

HOBO Dissolved Oxygen Logger Overview



- Records **Dissolved Oxygen Concentration** and **Temperature**
- The DO Assistant in HOBOWare Pro is used to get **Salinity-Adjusted DO Concentration** and **DO Percent Saturation**
- Uses RDO Basic Sensor from In-Situ – Optical DO Sensor with easy-to-replace, **6-month sensor cap**
- Part of the HOBO water logger family: Optic USB interface & waterproof shuttle for reliable data offload in wet environments; HOBOWare ease-of-use and data integration.
- Durable Delrin and PVC housing
- CE compliant
- Accuracy: 0.2 mg/L up to 8 mg/L; 0.5 mg/L from 8 to 20 mg/L
- 21,700 DO/temp measurements

Note: these stop recording temperature when the DO cap expires

DO Calibration

Lab Calibration - recommended after new DO sensor cap is installed

- 100% calibration with included calibration boot or in an air-saturated water bath; barometric pressure reading required.
- 0% calibration recommended if DO readings may be less than 4.0 mg/L. (use optional Sodium Sulfite solution)



DO Calibration

Field Calibration – use to compensate for fouling or to calibrate data **instead of lab calibration...meh..**

- Take precise readings at the start and end of each deployment – after stabilization
- Use both start & end points to compensate for fouling.
- A single-point calibration can be done with a reading from any time within the deployment.



Field Calibration Options



Field Meter/Sonde (Recommended) – Fastest method at around 5 minutes and logger can remain in the water

- Lake profiles – some RMN partners are using .25m profiles for QC

100% saturation method (Better than nothing) – useful if a field meter is not available

- Use Calibration Boot with freshwater for sponge.
- Allow time for air in boot to reach saturation and for logger to reach temperature equilibrium with surrounding air (time depends on temperature difference from where it was)
- Requires barometric pressure – use meter, U20 Water Level logger, or nearby weather station.

DO Calibration tips from VT DEC

Yeast method (an alternative to sodium sulfite solution)

<https://in-situ.com/wp-content/uploads/2015/01/RDO-Sensor-Two-Point-Dissolved-Oxygen-Calibration-Using-Yeast-Tech-Note.pdf>

Free barometer apps for smartphones may be helpful for on-site calibration of DO sensors.

App Store Preview

This app is only available on the App Store for iOS devices.



