going concern and using the going concern basis of accounting unless the Board either intends to cease operations of the Western Australian Satellite Technology and Application Consortium (WASTAC) L Band, or has no realistic alternative but to do so.

The members of the Board are responsible for overseeing the Western Australian Satellite Technology and Application Consortium (WASTAC) L Band's financial reporting process.

Auditor's Responsibilities for the Audit of the Financial Report.

Our objectives are to obtain reasonable assurance about whether the special purpose financial report, as a whole, is free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Australian Auditing Standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of this financial report.

As part of an audit in accordance with Australian Auditing Standards, we exercise professional judgement and maintain professional scepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the financial report, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.

- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Western Australian Satellite Technology and Application Consortium (WASTAC) L Band's internal control.

- Evaluate the appropriateness of accounting policies used as described in Note 1 to the financial statements and the reasonableness of accounting estimates and related disclosures made by Curtin University management, if any.

- Conclude on the appropriateness of Western Australian Satellite Technology and Application Consortium (WASTAC) L Band's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Western Australian Satellite Technology and Application Consortium (WASTAC) L Band's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial report or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Western Australian Satellite Technology and Application Consortium (WASTAC) L Band to cease to continue as a going concern.

Electronic publication of the audited financial report

It is our understanding that the Western Australian Satellite Technology and Application Consortium L Band intends to electronically present the audited financial report and auditor's report on its internet website. Responsibility for the electronic presentation of the financial report on the Western Australian Satellite Technology and Application Consortium website is that of those charged with governance of the Western Australian Satellite Technology and Application Consortium. The security and controls over information on the website should be addressed by the Western Australian Satellite Technology and Application Consortium to maintain the integrity of the data presented. The examination of the controls over the electronic presentation of audited financial report on the Western Australian Satellite Technology and Application Consortium website is beyond the scope of the audit of the financial report.

We have communicated with Western Australian Satellite Technology and Application Consortium (WASTAC) L Band Board regarding, among other matters, the planned scope and timing of the audit and, via our management letter, significant audit findings, including any significant deficiencies in internal control that we may have identified during our audit.

Date: 28 March 2018

Perth

Suite 8 – 336 Churchill Avenue Subiaco WA 6008; PO Box 617 Subiaco WA 6904
Mobile: 0409 104 929 - **Phone:** 9388 3678 **Fax:** (08) 9388 3860; **Email:** scasilli@westnet.com.au;
Web: www.avantedgeconsulting.com.au

WASTAC L-Band Budget 2017

Estimated expenditure for the year
January 2017 – December 2017

		2017	2016
		$	$
1.	Data Tapes	-	-
2.	System maintenance/repairs	5,000	5,000
3.	Telecommunications license of facility	0	5,000
4.	Consultants	5,000	5,000
5.	Sundry consumables	1,500	1,500
6.	Travelling – Airfares	3,000	3,000
7.	Provision for major equipment (NW WA Dish)	343,730	375,000
8.	Annual Report	12,000	6,000
9.	Melbourne Workshop expenses	3,015	3,015
10.	Decommission Curtin site	100,000	-
11.	Funding to Support Research & Education entity	48,200	-
12.	Development of website for schedules from all tiers	12,050	-
13.	Development of national scheduling system (Tier 3)	24,100	-
14.	Development of Tier 3 stitching	36,150	-
	TOTAL:	**$593,745**	**$403,515**

Estimated income/revenue for the year
January 2017 – December 2017

1.	Contributions received ($10,000 each)	20,000	40,000
2.	Interest	13,000	15,000
	TOTAL INCOME:	**$33,000**	**$55,000**

TECHNOLOGY and APPLICATION CONSORTIUM
L-BAND
INCOME STATEMENT FOR THE YEAR ENDED 31 DECEMBER 2017

	2017	2016
	$	$
REVENUE		
Contributions Received	30,000	40,000
Interest Received	15,137	13,093
Other Income		4,772
TOTAL REVENUE	**45,137**	**57,865**
EXPENDITURE		
Outsourced work	75,000	-
Depreciation expenses	-	458
Travel & Transport	-	547
Venue Hire	-	2,150
Hospitality	-	167
Microwave licence	-	2,791
External Printing Expenses	6,890	-
Other operating expenditure	-	76
TOTAL EXPENDITURE	**81,890**	**6,189**
NET OPERATING RESULT FOR THE YEAR	**(36,753)**	**51,676**

