Flood Performance Analysis Tool PAT

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Australian Bureau of Meteorology

Acknowledgement

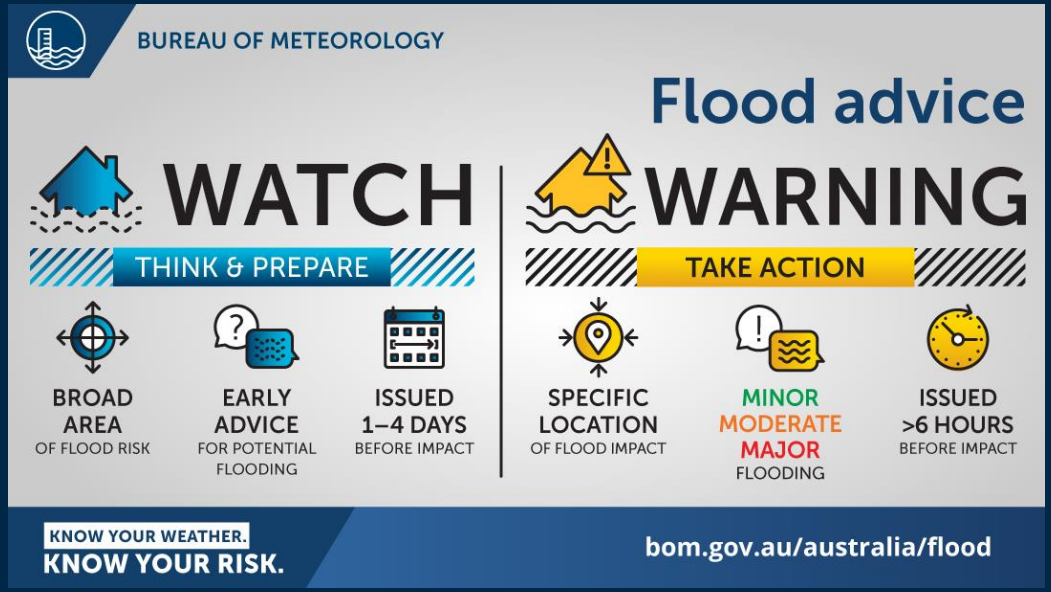
Wen Wang, Claire McClusky, Justin Robinson and Deltares

Outline

- What is the Bureau Service performance analysis and which metrics are evaluated?
- How do we use PAT to support analysis? And what's new since 2021?
- Benefits of PAT – bringing in a new era of performance analysis and continuous service improvements.

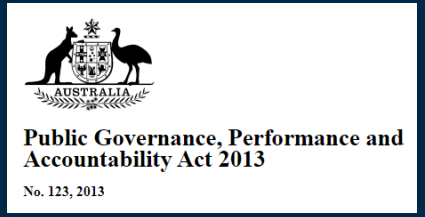
*PAT – Performance Analysis Tool

What is Bureau Flood Service Performance Analysis?

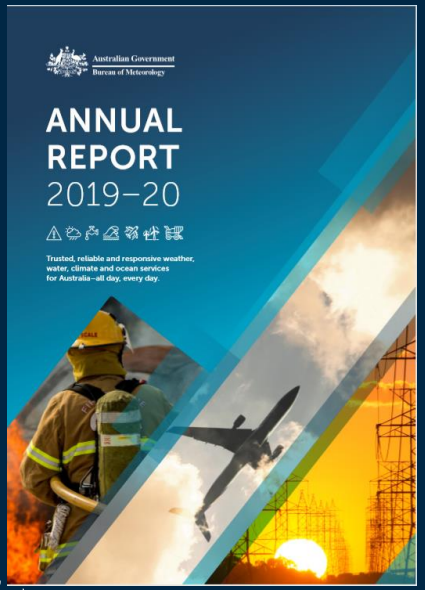


The performance analysis compares flood watches, warnings and forecasts against key targets that are defined for each product and forecast location around Australia.

Why do we evaluate our service performance?

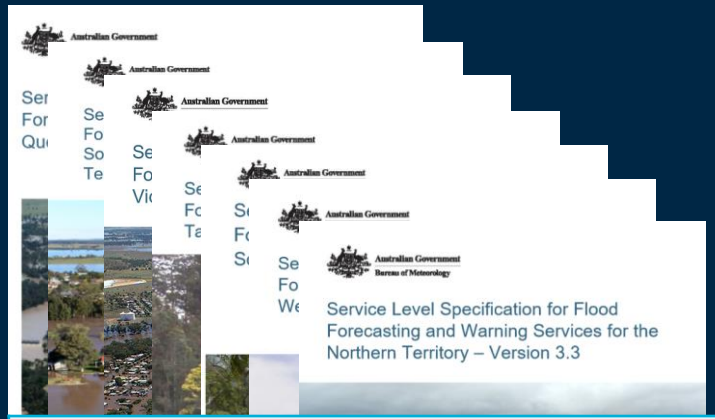


- To ensure we're always looking at how we can improve the flood warning service for the community!!



- Bi-monthly performance reporting to the Bureau executive team (internal)
- Annual Reporting (external)
- Flood Warning Consultive Committee (FWCC) meetings with emergency management partners (limited external)
- Annual or Special Climate and Water Statement (external)
- Flood event specific summaries (limited external, external)
- Ad hoc requests (internal, limited external)

What performance metrics are used for evaluation?



Bureau number	AWRC Number	Forecast location	Flood classification (m)			Prediction type	Target warning lead time		70% of peak forecasts within
			Minor	Moderate	Major		Time	Trigger height (m)	
403 – Ovens River Basin									
583148	403205	Bright	3.0	3.6	4.3	Qualitative	3 hrs	>3.0m	n/a
082112	403250	Eurobin (Ovens R)	4.5	5.5	6.0	Quantitative	3 hrs	>4.5m	+/- 0.3m
582014	403230	Rocky Point	3.2	4.4	5.2	Quantitative	6 hrs	>3.2m	+/- 0.3m
582004	403223	Docker Rd Bridge	3.7	3.95	4.1	Quantitative	6 hrs	>3.7m	+/- 0.3m
582002	403213	Greta South	2.8	4.2	6.0	Qualitative	3 hrs	>2.8m	n/a
582033	403200	Wangaratta (Ovens R)	11.9	12.4	12.7	Quantitative	9 hrs	>11.9m	+/- 0.3m

Timeliness: % flood watches and flood warnings issued to customers on time (before or at the stated next issue time) - target 97%

Lead time: % trigger height exceedances for which target lead time was provided to customers as per Service Level Specifications – target 70%

Accuracy: % peak predictions provided to customers within specified range (e.g. ±0.3 m) as per Service Level Specifications – target 70%

*SLS metadata stored as .csv files in the HyFS Configuration.

In a past life: Manual Performance Analysis

February 2020

- 716 Flood Warnings, 84 Flood Watches
- Approx. **25 days** effort to collect the performance data and produce metric analysis

January 2021 to May 2022
Nearly 8000 products issued.

Similar to the amount issued in the 4 years prior (2017-2020).

2019 - 2020 FY: Flood Verification Results

All Regions Combined

	Total product count / severity / type								Verification metric one: On Time (at or before scheduled time)			Verification metric two: SLS Forecast lead time					
	Total Count of Watches	Total Count of Warnings	Watch	Minor	Moderate	Major	Generalised	Final (warning and watch)	Total No. of updated and final warnings and watches	On time (Count)	On time (%)	Hit	Miss (Lead time less than specified)	Miss (no prediction of target height)	False Alarms	% of forecast lead time as per SLS	False alarm Rate
Jul-19	26	89	20	67	1	0	0	27	91	59	65%	13	2	0	15	87%	0.50
Aug-19	16	64	12	48	5	0	0	15	68	59	87%	9	2	0	3	82%	0.21
Sep-19	1[illegible]	38	7	26	1	0	1	13	37	33	89%	4	0	0	13	100%	0.76
Oct-19	0	0	0	0	0	0	0	0	0	0	#DIV/0!	0	0	0	0	#DIV/0!	#DIV/0!
Nov-19	5	19	4	15	0	0	0	5	21	19	90%	1	0	1	0	50%	0.00
Dec-19	6		4	6	0	0	0	4	10	10	100%	1	2	0	1	33%	0.25
Jan-20	33	90	25	33	21	14	14	17	96	87	91%	5	5	0	1	50%	0.09
Feb-20	83	716	70	297	173	133	42	84	706	642	91%	66	36	4	18	62%	0.15
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	300	293	98%	27	3	0	6	90%	0.17
Apr-20	22	140	18	91	29	0	0	24	133	127	95%	16	7	0	9	70%	0.28
May-20	5	64	3	46	3	0	2	15	64	62	97%	10	4	1	8	67%	0.36
Jun-20	9	38	7	26	0	0	4	10	38	35	92%	6	1	0	12	86%	0.63
TOTAL	260	1553	205	726	338	202	85	257	1564	1426	91%	158	62	6	86	70%	0.28