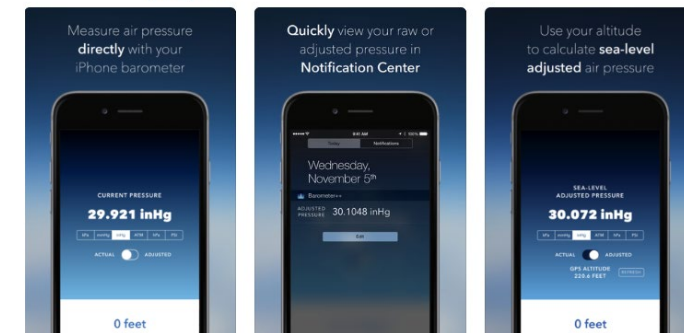
Simple Barometer 4+

Friends of The Web, LLC

★★★★☆ 4.0, 11 Ratings

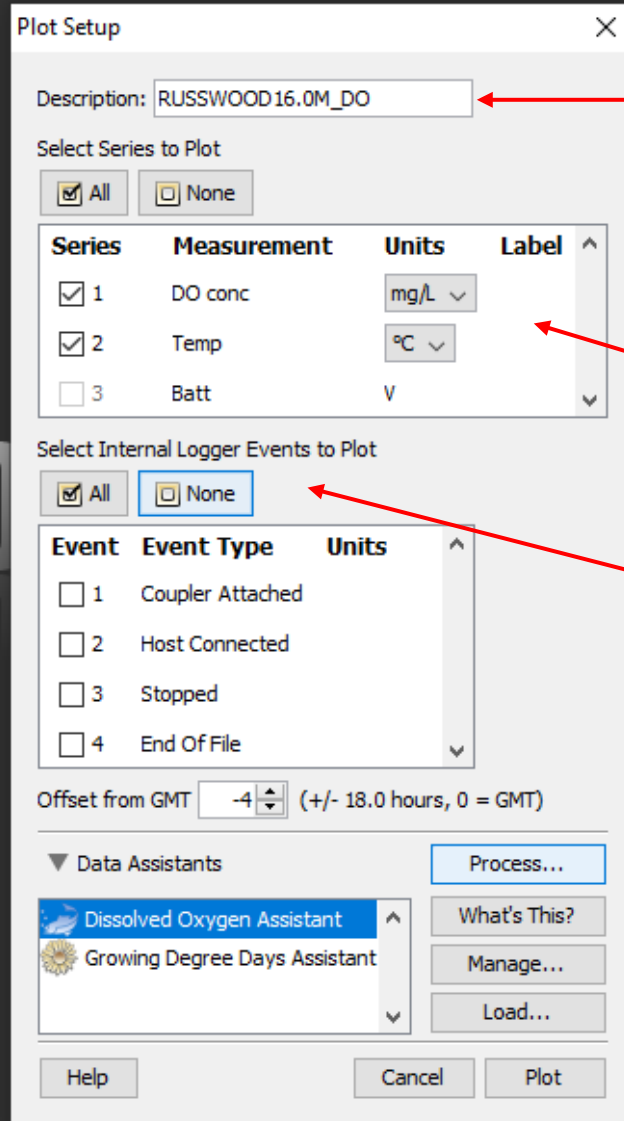
Free · Offers In-App Purchases

Screenshots iPhone iPad



Screenshots of data processing in HOBOWare

Open the water sensor DO file



The screenshot shows the 'Plot Setup' dialog box with the following settings:

- Description:** RUSSWOOD16.0M_DO
- Select Series to Plot:** 'All' is selected. The table below shows the selected series:

Series	Measurement	Units	Label
<input checked="" type="checkbox"/> 1	DO conc	mg/L	
<input checked="" type="checkbox"/> 2	Temp	°C	
<input type="checkbox"/> 3	Batt	V	

- Select Internal Logger Events to Plot:** 'None' is selected.
- Event Table:**

Event	Event Type	Units
<input type="checkbox"/> 1	Coupler Attached	
<input type="checkbox"/> 2	Host Connected	
<input type="checkbox"/> 3	Stopped	
<input type="checkbox"/> 4	End Of File	

- Offset from GMT:** -4 (+/- 18.0 hours, 0 = GMT)
- Data Assistants:** 'Dissolved Oxygen Assistant' is selected.
- Buttons:** 'Process...', 'What's This?', 'Manage...', 'Load...', 'Help', 'Cancel', 'Plot'.

Description: whatever is entered here becomes the Plot title but the R code doesn't pay attention to the plot title so you should be able to leave this as is. What's key is getting the file name correct because the R code reads the first part of the file name (whatever comes before the first underscore) and creates a SiteID column based on that.