WESTERN AUSTRALIAN SATELLITE
TECHNOLOGY and APPLICATION CONSORTIUM
L-BAND
BALANCE SHEET AS AT 31 DECEMBER 2017

	Note	2017	2016
		$	$
CURRENT ASSETS			
Cash at Bank		576,295	540,745
Account Receivable		-	-
Prepayments		-	-
Accrued Revenue		-	-
TOTAL CURRENT ASSETS		**576,295**	**540,745**
NON – CURRENT ASSETS			
Property, plant and equipment	2	-	-
TOTAL NON – CURRENT ASSETS		-	-
TOTAL ASSETS		**576,295**	**540,745**
CURRENT LIABILITIES			
Income received in advance		-	-
Accrued Expenses		75,000	2,697
TOTAL CURRENT LIABILITIES		75,000	2,697
TOTAL LIABILITIES		**75,000**	**2,697**
NET ASSETS		**501,295**	**538,048**
EQUITY			
Retained Funds	4	**501,295**	**538,048**
TOTAL EQUITY		**501,295**	**538,048**

WESTERN AUSTRALIAN SATELLITE
TECHNOLOGY and APPLICATION CONSORTIUM
L-BAND
CASH FLOW STATEMENT FOR THE YEAR ENDED 31 DECEMBER 2017

	Note	2017	2016
CASH FLOWS FROM OPERATING ACTIVITIES		**$**	**$**
Receipts			
Contributions Received:			
Landgate		10,000	10,000
CSIRO		-	-
Bureau of Meteorology		10,000	10,000
Curtin University		10,000	20,000
Interest received		15,137	13,093
Other Receipts		-	4,772
Total Receipts		**45,137**	**57,865**
Payments			
Payments to suppliers		(9,587)	(3,034)
Total Payments		(9,587)	(3,034)
Net cash provided by operating activities		**35,550**	**54,831**
CASH FLOWS FROM INVESTING ACTIVITIES			
Payments for property, plant and equipment		-	-
Net cash used in investing activities		-	-
Net increase/(decrease) in cash		**35,550**	**54,831**
Cash at the beginning of the year		540,745	485,914
Cash at the end of the year		**576,295**	**540,745**

Notes:

1 Summary of Significant Accounting Policies

The principal accounting policies adopted in the preparation of the financial report are set out below. These policies have been consistently applied unless otherwise stated.

Basis of Preparation

The Western Australian Satellite Technology and Application Consortium (WASTAC) L Band financial report is a special purpose financial report which has been prepared on an accrual basis.

(a) Valuation of Property, Plant and Equipment

All property, plant and equipment is shown at cost, less subsequent depreciation and impairment losses. Cost includes expenditure that is directly attributable to the acquisition of the items. Subsequent costs are included in the asset carrying amount or recognised as a separate asset, as appropriate, only when it is probable that future economic benefits associated with the item will flow to the entity and the cost of the item can be measured reliably.

Any gains and losses on disposals are determined by comparing the disposal proceeds with the carrying amount and are included in the Income Statement.

(b) Depreciation of non-current assets

All property, plant and equipment having a limited useful life are depreciated over their estimated useful lives, in a manner which reflects the consumption of their future economic benefits.

Depreciation is calculated on a straight-line basis from the time the asset becomes available for use. Estimated useful lives are as follows:

- Computing equipment 3 years
- Other equipment 8 years

Assets' residual values and useful lives are reviewed, and adjusted if appropriate, at each balance sheet date.

A class of asset's carrying amount is written down immediately to its recoverable amount if the class of asset's carrying amount is greater than its estimated recoverable amount (see note 1(c)).