Product	Flood Warning pr														
Jan-20															
IDQ20900	Flood Watch 1														
IDQ20905	Flood Watch 2														
IDQ20855	Bulloo														
IDQ20745	Burdekin														
IDQ20860	Cooper Creek, Thoma														
IDQ20705	Daintree and Mossma														
IDQ20865	Diamantina														
IDQ20765	Fitzroy (Connors-Isa														
IDQ20870	Georgina & Eyre Ck		29/01/2020	-	3	Warning set continuing in Feb			✓	IDQ20865	Diamantina	4	1	1	0
IDQ20875	Gulf		26/01/2020	-	15	Warning set continuing in Feb			✓	IDQ20765	Fitzroy River	2	2	0	0
IDQ20725	Herbert		28/01/2020	29/01/2020	6		2		✓	IDQ20840	Moonie	2	1	0	0
IDQ20840	Moonie		28/01/2020	29/01/2020	2		2		✓	IDQ20870	Georgina	3	1	2	0
IDQ20850	Paroo		21/01/2020	-	11	Warning set continuing in Feb			✓	IDQ20855	Bulloo	1	1	0	0
IDQ20842	Wallam-Mungallala		27/01/2020	29/01/2020	3		3		✓	IDQ20705	Daintree	2	1	0	0
	TOTAL				68						Total	68	25	19	10
Feb-20										Product II	Product Name	Total Updates of Watch and Warnings	Minor	Moderate	Major
IDQ20900	Flood Watch 1		4/02/2020	14/02/2020	12		11		✓	IDQ20900	Flood Watch	18			
IDQ20900	Flood Watch 1		20/02/2020	23/02/2020	4		4		✓	IDQ20710	Barcoo River				
IDQ20905	Flood Watch 2		21/02/2020	25/02/2020	5		5		✓	IDQ20855	Bulla River	17	9	6	2
IDQ20800	Brisbane (Upper & Stanley)		10/02/2020	14/02/2020	10		5		✓	IDQ20745	Burdekin River	3	2	0	0
IDQ20805	Brisbane (Warrill & Bremer)		13/02/2020	14/02/2020	7		2		✓	IDQ20770	Burnett River				
IDQ20855	Bulloo		31/01/2020	2/02/2020	2		3		✓	IDQ20785	Barcoo-Cherwell River	2	1	0	0
IDQ20855	Bulloo 1		7/02/2020	14/02/2020	8		8		✓	IDQ20825	Condamine & Balonne Rivers	52	1	14	38
IDQ20855	Bulloo 2		22/02/2020	-	9	Warning set continuing in Mar			✓	IDQ20705	Daintree & Mossman Rivers				

SUMMARY | Jul 19 summary | Jan 20 summary | Feb 20 summary | Mar 20 summary | Apr 20 summary | May 20 summary | Flood Watches

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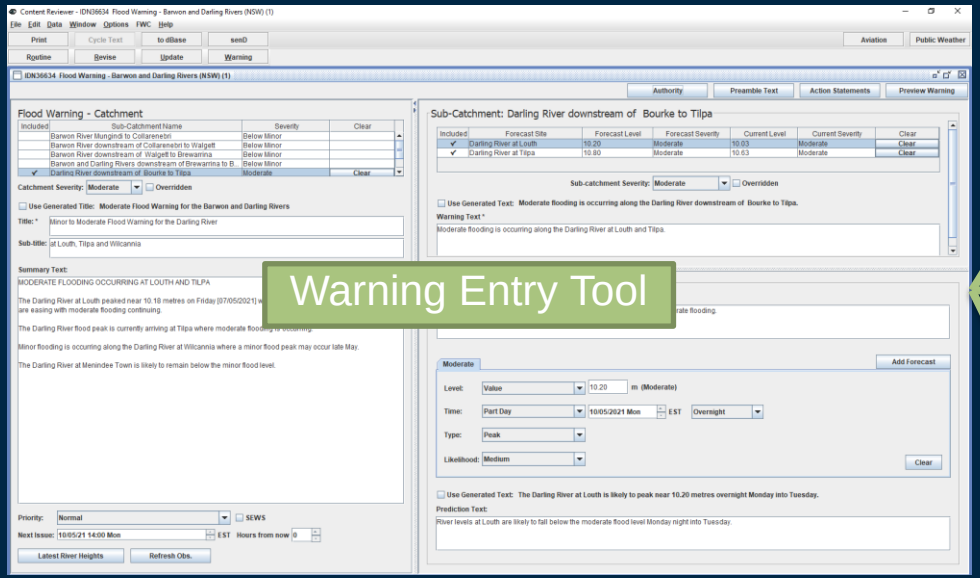
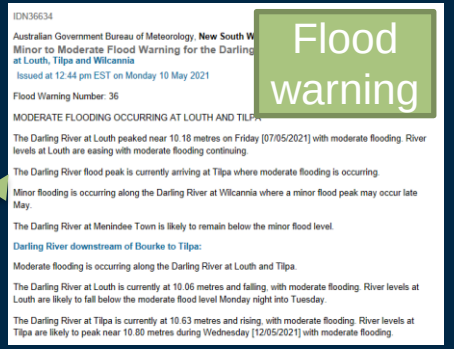
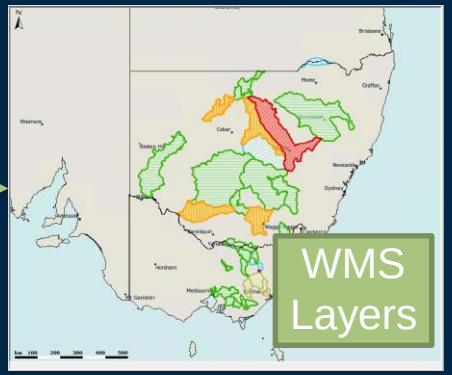
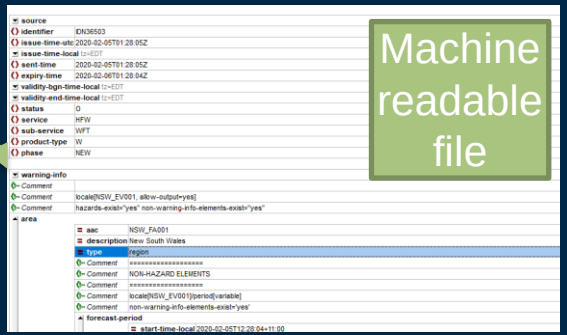
Issue Flood Warnings









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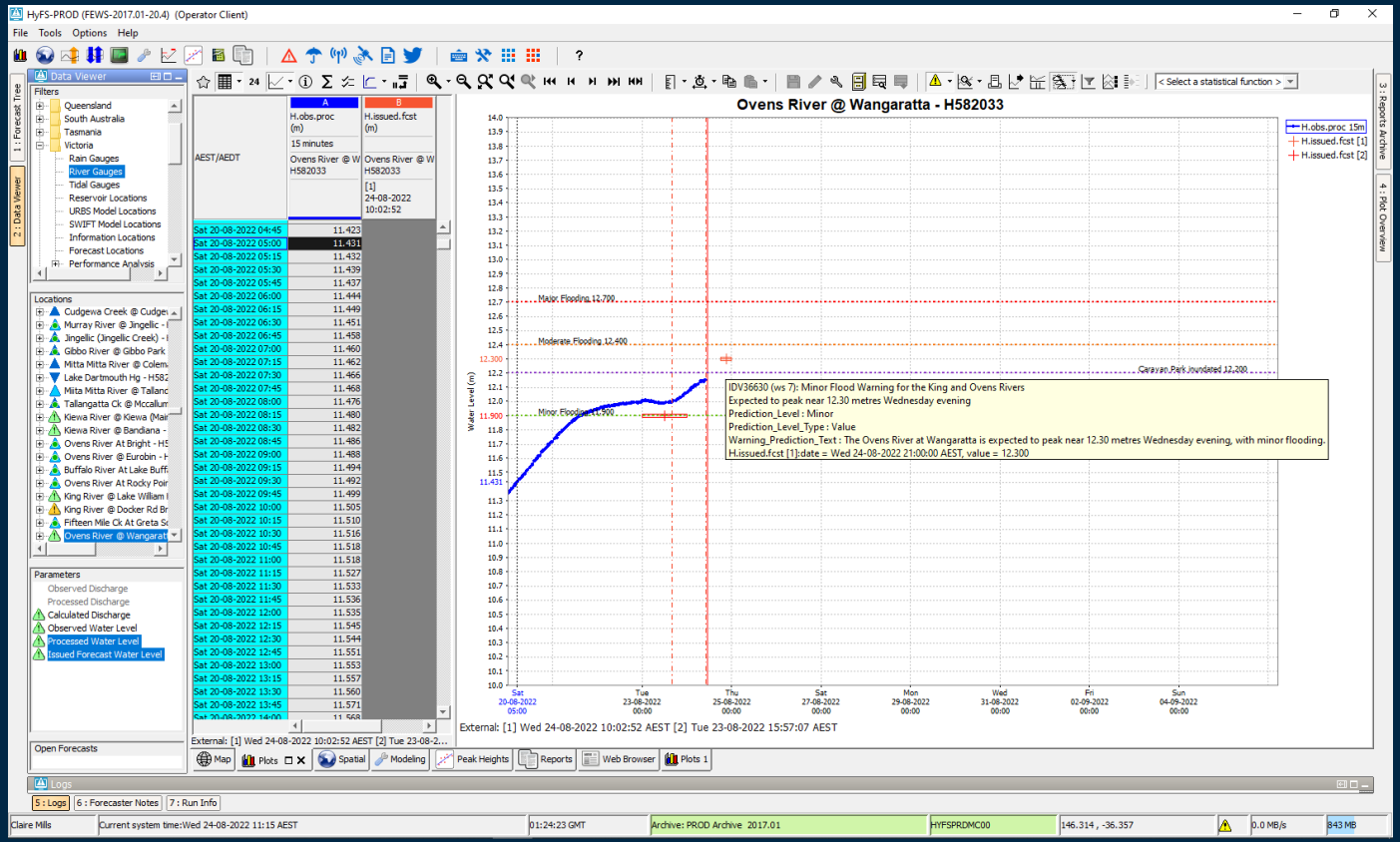
Import to HyFS (FEWS)