Set Units –

- mg/L for DO
- °C for Temp

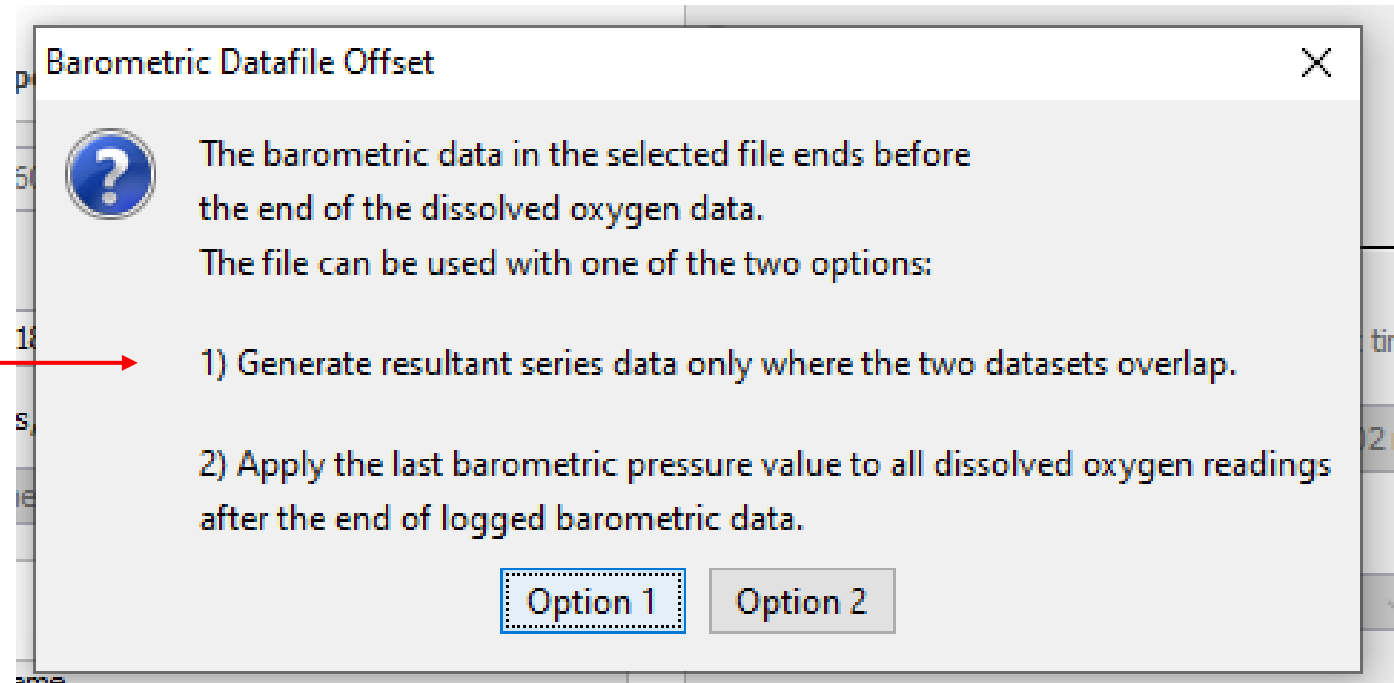
Select 'None', if necessary, to clear all checkboxes

Click 'Process'

If the date/times don't match exactly across the two files, you'll see a box like this...

For our purposes

Select Option 1—
compensate for the data
only where the two
datasets overlap,
interpolating between
points that do not exactly
align.



This screen will then appear

DO Adj Conc and DO Percent Sat have been added

Click 'Plot'

Plot Setup

Description: RUSSWOOD16M_DO

Select Series to Plot

☒ All ☐ None

DO conc mg/L RUSSWOOD16M_DO

Temp °C

DO Adj Conc mg/L

DO Percent Sat %

Abs Pres psi RUSSWOODTREE_PRESSURE

Batt V

Select Internal Logger Events to Plot

☒ All ☐ None

Event	Event Type	Units
<input type="checkbox"/> 1	Expired Sensor Cap	
<input type="checkbox"/> 2	Coupler Attached	
<input type="checkbox"/> 3	Host Connected	
<input type="checkbox"/> 4	Stopped	
<input type="checkbox"/> 5	End Of File	

Offset from GMT -4 (+/- 18.0 hours, 0 = GMT)

Data Assistants

Dissolved Oxygen Assistant

Growing Degree Days Assistant

Process...