(c) Impairment of property, plant and equipment

At each reporting date, WASTAC reviews the carrying amounts of each class of asset within property, plant and equipment to determine whether there is any indication that those asset classes have suffered an impairment loss. If any such indication exists, the recoverable amount of the class of asset is estimated in order to determine the extent of the impairment loss. Where the asset does not generate cash flows that are independent from other assets, WASTAC estimates the recoverable amount of the cash-generating unit to which the asset belongs.

Recoverable amount is the higher of fair value less costs to sell and value in use. In assessing value in use, the depreciated replacement cost is used where the future economic benefits of WASTAC's assets are not primarily dependent on the assets ability to generate net cash inflows.

If the recoverable amount of a class of asset is estimated to be less than its carrying amount, the carrying amount is reduced to recoverable amount. An impairment loss is recognised as an expense to the Income Statement immediately.

(d) Income Tax

The Board considers that its operations are exempt from income tax under the provisions of section 50-25 of the Income Tax Assessment Act (1997) as amended.

(e) Goods and Services Tax (GST)

Revenues, expenses and assets are recognised net of the amount of GST, except where the amount of GST is not recoverable from the Australian Taxation Office. In these circumstances the GST is recognised as part of the cost of acquisition of the asset or as part of an item of the expense.

(f) Income Recognition

The Board recognises income as it is received. All income is stated net of the amount of goods and services tax (GST). Interest is recognised on the effective interest rate method.

2 Property, Plant and Equipment

	2017	2016
Computer Equipment		
At cost	35,196	35,196
Accumulated depreciation	(35,196)	(35,196)
	-	-
Other Equipment		
At cost	202,441	202,441
Accumulated depreciation	(202,441)	(202,441)
	-	-
Total Property, Plant and Equipment	**-**	**-**

Reconciliations

Reconciliations of the carrying amounts of property, plant and equipment at the beginning and end of the current financial year are set out below:

	Computer Equipment	Other Equipment	Total
Carrying amount at start of year	-	-	-
Additions/(Disposals)	-	-	-
Depreciation expense	-	-	-
Carrying amount at end of year	**-**	**-**	**-**

3 Notes to the Cash Flow Statement

Reconciliation of operating result from ordinary activities to net cash inflow from operating activities

	2017	2016
Net operating result	(36,753)	51,676
Depreciation expense	-	458
Movement in Current Assets & Liability	72,303	2,697
Net cash provided/(used) by operating activities	**35,550**	**54,831**
Balance at beginning of the year	538,048	486,372
Operating surplus/(deficit) for the year	(36,753)	51,676
Balance at end of the year	**501,295**	**538,048**

Independent auditor's report - X band

Liability limited by a scheme approved under Professional Standards Legislation

AUDITOR'S INDEPENDENCE DECLARATION

Auditor's independence declaration to the Members of the Board of the Western Australian Satellite Technology and Application Consortium (WASTAC) X Band.

In relation to my audit of the special purpose financial report of the Western Australian Satellite Technology and Application Consortium (WASTAC) X Band for the period ended 31 December 2017, to the best of my knowledge and belief, there have been no contraventions of the auditor independence requirements of Australian Professional Accounting Bodies.

Santo Casilli FCPA

Date: 28 March 2018

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INDEPENDENT AUDITOR'S REPORT

The Members of the Board

Opinion

We have audited the special purpose financial report of the Western Australian Satellite Technology and Application Consortium (WASTAC) X Band, which comprises the balance sheet as at 31 December 2017, the income statement and the statement of cash flows for the year then ended, notes to the financial report and including a summary of significant accounting policies and other explanatory information. Our audit opinion is provided in order to satisfy the reporting requirements of the Board and its Joint venture participants.

In our opinion, the accompanying special purpose financial report of the Western Australian Satellite Technology and Application Consortium (WASTAC) X Band for the year ended 31 December 2017 is prepared, in all material respects, in accordance with the financial reporting provisions as outlined in Note 1 of the financial statements.