FEWS User days 2021 – Next steps

FEWS User days 2021 (presented by Wen Wang) identified a number of further improvements**:**

- Automate the process as much as possible
- Improve algorithms, including peak selection
- Improve PAT display functionality for linking warnings with predictions for individual locations
- Better visualisation and filters from Forecast Tree
- Create peak height correlations with the peak identified in PAT
- Investigate metrics for flood watch products

Performance Analysis Tool (PAT) – Warnings import to FEWS

IDN36609
Australian Government Bureau of Meteorology

Initial Minor to Major Flood Warning for the Hawkesbury and Nepean Rivers

at Menangle, Camden, Wallacia, Penrith, North Richmond, Windsor and Putty Road

Issued at 3:47 pm EST on Saturday 2 July 2022
Flood Warning Number: 1

MINOR TO MAJOR FLOODING LIKELY ALONG THE HAWKESBURY, NEPEAN AND COLO RIVERS

MAJOR FLOODING POSSIBLE AT MENANGLE AND NORTH RICHMOND FROM SUNDAY

A surface trough and a developing East Coast Low has been producing heavy rainfall over the Hawkesbury Nepean Valley since Saturday morning with heavy rainfall forecast to continue through Saturday evening into Sunday and Monday. This rain coupled with high dam levels has the potential to produce riverine flooding along the Nepean river from Saturday evening at Menangle, and the Hawkesbury and Colo Rivers from Sunday.

River level rises have been observed along the Upper Nepean and Wollondilly rivers and are expected to rise further with forecast rain.

A Severe Weather Warning for heavy rainfall is current for the Metropolitan, Illawarra and parts of Hunter and Central Tablelands Forecast Districts.

A Flood Watch is current for the Hawkesbury and Nepean, Upper Cox's, Colo and Macdonald Rivers.

Upper Nepean River:
Minor to Major flooding may occur along the Upper Nepean River.

The Nepean River at Menangle Bridge is likely to exceed the minor flood level (5.20 m) around 09:00 pm Saturday. The river level may exceed the moderate flood level (9.20 m) Sunday morning and may reach around 11.00 metres during Sunday, with moderate flooding. Further rises to the major flood level are possible, with forecast rainfall

The Nepean River at Camden Weir may reach the minor flood level (6.80 m) during Sunday. Further rises to the moderate flood level are possible, with forecast rainfall.

The Nepean River at Wallacia Weir may reach the minor flood level (5.00 m) late Sunday. Further rises to the moderate flood level are possible, with forecast rainfall.

Hawkesbury and Lower Nepean River:
Minor to Major flooding may occur along the Lower Nepean and Hawkesbury River.

The Nepean River at Penrith may reach the minor flood level (3.90 m) Sunday evening. Further rises possible with forecast rainfall.

Start Time: Wed 01-06-2022 00:00:00 End Time: Sat 16-07-2022 00:00:00 Apply

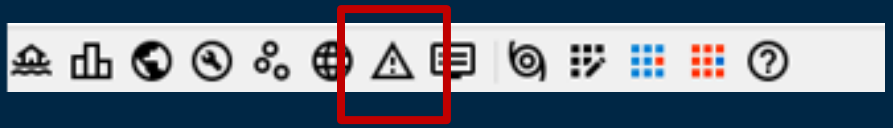
Flood Watches | Flood Warnings | Forecast Locations

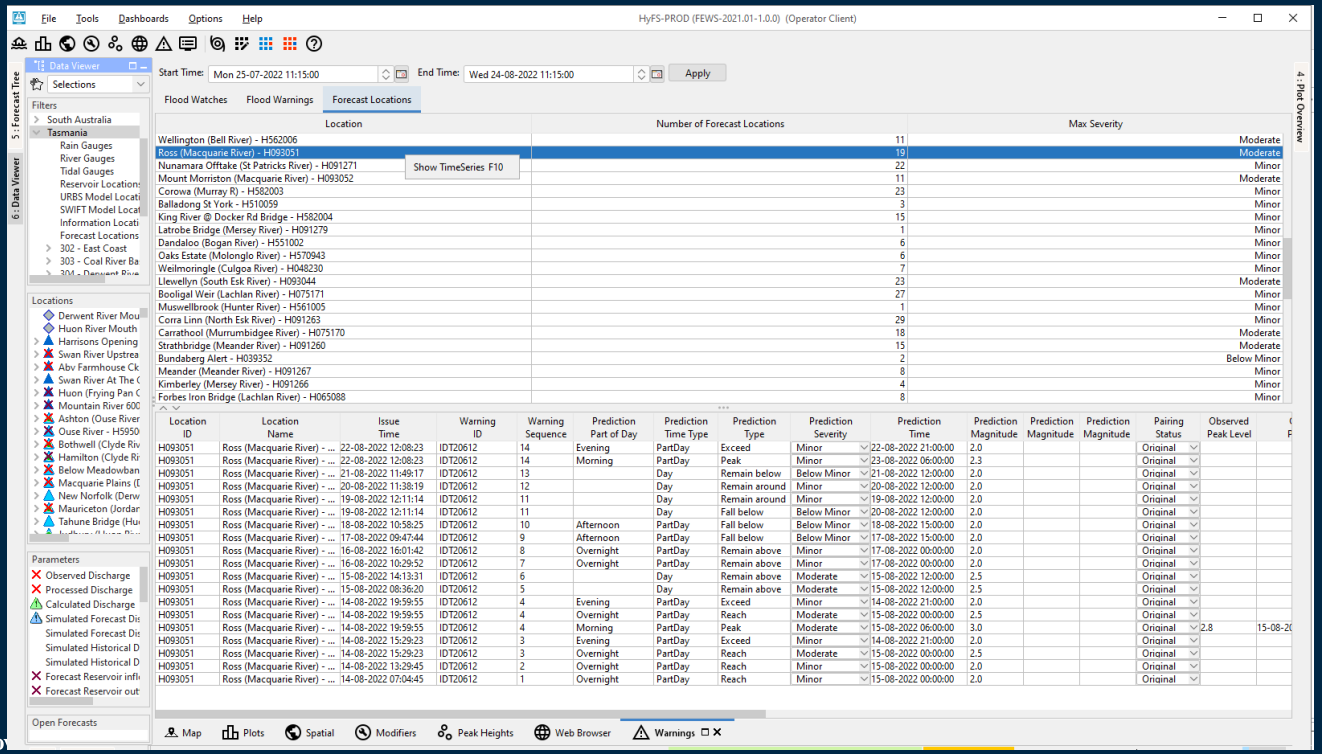
Location	Number of Flood Warnings	Max Severity
IDQ20825 - Condamine and Balonne Rivers	16	Major
IDN36609 - Hawkesbury and Nepean Rivers	45	Major
IDN36608 - Hunter River	38	Major
IDN36624 - Macquarie River	26	Major
IDN36615 - Wyong River and Tuggerah Lake	21	Major
IDN36634 - Barwon and Darling Rivers	24	Major
IDN36631 - Warrego River (NSW)	6	Minor