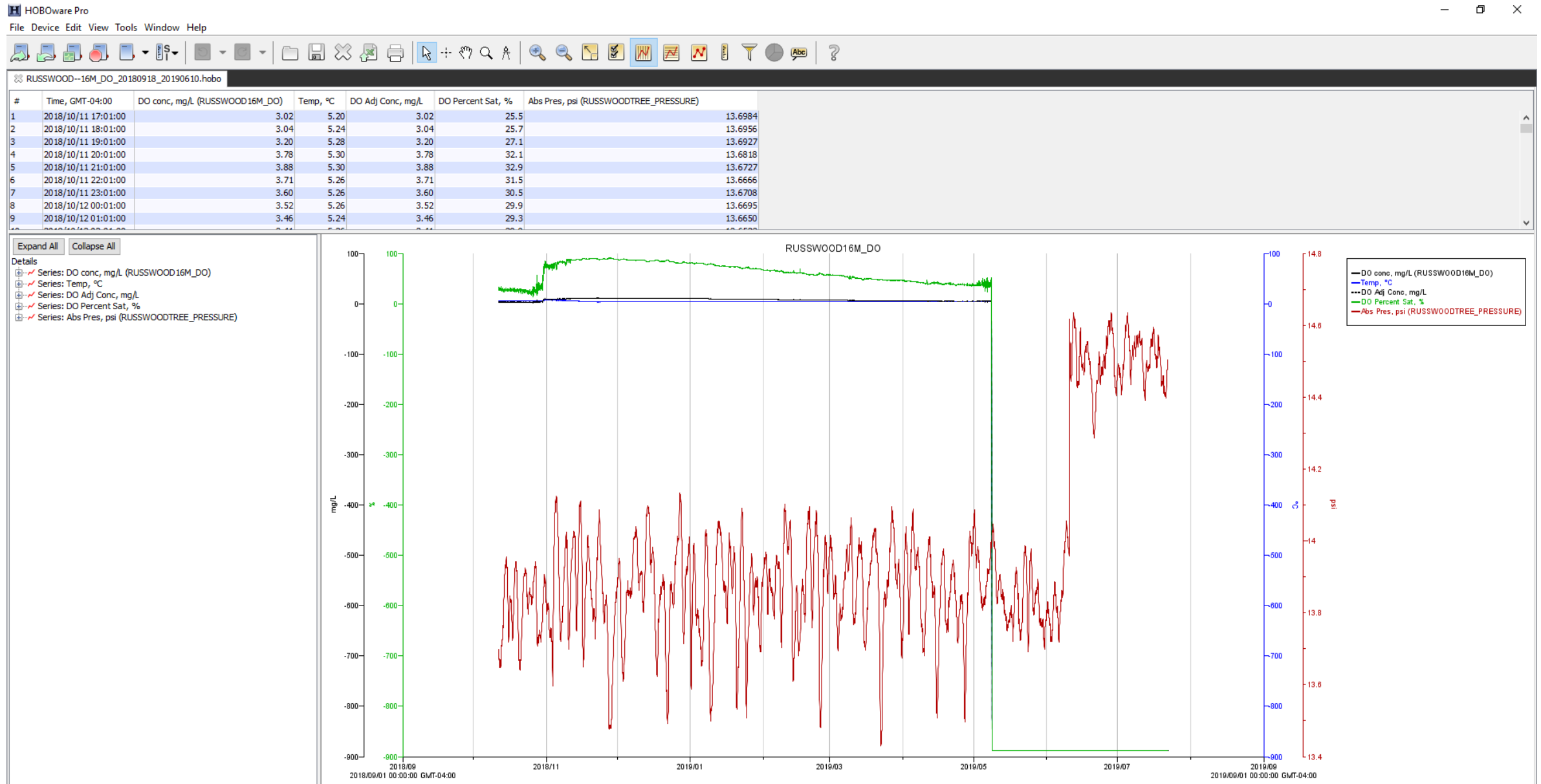
What's This?

Manage...

Load...