Basis for Opinion

We conducted our audit in accordance with Australian Auditing Standards. Our responsibilities under those standards are further described in the ***Auditor's Responsibilities for the Audit of the Financial Report*** section of our report. We are independent of the Western Australian Satellite Technology and Application Consortium (WASTAC) X Band in accordance with the ethical requirements of the Accounting Professional and Ethical Standards Board's APES 110 ***Code of Ethics for Professional Accountants*** (the Code) that are relevant to our audit of the financial report in Australia, and we have fulfilled our other ethical responsibilities in accordance with the Code. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Emphasis of Matter - Basis of Accounting and Restriction on Distribution and Use

We draw attention to Note 1 to the special purpose financial report, which describes the basis of accounting. The financial report is prepared to assist the Western Australian Satellite Technology and Application Consortium (WASTAC) X Band to meet its reporting obligations between the Board and its Joint Venture participants. As a result, the financial report may not be suitable for another purpose. Our report is intended solely for the Board and its joint venture participants and should not be distributed to or used by other parties. Our opinion is not modified in respect of this matter.

Responsibilities of Management and Those Charged with Governance for the Financial Report

Curtin University management, on behalf of the Board, is responsible for the preparation of the special purpose financial report and for establishing such internal control as Curtin University management determines is necessary to enable the preparation of a special purpose financial report that is free from material misstatement, whether due to fraud or error.

In preparing the special purpose financial report, Curtin University management with the Board is responsible for assessing the Western Australian Satellite Technology and Application Consortium (WASTAC) X Band's ability to continue as a going concern, disclosing, as applicable, matters relating to going concern and using the going concern basis of accounting unless the Board either intends to cease operations of the Western Australian Satellite Technology and Application Consortium (WASTAC) X Band, or has no realistic alternative but to do so.

The members of the Board are responsible for overseeing the Western Australian Satellite Technology and Application Consortium (WASTAC) X Band's financial reporting process.

Auditor's Responsibilities for the Audit of the Financial Report.

Our objectives are to obtain reasonable assurance about whether the special purpose financial report, as a whole, is free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Australian Auditing Standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of this financial report.

As part of an audit in accordance with Australian Auditing Standards, we exercise professional judgement and maintain professional scepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the financial report, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.

- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Western Australian Satellite Technology and Application Consortium (WASTAC) X Band's internal control.

- Evaluate the appropriateness of accounting policies used as described in Note 1 to the financial statements and the reasonableness of accounting estimates and related disclosures made by Curtin University management, if any.

- Conclude on the appropriateness of Western Australian Satellite Technology and Application Consortium (WASTAC) X Band's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Western Australian Satellite Technology and Application Consortium (WASTAC) X Band's ability to continue as a going concern. If we conclude that a

material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial report or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Western Australian Satellite Technology and Application Consortium (WASTAC) X Band to cease to continue as a going concern.

Electronic publication of the audited financial report

It is our understanding that the Western Australian Satellite Technology and Application Consortium X Band intends to electronically present the audited financial report and auditor's report on its internet website. Responsibility for the electronic presentation of the financial report on the Western Australian Satellite Technology and Application Consortium website is that of those charged with governance of the Western Australian Satellite Technology and Application Consortium. The security and controls over information on the website should be addressed by the Western Australian Satellite Technology and Application Consortium to maintain the integrity of the data presented. The examination of the controls over the electronic presentation of audited financial report on the Western Australian Satellite Technology and Application Consortium website is beyond the scope of the audit of the financial report.

We have communicated with Western Australian Satellite Technology and Application Consortium (WASTAC) X Band Board regarding, among other matters, the planned scope and timing of the audit and, via our management letter, significant audit findings, including any significant deficiencies in internal control that we may have identified during our audit.