Warning ID	Warning Sequence	Issue Time	Next Issue Time	Severity	Phase	Status	Warning Title
IDN36609	1	02-07-2022 15:47:05	02-07-2022 20:00:00	Major	NEW	Original	Initial Minor to Major Flood Warning for the Hawkesbury and Nepean Rivers
IDN36609	2	02-07-2022 16:45:23	02-07-2022 20:00:00	Major	NEW	Original	Minor to Major Flood Warning for the Hawkesbury and Nepean Rivers
IDN36609	3	02-07-2022 19:15:50	02-07-2022 23:00:00	Major	UPD	Original	Moderate to Major Flood Warning for the Hawkesbury and Nepean Rivers
IDN36609	4	02-07-2022 19:24:39	02-07-2022 23:00:00	Major	UPD	Original	Moderate to Major Flood Warning for the Nepean, Hawkesbury and Colo Rivers
IDN36609	5	02-07-2022 22:18:51	03-07-2022 03:00:00	Major	REN	Original	Moderate to Major Flood Warning for the Nepean, Hawkesbury and Colo Rivers
IDN36609	6	03-07-2022 00:24:55	03-07-2022 03:30:00	Major	REN	Original	Moderate to Major Flood Warning for the Nepean, Hawkesbury and Colo Rivers
IDN36609	7	03-07-2022 01:31:01	03-07-2022 03:30:00	Major	REN	Original	Moderate to Major Flood Warning for the Nepean, Hawkesbury and Colo Rivers
IDN36609	8	03-07-2022 02:55:58	03-07-2022 06:30:00	Major	REN	Original	Moderate to Major Flood Warning for the Nepean, Hawkesbury and Colo Rivers
IDN36609	9	03-07-2022 05:55:18	03-07-2022 09:00:00	Major	REN	Original	Moderate to Major Flood Warning for the Nepean, Hawkesbury and Colo Rivers
IDN36609	10	03-07-2022 08:44:54	03-07-2022 12:00:00	Major	REN	Original	Moderate to Major Flood Warning for the Nepean, Hawkesbury and Colo Rivers
IDN36609	11	03-07-2022 11:29:26	03-07-2022 15:00:00	Major	REN	Original	Moderate to Major Flood Warning for the Nepean, Hawkesbury and Colo Rivers
IDN36609	12	03-07-2022 14:25:58	03-07-2022 18:00:00	Major	REN	Original	Moderate to Major Flood Warning for the Nepean, Hawkesbury and Colo Rivers

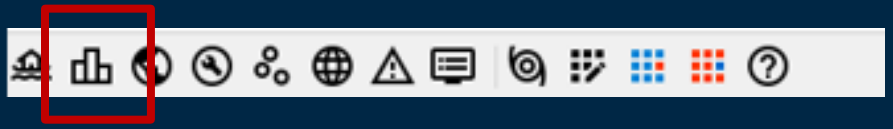
Location ID	Location Name	Forecast Time	Warning ID	Warning Sequence	Prediction Part of Day	Prediction Time Type	Prediction Type	Prediction Severity	Time	Prediction Magnitude	Prediction Magnitude	Prediction Magnitude	Pairing Status	Observed Peak	Observed Peak Time	Prediction Magnitude Exceed	
H568154	Camden Weir (Nepean River) - H568154	02-07-2022 15:47:05	IDN36609	1		Day	Reach	Minor	03-07-2022 12:00:00	6.8			Original				The
H568154	Camden Weir (Nepean River) - H568154	02-07-2022 16:45:23	IDN36609	2	Overnight	PartDay	Reach	Minor	03-07-2022 00:00:00	6.8			Original			02-07-2022 23:45:00	The
H568154	Camden Weir (Nepean River) - H568154	02-07-2022 19:15:50	IDN36609	3	Overnight	PartDay	Reach	Minor	03-07-2022 00:00:00	6.8			Original				The
H568154	Camden Weir (Nepean River) - H568154	02-07-2022 19:15:50	IDN36609	3	Morning	PartDay	Reach	Moderate	03-07-2022 06:00:00	8.3			Original				The
H568154	Camden Weir (Nepean River) - H568154	02-07-2022 19:24:39	IDN36609	4	Overnight	PartDay	Reach	Minor	03-07-2022 00:00:00	6.8			Original				The
H568154	Camden Weir (Nepean River) - H568154	02-07-2022 19:24:39	IDN36609	4	Morning	PartDay	Reach	Moderate	03-07-2022 06:00:00	8.3			Original				The
H568154	Camden Weir (Nepean River) - H568154	02-07-2022 22:18:51	IDN36609	5	Overnight	PartDay	Reach	Minor	03-07-2022 00:00:00	6.8			Original				The

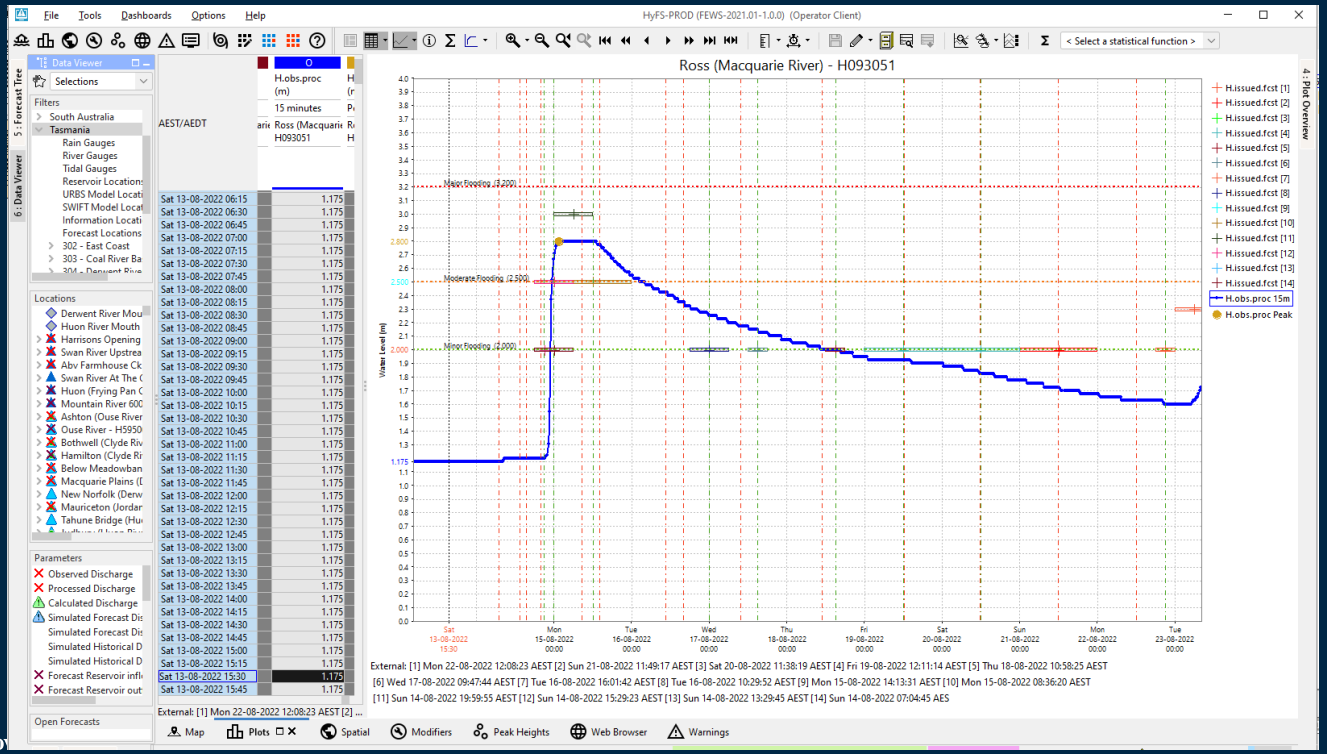
PAT – Linking forecasts with predictions for individual locations