Help Cancel Plot

A time series plot will then appear



Crop the time series if needed (if the DO sensor cap expired, values change to -888)

HOBOWare Pro

File Device Edit View Tools Window Help

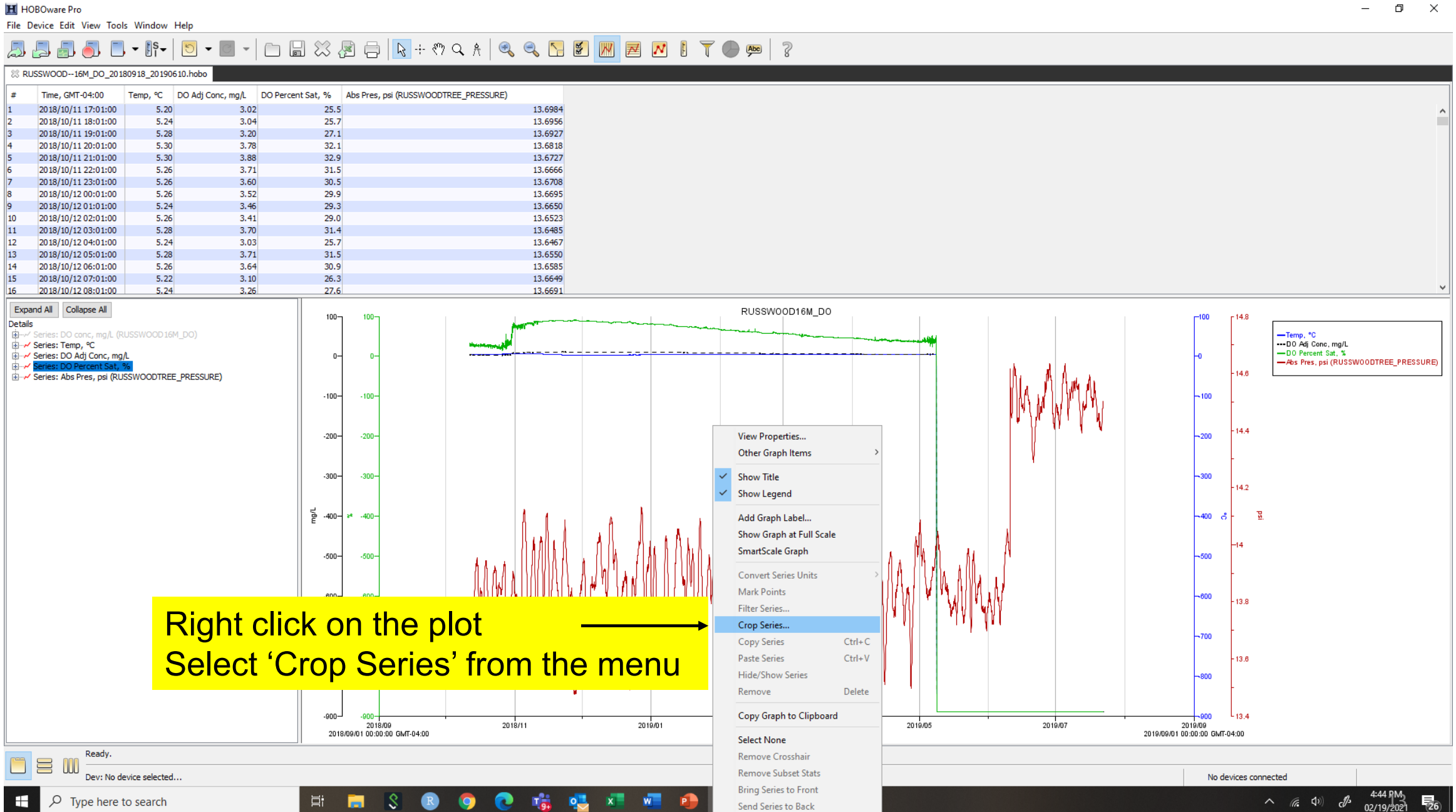
RUSSWOOD--16M_DO_20180918_20190610.hobo RUSSWOOD_PRESAIR_20180918_20190610.hobo RUSSWOOD--16M_DO_20180918_20190610.hobo