Date: 28 March 2018

Perth

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Web: www.avantedgeconsulting.com.au

WASTAC X-Band Budget 2017

Estimated expenditure for the year
January 2017 – December 2017

		2017	2016
		$	$
1.	Data Tapes	-	-
2.	System maintenance/repairs	40,000	84,000
3.	Consultants, product development	10,000	141,000
4.	Sundry consumables	2,000	2,000
5.	Travelling – Airfares	4,000	4,000
6.	Provision for major equipment (Murdoch)	25,000	25,000
7.	Melbourne Workshop expenses	4,165	4,165
8.	ACMA Licensing for Murdoch	50,000	50,000
9.	Decommission Murdoch site	50,000	-
10.	Funding to Support Research & Education entity	51,800	-
11.	Development of website for schedules from all tiers	12,950	-
12.	Development of national scheduling system (Tier 3)	25,900	-
13.	Development of Tier 3 stitching	38,850	-
14.	Provision for major equipment (NW WA Dish)	156,270	-
	TOTAL:	**$470,935**	**$310,165**

Estimated income/revenue for the year
January 2017 – December 2017

1.	Annual Contributions ($20,000 each)	60,000	80,000
2.	Interest	18,000	25,000
	TOTAL INCOME:	**$78,000**	**$105,000**

WESTERN AUSTRALIAN SATELLITE
TECHNOLOGY and APPLICATION CONSORTIUM
X-BAND
INCOME STATEMENT FOR THE YEAR ENDED 31 DECEMBER 2017

	2017	2016
	$	$
REVENUE		
Contributions received	60,000	80,000
Interest received	16,824	17,597
Expense Reimbursement	304	
TOTAL REVENUE	**77,128**	**97,597**
EXPENDITURE		
Outsourced Work (Consultancy)	7,570	299
Freight Expenses	-	83
Other Software & licence <$5,000	13,488	14,263
Venue Hire	-	2,969
Computer Equipment Purchase	1,097	
Travel & Transport	-	756
Outsourced work (Software Support)	-	127,370
Depreciation	27,380	31,928
TOTAL EXPENDITURE	**49,535**	**177,668**
NET OPERATING RESULT FOR THE YEAR	**27,593**	**(80,071)**

WESTERN AUSTRALIAN SATELLITE TECHNOLOGY and APPLICATION CONSORTIUM X-BAND

BALANCE SHEET AS AT 31 DECEMBER 2017

	Note	2017	2016
		$	$
CURRENT ASSETS			
Cash at Bank		652,783	600,885
TOTAL CURRENT ASSETS		**652,783**	**600,885**
NON – CURRENT ASSETS			
Property, plant and equipment		115,474	142,854
TOTAL NON – CURRENT ASSETS	2	115,474	142,854
TOTAL ASSETS		**768,257**	**743,739**
CURRENT LIABILITIES			
Income received in advance		-	-
Accrued Expenses		-	3,075
TOTAL CURRENT LIABILITIES		-	3,075
TOTAL LIABILITIES		**-**	**3,075**
NET ASSETS		**768,257**	**740,664**
EQUITY			
Retained Funds	4	768,257	740,664
TOTAL EQUITY		**768,257**	**740,664**

WESTERN AUSTRALIAN SATELLITE
TECHNOLOGY and APPLICATION CONSORTIUM
X-BAND
CASH FLOW STATEMENT FOR THE YEAR ENDED 31 DECEMBER 2017

	Note	2017	2016
CASH FLOWS FROM OPERATING ACTIVITIES		**$**	**$**
Receipts			
Contributions received			
Landgate		20,000	20,000
CSIRO		-	-
Bureau of Meteorology		20,000	20,000
Geoscience Australia		20,000	20,000
Interest received		16,824	17,597
Expense Reimbursement		304	-
Total Receipts		**77,128**	**77,597**
Payments			
Payments to Suppliers		(25,230)	(142,665)
Total Payments		(25,230)	(142,665)
Net cash provided/ (used) by operating activities		**51,898**	**(65,068)**
CASH FLOWS FROM INVESTING ACTIVITIES			
Payments for property, plant and equipment		-	-
Net cash used in investing activities		**-**	**-**
Net increase/(decrease) in cash		**51,898**	**(65,068)**
Cash at the beginning of the year		600,885	665,953
Cash at the end of the year		**652,783**	**600,885**

Notes:

1 Summary of Significant Accounting Policies

The principal accounting policies adopted in the preparation of the financial report are set out below. These policies have been consistently applied unless otherwise stated.