PAT – Linking forecasts with predictions for individual locations





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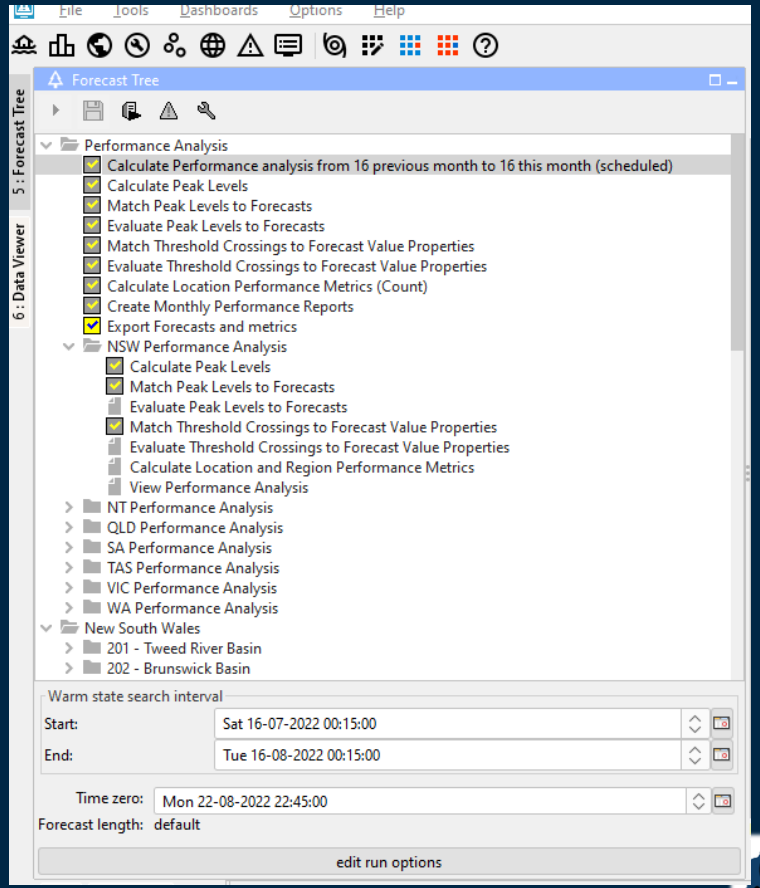
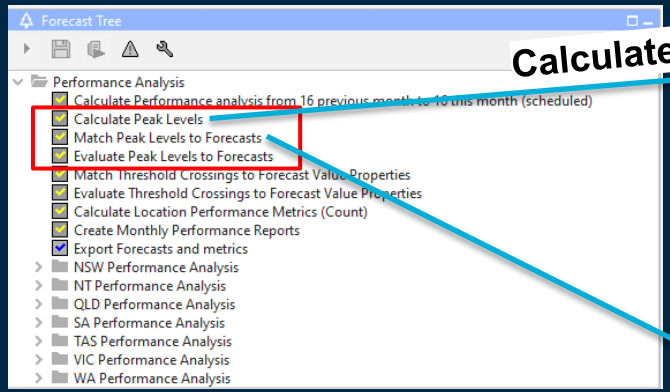
Automate wherever possible!

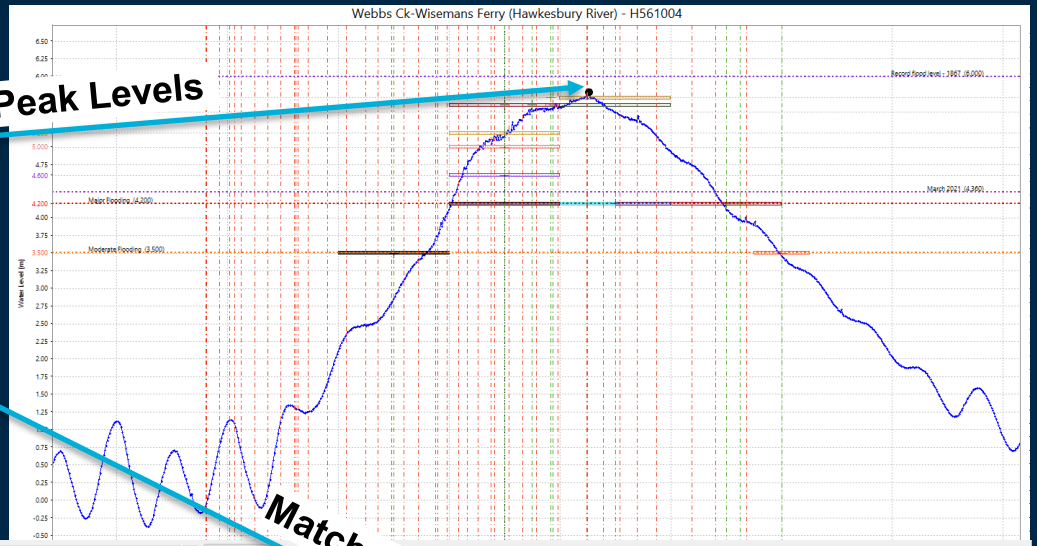
PAT Workflows

- Performance analysis in Forecast Tree
- Specialised user group to see and use performance nodes
- Automatically calculates performance KPIs for each month on the 16th of the month.
- Still requires quality control via Warnings Display



Performance Analysis Tool (PAT) Workflow – Peak Accuracy





Calculate Peak Levels

Match Peak Levels to Forecasts

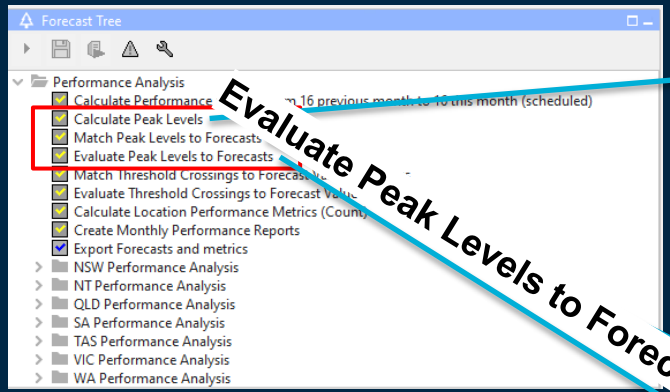
Start Time: Thu 16-06-2022 00:00:00 End Time: Sat 16-07-2022 00:00:00 Apply

Flood Watches | Flood Warnings | Forecast Locations

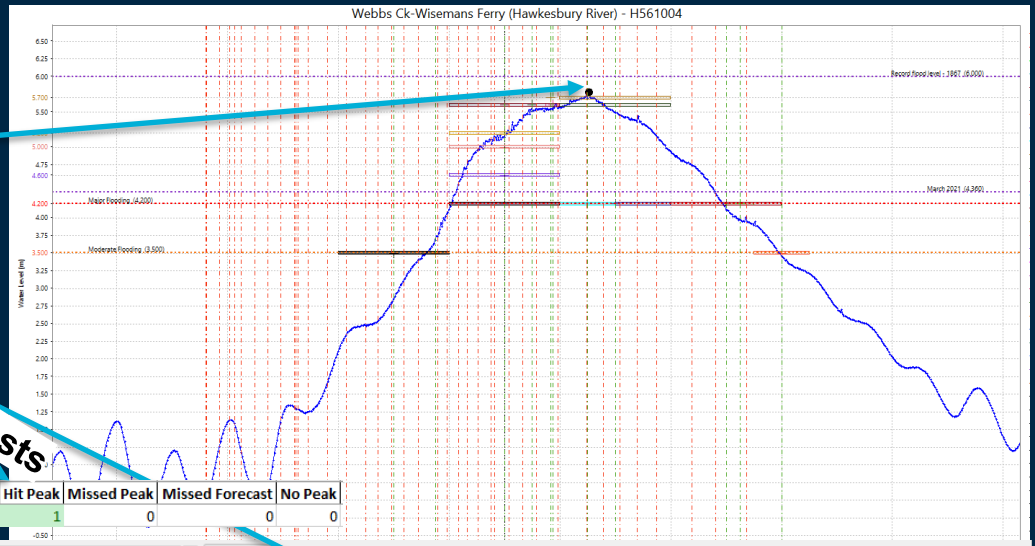
Location	Number of Forecast Locations	Max Severity
Tuncurry (Point Rd) - H560057		Moderate
Wallacia Weir (Nepean River) - H067093		Major
Warren Town (Macquarie River) - H051145		Major
Wauchope Rwy Br (Hastings River) - H060124		Minor
Webbs Ck-Wisemans Ferry (Hawkesbury River) - H561004	42	Major
Wellington (Bell River) - H562006	6	Moderate
Wellington Bridge (Macquarie River) - H565002	17	Minor
Wilcannia (Darling River) - H546010	18	Moderate
Windsor Pwd (Hawkesbury River) - H567044	62	Major

Location ID	Location Name	Issue Time	Warning ID	Warning Sequence	Prediction Part of Day	Prediction Time Type	Prediction Type	Prediction Severity	Prediction Time	Prediction Magnitude	Prediction Magnitude	Prediction Magnitude	Pairing Status	Observed Peak Level	Observed Peak Time
H561004	Webbs Ck-Wisemans Fer...	05-07-2022 15:59:46	IDN36609	31		DateTime	Reach	Major	05-07-2022 18:00:00	5.6			Original		
H561004	Webbs Ck-Wisemans Fer...	05-07-2022 18:51:34	IDN36609	31		DateTime	Peak	Major	05-07-2022 22:00:00	5.7			Original	5.779	06-07-2022 06:15:00
H561004	Webbs Ck-Wisemans Fer...	05-07-2022 23:38:14	IDN36609	32	Morning	PartDay	Remain above	Major	06-07-2022 06:00:00	4.2			Original		
H561004	Webbs Ck-Wisemans Fer...	06-07-2022 05:53:04	IDN36609	34		Day	Remain above	Major	06-07-2022 12:00:00	4.2			Original		
H561004	Webbs Ck-Wisemans Fer...	06-07-2022 09:25:38	IDN36609	36		Day	Remain above	Major	06-07-2022 12:00:00	4.2			Original		
H561004	Webbs Ck-Wisemans Fer...	06-07-2022 12:55:41	IDN36609	37		Day	Remain above	Major	06-07-2022 12:00:00	4.2			Original		