#	Time, GMT-04:00	DO conc, mg/L (RUSSWOOD16M_DO)	Temp, °F	Expired Sensor Cap	Coupler Attached	Host Connected	Stopped	End Of File
5006	2019/05/08 06:01:00	4.49	39.13					
5007	2019/05/08 07:01:00	4.43	39.13					
5008	2019/05/08 08:01:00	5.51	39.09					
5009	2019/05/08 09:01:00	5.38	39.06					
5010	2019/05/08 10:01:00	5.22	39.06					
5011	2019/05/08 11:01:00	4.31	39.13					
5012	2019/05/08 12:01:00	5.68	38.98					
5013	2019/05/08 13:01:00	6.36	38.95					
5014	2019/05/08 14:01:00	3.94	39.20					
5015	2019/05/08 15:01:00	5.83	39.06					
5016	2019/05/08 16:01:00	6.53	38.95					
5017	2019/05/08 17:01:00	5.45	39.02					
5018	2019/05/08 18:01:00	6.12	39.02					
5019	2019/05/08 19:01:00	-888.88	-888.88	Logged				
5020	2019/05/08 20:01:00	-888.88	-888.88					
5021	2019/05/08 21:01:00	-888.88	-888.88					
5022	2019/05/08 22:01:00	-888.88	-888.88					
5023	2019/05/08 23:01:00	-888.88	-888.88					
5024	2019/05/09 00:01:00	-888.88	-888.88					