Basis of Preparation

The Western Australian Satellite Technology and Application Consortium (WASTAC) X Band financial report is a special purpose financial report which has been prepared on an accrual basis.

(a) Valuation of Property, Plant and Equipment

All property, plant and equipment is shown at cost, less subsequent depreciation and impairment losses. Cost includes expenditure that is directly attributable to the acquisition of the items. Subsequent costs are included in the asset carrying amount or recognised as a separate asset, as appropriate, only when it is probable that future economic benefits associated with the item will flow to the entity and the cost of the item can be measured reliably.

Any gains and losses on disposals are determined by comparing the disposal proceeds with the carrying amount and are included in the Income Statement.

(b) Depreciation of non-current assets

All property, plant and equipment having a limited useful life are depreciated over their estimated useful lives, in a manner which reflects the consumption of their future economic benefits.

Depreciation is calculated on a straight-line basis from the time the asset becomes available for use. Estimated useful lives are as follows:

- Computing equipment 3 years
- Computer software 10 years
- Other equipment 8 years

Assets' residual values and useful lives are reviewed, and adjusted if appropriate, at each balance sheet date.

A class of asset's carrying amount is written down immediately to its recoverable amount if the class of asset's carrying amount is greater than its estimated recoverable amount (see note 1(c)).

(c) Impairment of property, plant and equipment

At each reporting date, WASTAC reviews the carrying amounts of each class of asset within property, plant and equipment to determine whether there is any indication that those asset classes have suffered an impairment loss. If any such indication exists, the recoverable amount of the class of asset is estimated in order to determine the extent of the impairment loss. Where the asset does not generate cash flows that are independent from other assets, WASTAC estimates the recoverable amount of the cash-generating unit to which the asset belongs.

Recoverable amount is the higher of fair value less costs to sell and value in use. In assessing value in use, the depreciated replacement cost is used where the future economic benefits of WASTAC's assets are not primarily dependent on the assets ability to generate net cash inflows.

If the recoverable amount of a class of asset is estimated to be less than its carrying amount, the carrying amount is reduced to recoverable amount. An impairment loss is recognised as an expense to the Income Statement immediately.

(d) Income Tax

The Board considers that its operations are exempt from income tax under the provisions of section 50-25 of the Income Tax Assessment Act (1997) as amended.

(e) Goods and Services Tax (GST)

Revenues, expenses and assets are recognised net of the amount of GST, except where the amount of GST is not recoverable from the Australian Taxation Office. In these circumstances the GST is recognised as part of the cost of acquisition of the asset or as part of an item of the expense.

(f) Income Recognition

The Board recognises income as it is received. All income is stated net of the amount of goods and services tax (GST). Interest is recognised on the effective interest rate method.

2 Property, Plant and Equipment

	2017	2016
Computer Equipment		
At cost	93,099	119,937
Accumulated depreciation	(30,125)	(48,312)
	62,974	71,625
Other Equipment		
At cost	852,919	852,919
Accumulated depreciation	(800,419)	(781,690)
	52,500	71,229
Total Property, Plant and Equipment	**115,474**	**142,854**

Reconciliations

Reconciliations of the carrying amounts of property, plant and equipment at the beginning and end of the current financial year are set out below:

	Computer Equipment	Other Equipment	Total
Carrying amount at start of year	71,625	71,229	142,854
Additions/(Disposals)	-	-	-
Depreciation expense	(8,651)	(18,729)	(27,380)
Carrying amount at end of year	**62,974**	**52,500**	**115,474**