Performance Analysis Tool (PAT) Workflow – Peak Accuracy



Evaluate Peak Levels to Forecasts



PRODUCT_ID	PRODUCT_NAME	Location	Short Name	Region	Month	Hit Peak	Missed Peak	Missed Forecast	No Peak
IDN36609	Hawkesbury and Nepean Rivers	H561004	Wisemans Ferry	NSW	2022-Jul	1	0	0	0

Start Time: Thu 16-06-2022 00:00:00 End Time: Sat 16-07-2022 00:00:00 Apply

Flood Watches | Flood Warnings | Forecast Locations

Location	Number of Forecast Locations	Max Severity
Tuncurry (Point Rd) - H560057	9	Moderate
Wallacia Weir (Nepean River) - H067093	48	Major
Warren Town (Macquarie River) - H051145	31	Major
Wauchope Rwy Br (Hastings River) - H060124		Minor
Webbs Ck-Wisemans Ferry (Hawkesbury River) - H561004	42	Major
Wellington (Bell River) - H562006	6	Moderate
Wellington Bridge (Macquarie River) - H565002	17	Minor
Wilcannia (Darling River) - H546010	18	Moderate
Windsor Pwd (Hawkesbury River) - H567044	62	Major

Location ID	Location Name	Issue Time	Warning ID	Warning Sequence	Prediction Part of Day	Prediction Time Type	Prediction Type	Prediction Severity	Prediction Time	Prediction Magnitude	Prediction Magnitude	Prediction Magnitude	Pairing Status	Observed Peak Level	Observed Peak Time
H561004	Webbs Ck-Wisemans Fer...	05-07-2022 15:59:46	IDN36609	31		DateTime	Reach	Major	05-07-2022 18:00:00	5.6			Original		
H561004	Webbs Ck-Wisemans Fer...	05-07-2022 18:51:34	IDN36609	31		DateTime	Peak	Major	05-07-2022 22:00:00	5.7			Original	5.779	06-07-2022 06:15:00
H561004	Webbs Ck-Wisemans Fer...	05-07-2022 23:38:14	IDN36609	32	Morning	PartDay	Remain above	Major	06-07-2022 06:00:00	4.2			Original		
H561004	Webbs Ck-Wisemans Fer...	06-07-2022 05:53:04	IDN36609	34		Day	Remain above	Major	06-07-2022 12:00:00	4.2			Original		
H561004	Webbs Ck-Wisemans Fer...	06-07-2022 09:25:38	IDN36609	36		Day	Remain above	Major	06-07-2022 12:00:00	4.2			Original		
H561004	Webbs Ck-Wisemans Fer...	06-07-2022 12:55:41	IDN36609	37		Day	Remain above	Major	06-07-2022 12:00:00	4.2			Original		

Improved algorithms for peak selection

Peak selection algorithm includes:

- Peak forecast trigger height
- Minimum prominence
- Configurable for each location

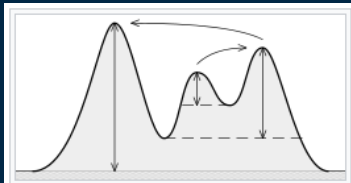
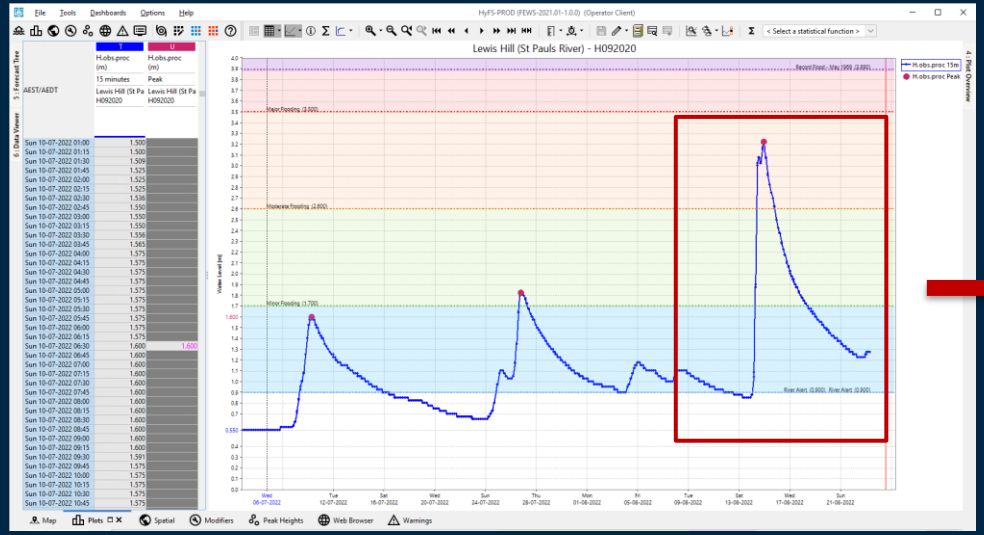
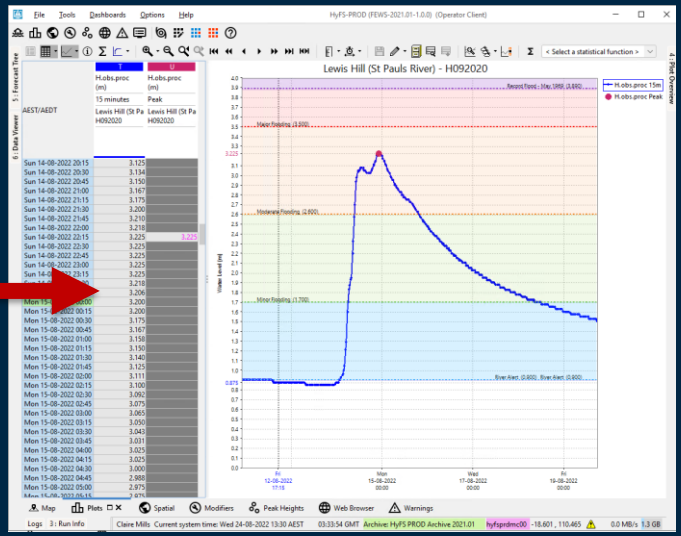


Figure 1. Vertical arrows show the topographic prominence of three peaks on an island. The dashed horizontal lines show the lowest contours that do not encircle higher peaks. Curved arrows point from a peak to its parent.

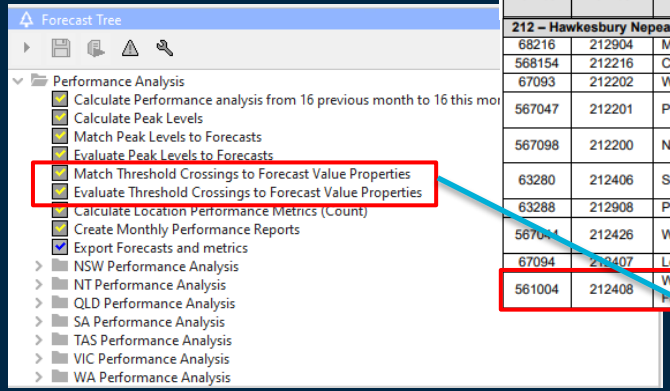
False peaks still occur!