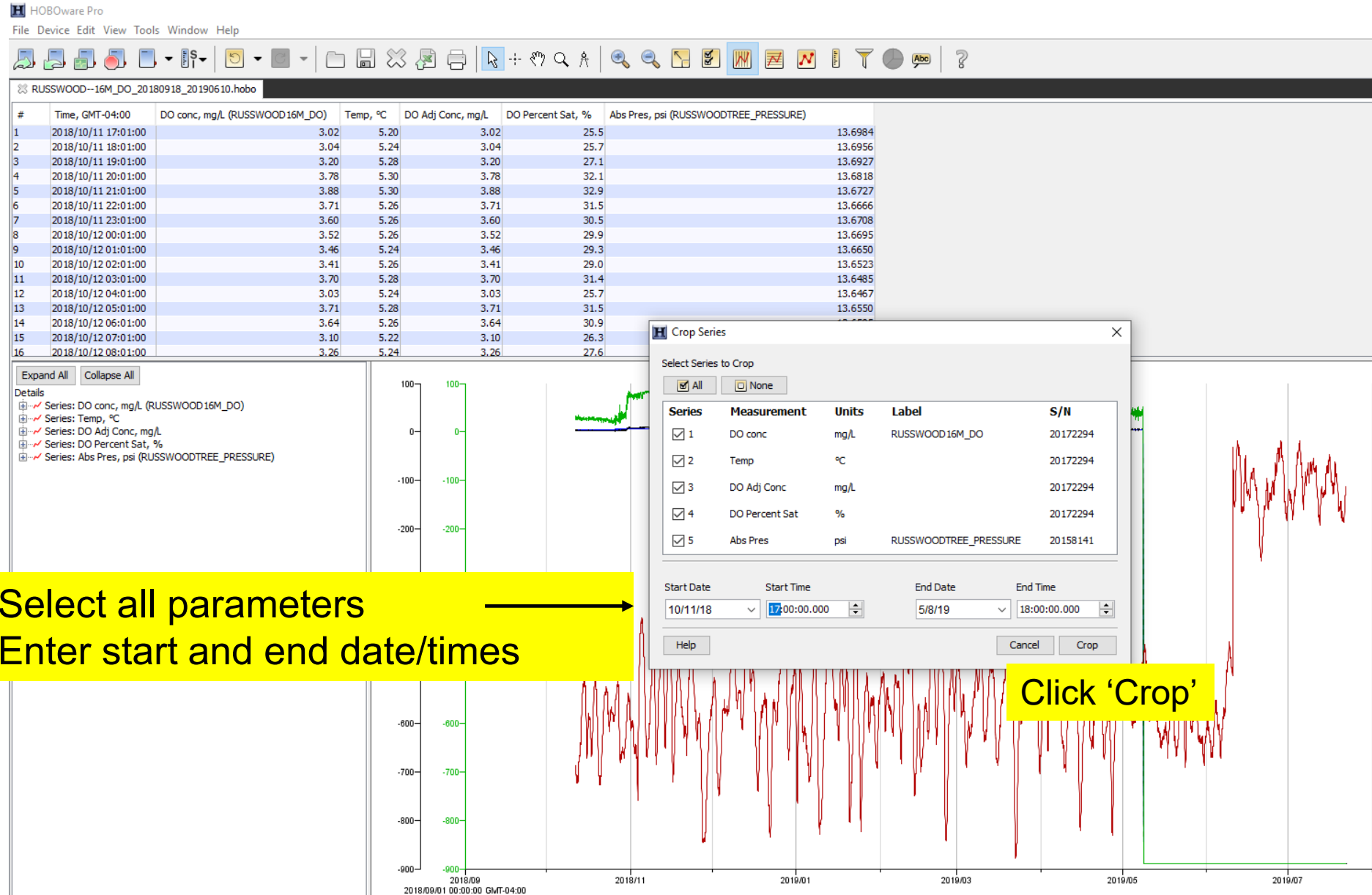
DO sensor cap expired

Values changed to -888

Crop the time series to remove the expired sensor cap -888.88 values



Crop the time series



Change the Temp series name to 'Water Temp'

The screenshot shows the HOBOWare Pro interface. On the left, a list of series includes 'Series: Temp, °C', which is highlighted with a red arrow. The 'Edit' menu is open, and 'Graph Properties' is selected, also indicated by a red arrow. A yellow box with four numbered steps is overlaid on the bottom left: 1. Left click on Series: Temp, 2. Edit – Graph Properties, 3. Enter 'Water Temp', and 4. Click 'Done'. A red line connects the 'Done' button in the 'Series Properties' dialog to the 'Graph Properties' menu item. The 'Series Properties' dialog is open on the right, showing the 'Description' field with 'Water Temp' entered, which is highlighted by a red box. The 'Units' field shows '°C'. The 'Alarms' section has 'Max: 50.000' and 'Min: -20.000'. The 'Misc.' section shows 'Time Axis' and 'Value Axis: °C'. The 'Done' button at the bottom right of the dialog is circled in red.