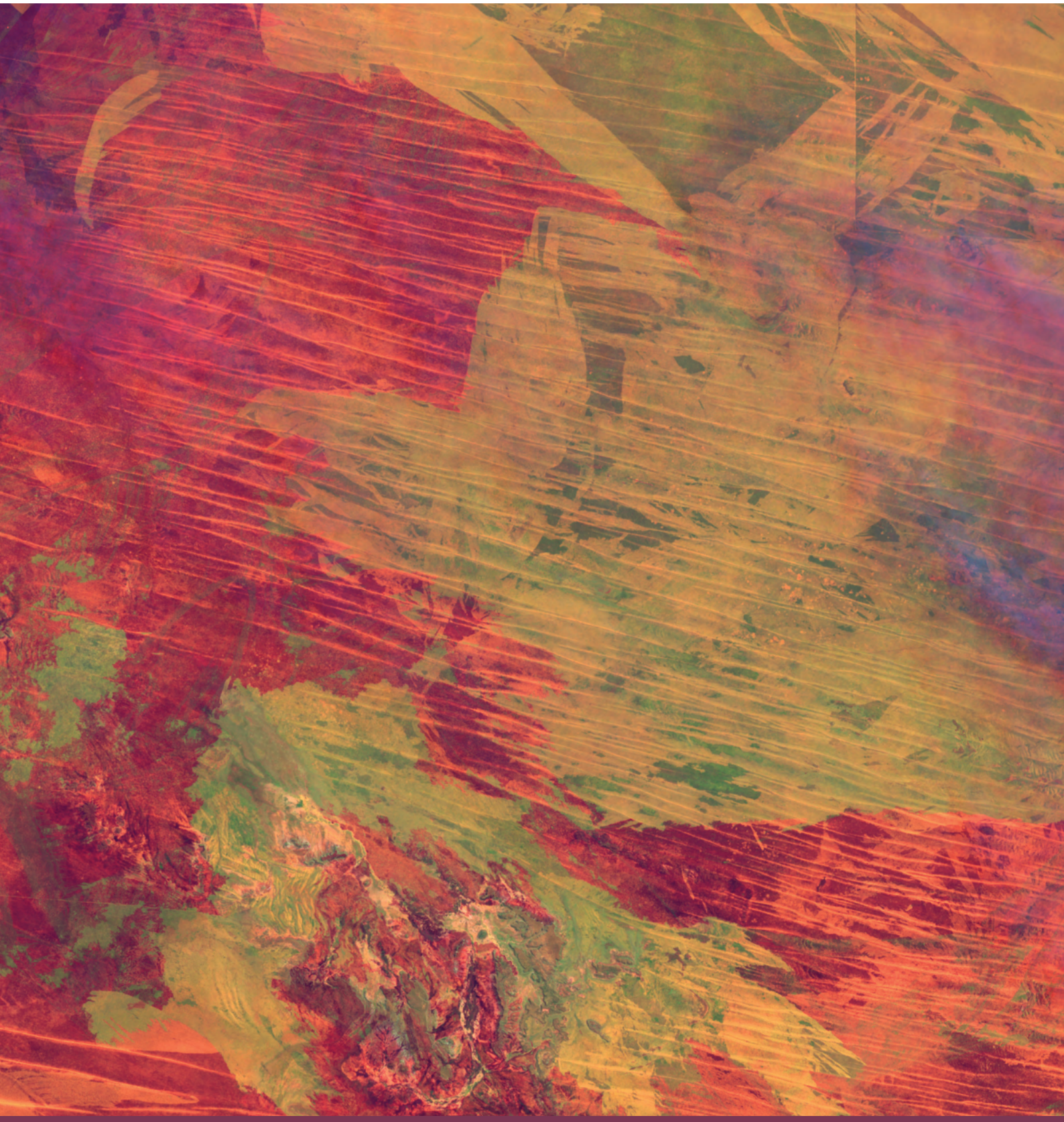
3 Notes to the Cash Flow Statement

Reconciliation of operating result from ordinary activities to net cash inflow from operating activities

	2017	2016
Net operating result	27,593	(80,071)
Depreciation expense	27,380	31,928
Movement in Current Assets & Liability	(3,075)	(16,925)
Net cash provided/(used) by operating activities	**51,898**	**(65,068)**

4 Retained Earnings

Balance at beginning of the year	740,664	820,735
Operating surplus/(deficit) for the year	27,593	(80,071)
Balance at end of the year	**768,257**	**740,664**



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