During the QAQC stage, peaks can be removed via the plot window in edit mode





Performance Analysis Tool (PAT) Workflow – Lead Time



Bureau number	AWRC number	Forecast location	Station owner	Gauge type	Gauge datum	Flood classification (m)			Prediction type	Target warning lead time		70% of peak forecasts within	Priority
						Minor	Moderate	Major		Time (hrs)	Trigger height (m)		
212 – Hawkesbury Nepean River Valley													
68216	212904	Menangle Bridge	BOM	Automatic	Local	5.2	9.2	12.2	Quantitative	6 hrs	>5.2 m	+/- 0.3 m	High
568154	212216	Camden Weir	WaterNSW	Automatic	Local	6.8	8.3	13.8	Quantitative	12 hrs	>6.8 m	+/- 0.3 m	High
67093	212202	Wallacia Weir	WaterNSW	Automatic	Local	5.0	8.7	11.0	Quantitative	12 hrs	> 5.0 m	+/- 0.3 m	High
567047	212201	Penrith	WaterNSW	Automatic	Local	3.9	7.9	10.4	Quantitative	6 hrs 8 hrs	>8.9 m >11.3 m	+/- 0.3 m	High
567098	212200	North Richmond (WPS)	WaterNSW	Automatic	Local	3.8	7.9	10.5	Quantitative	6 hrs 15 hrs	>16.0 m >18.0 m	+/- 0.3 m	High
63280	212406	Sackville	WaterNSW NSW OEH	Automatic	AHD	4.6	7.3	9.7	Quantitative	18 hrs	>4.6 m	+/- 0.3 m	High
63288	212908	Putty Road	-	Manual	Local	2.7	5.7	10.7	Quantitative	12 hrs	>5.7 m	+/- 0.3 m	High
567041	212426	Windsor (PWD)	NSW OEH	Automatic	AHD	5.8	7.0	12.2	Quantitative	6 hrs 15 hrs	>9.6 m >13.7 m	+/- 0.3 m	High
67094	212407	Lower Portland	NSW OEH	Automatic	AHD	4.6	6.1	7.6	Quantitative	18 hrs	>4.6 m	+/- 0.3 m	High
561004	212408	Webbs Creek (Wisemans Ferry)	WaterNSW NSW OEH	Automatic	AHD	n/a	3.5	4.2	Quantitative	12 hrs	>3.5 m	+/- 0.3 m	High

Match Threshold crossing to Forecast Value

Start Time: Thu 16-06-2022 00:00:00 End Time: Sat 16-07-2022 00:00:00 Apply

Flood Watches | Flood Warnings | Forecast Locations

Location	Number of Forecast Locations	Max Severity
Tuncurry (Point Rd) - H560057	9	Moderate
Wallacia Weir (Nepean River) - H067093	48	Major
Warren Town (Macquarie River) - H051145	31	Major
Wauchope Rwy Br (Hastings River) - H060124	10	Minor
Webbs Ck-Wisemans Ferry (Hawkesbury River) - H561004	42	Major
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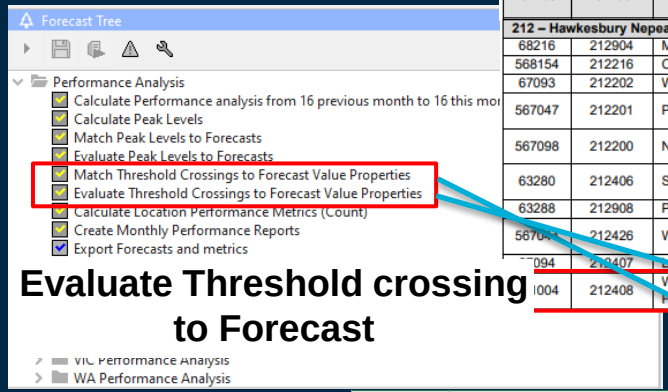
Wellington Bridge (Macquarie River) - H565002	17	Minor
Wilcannia (Darling River) - H546010	18	Moderate
Windsor Pwd (Hawkesbury River) - H567044	62	Major

Location ID	Location Name	Issue Time	Warning ID	Warning Sequence	Prediction Part of Day	Prediction Time Type	Prediction Type	Prediction Severity	Prediction Time	Prediction Magnitude	Prediction Magnitude	Prediction Magnitude	Pairing Status	Observed Peak Level	Observed Peak Time	Prediction Magnitude Exceed
H561004	Webbs Ck-Wisemans Fer...	02-07-2022 19:15:50	IDN36609	3		Day	Reach	Moderate	04-07-2022 12:00:00	3.5			Original			04-07-2022 19:00:00
H561004	Webbs Ck-Wisemans Fer...	02-07-2022 19:24:39	IDN36609	4		Day	Reach	Moderate	04-07-2022 12:00:00	3.5			Original			
H561004	Webbs Ck-Wisemans Fer...	02-07-2022 22:18:51	IDN36609	5		Day	Reach	Moderate	04-07-2022 12:00:00	3.5			Original			
H561004	Webbs Ck-Wisemans Fer...	03-07-2022 00:24:55	IDN36609	6		Day	Reach	Moderate	04-07-2022 12:00:00	3.5			Original			
H561004	Webbs Ck-Wisemans Fer...	03-07-2022 01:31:01	IDN36609	7		Day	Reach	Moderate	04-07-2022 12:00:00	3.5			Original			
H561004	Webbs Ck-Wisemans Fer...	03-07-2022 02:55:58	IDN36609	8		Day	Reach	Moderate	04-07-2022 12:00:00	3.5			Original			

Performance Analysis Tool (PAT) Workflow – Lead Time



Evaluate Threshold crossing to Forecast

Bureau number	AWRC number	Forecast location	Station owner	Gauge type	Gauge datum	Flood classification (m)			Prediction type	Target warning lead time		70% of peak forecasts within	Priority
						Minor	Moderate	Major		Time (hrs)	Trigger height (m)		
212 – Hawkesbury Nepean River Valley													
68216	212904	Menangle Bridge	BOM	Automatic	Local	5.2	9.2	12.2	Quantitative	6 hrs	>5.2 m	+/- 0.3 m	High
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63288	212908	Putty Road	-	Manual	Local	2.7	5.7	10.7	Quantitative	12 hrs	>5.7 m	+/- 0.3 m	High
5670[illegible]	212426	Windsor (PWD)	NSW OEH	Automatic	AHD	5.8	7.0	12.2	Quantitative	6 hrs 15 hrs	>9.6 m >13.7 m	+/- 0.3 m	High
[illegible]094	212407	Lower Portland	NSW OEH	Automatic	AHD	4.6	6.1	7.6	Quantitative	18 hrs	>4.6 m	+/- 0.3 m	High
[illegible]004	212408	Webbs Creek (Wisemans Ferry)	WaterNSW NSW OEH	Automatic	AHD	n/a	3.5	4.2	Quantitative	12 hrs	>3.5 m	+/- 0.3 m	High

PRODUCT_ID	PRODUCT_NAME	Location	Short Name	Region	Month	Hit	Missed Time	Missed Height	False Alarm
IDN36609	Hawkesbury and Nepean Rivers	H561004	Wisemans Ferry	NSW	2022-Jul	1	0	0	0

Start Time: Thu 16-06-2022 00:00:00 End Time: Sat 16-07-2022 00:00:00 Apply

Flood Watches | Flood Warnings | Forecast Locations

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Tuncurry (Point Rd) - H560057	9	Moderate
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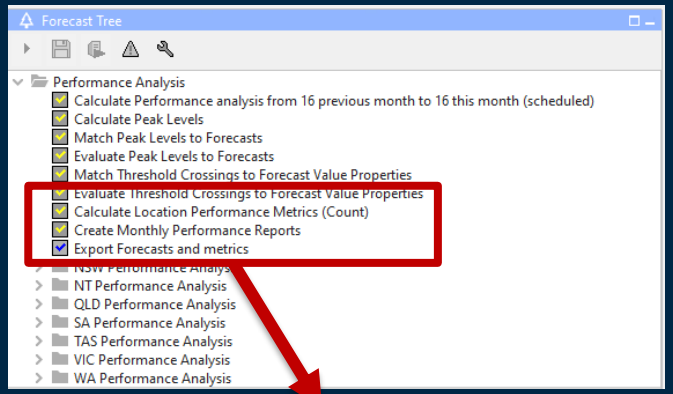
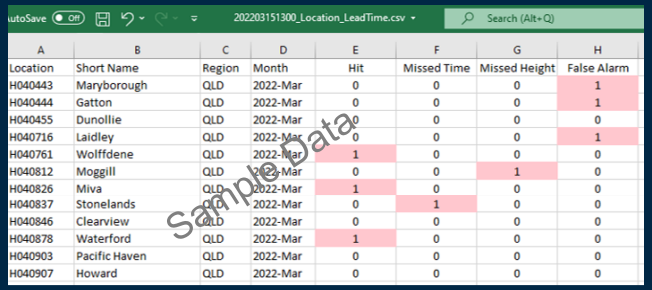
Wauchope Rwy Br (Hastings River) - H060124	10	Minor
Webbs Ck-Wisemans Ferry (Hawkesbury River) - H561004	42	Major
Wellington (Bell River) - H562006	6	Moderate
Wellington Bridge (Macquarie River) - H565002	17	Minor
Wilcannia (Darling River) - H546010	18	Moderate
Windsor Pwd (Hawkesbury River) - H567044	62	Major

Location ID	Location Name	Issue Time	Warning ID	Warning Sequence	Prediction Part of Day	Prediction Time Type	Prediction Type	Prediction Severity	Prediction Time	Prediction Magnitude	Prediction Magnitude	Prediction Magnitude	Pairing Status	Observed Peak Level	Observed Peak Time	Prediction Magnitude Exceed
H561004	Webbs Ck-Wisemans Fer...	02-07-2022 19:15:50	IDN36609	3		Day	Reach	Moderate	04-07-2022 12:00:00	3.5			Original			04-07-2022 19:00:00
H561004	Webbs Ck-Wisemans Fer...	02-07-2022 19:24:39	IDN36609	4		Day	Reach	Moderate	04-07-2022 12:00:00	3.5			Original			
H561004	Webbs Ck-Wisemans Fer...	02-07-2022 22:18:51	IDN36609	5		Day	Reach	Moderate	04-07-2022 12:00:00	3.5			Original			
H561004	Webbs Ck-Wisemans Fer...	03-07-2022 00:24:55	IDN36609	6		Day	Reach	Moderate	04-07-2022 12:00:00	3.5			Original			
H561004	Webbs Ck-Wisemans Fer...	03-07-2022 01:31:01	IDN36609	7		Day	Reach	Moderate	04-07-2022 12:00:00	3.5			Original			
H561004	Webbs Ck-Wisemans Fer...	03-07-2022 02:55:58	IDN36609	8		Day	Reach	Moderate	04-07-2022 12:00:00	3.5			Original			

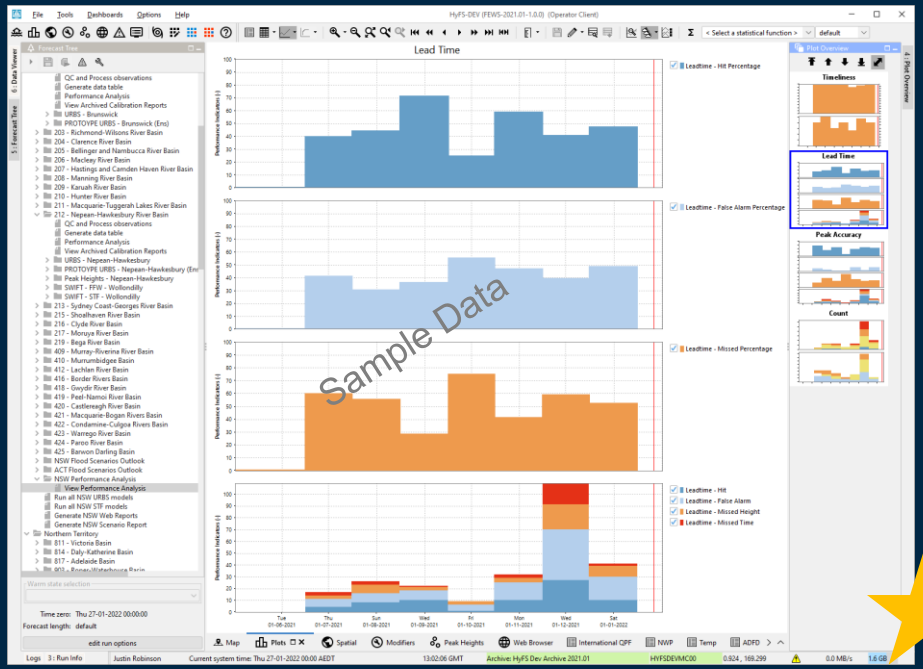
Performance Analysis Tool (PAT) Workflow – Results





Location	Short Name	Region	Month	Hit	Missed Time	Missed Height	False Alarm
H040443	Maryborough	QLD	2022-Mar	0	0	0	1
H040444	Gatton	QLD	2022-Mar	0	0	0	1
H040455	Dunollie	QLD	2022-Mar	0	0	0	0
H040716	Laidley	QLD	2022-Mar	0	0	0	1
H040761	Wolffdene	QLD	2022-Mar	1	0	0	0
H040812	Moggill	QLD	2022-Mar	0	0	1	0
H040826	Miva	QLD	2022-Mar	1	0	0	0
H040837	Stonelands	QLD	2022-Mar	0	1	0	0
H040846	Clearview	QLD	2022-Mar	0	0	0	0
H040878	Waterford	QLD	2022-Mar	1	0	0	0
H040903	Pacific Haven	QLD	2022-Mar	0	0	0	0
H040907	Howard	QLD	2022-Mar	0	0	0	0

Visualisation and filters from Forecast Tree



View Performance KPIs at the State/Territory, Basin and Location Scale

Back to the future: Performance Analysis Tool

Monthly performance statistics from start of QAQC to final export of results is now taking one person between **2-4 days.**

More time to:

- Focus on analysis for improving the service
- Identifying issues around process in the flood warning centres
- Determining priority locations / catchments for improvements
- Running internal performance results workshops and training (NEW!)

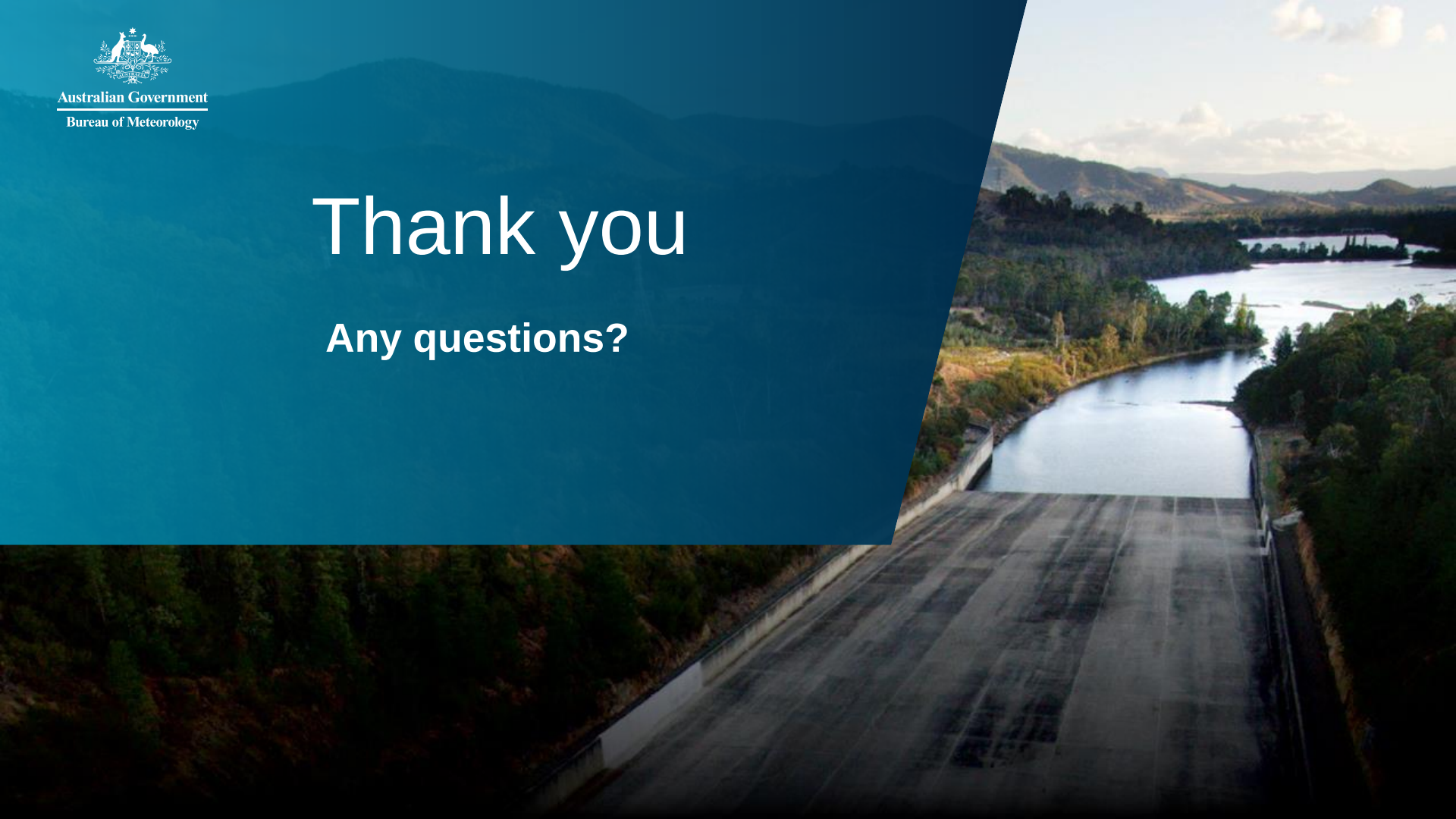
Close to near time analysis:

- Ability to meet internal and external reporting requirements DURING or shortly after major events.
- Performance analysis available for input into post event debriefs (PERM) and internal performance results workshops and training

Next steps for Performance Analysis Tool

- Minimise the QAQC requirements
- Further improvements to visualisation to the performance analysis data
- Progress using the peak selection and export to automate development of peak height correlations
- Investigate the use of the tool and algorithms for analysis of model performance
- Investigate metrics for flood watch products

Australian Government
Bureau of Meteorology

Thank you

Any questions?