Series Properties

Description: **Water Temp**

Units: °C

Lines: ☒ Connect Points
Style: Solid
Width: 1
☐ Connect As Steps

Points: ☐ Mark Points
Marker: Rectangle
Point Size: 3

Alarms: Max: 50.000
Min: -20.000
Enable Alarms:
☐ High Alarm
☐ Low Alarm

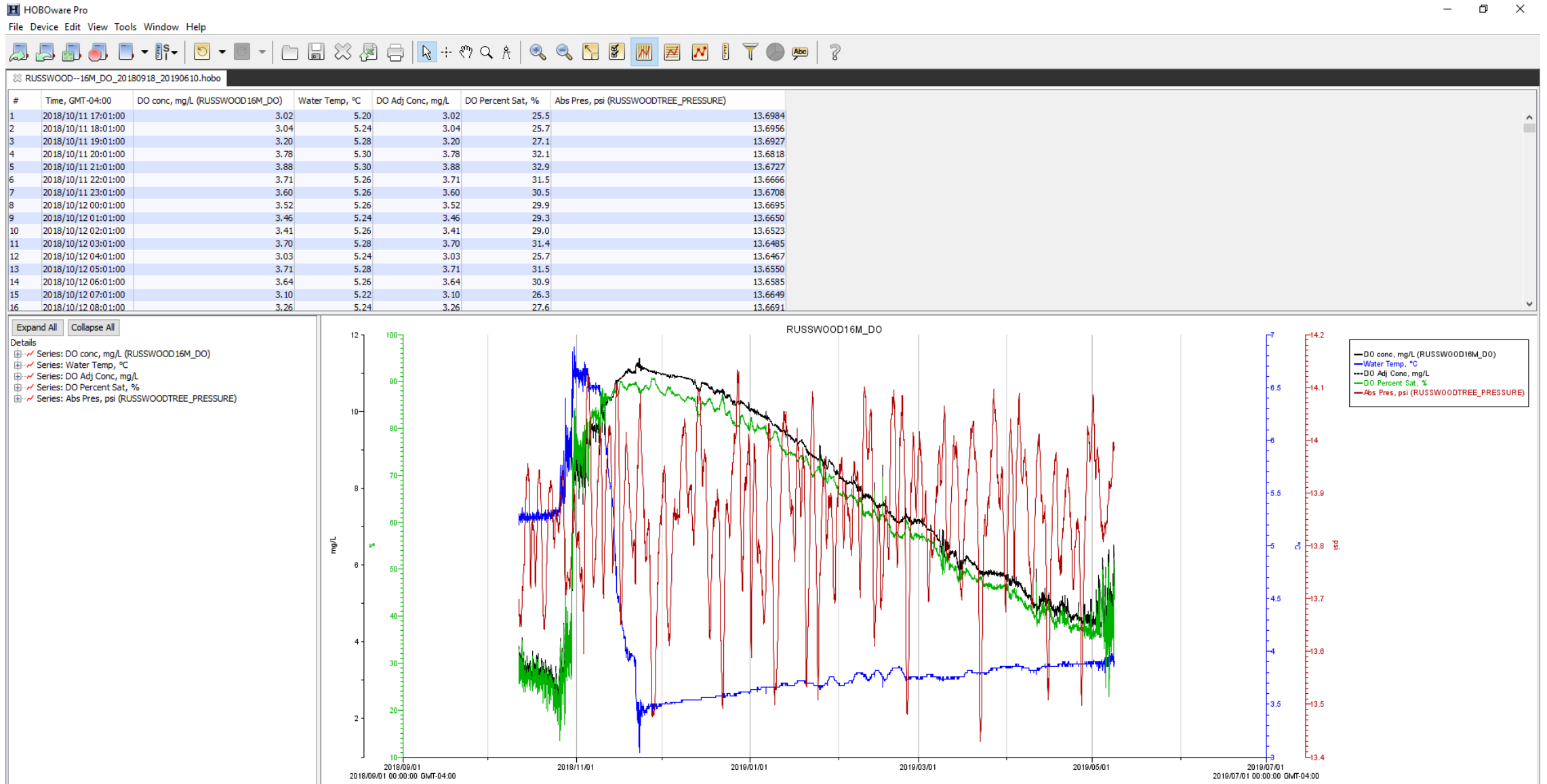
Misc.: Time Axis: Time Axis
Value Axis: °C
Color: Choose...

Cancel Apply **Done**

1. Left click on Series: Temp
2. Edit – Graph Properties
3. Enter 'Water Temp'
4. Click 'Done'

Examine the data

Check for correspondence between turnover signals in the water temp vs DO data



Now you're ready to export the .csv file

File Device Edit View Tools Window Help

- Open Datafile(s)... Ctrl+O
- Merge Datafile(s)... Ctrl+Shift+O
- Open Project... Ctrl+Shift+Q
- Plot/Export wireless data... Ctrl+Shift+Q
- Recent Files
 - 513
 - 513
 - 513
 - 513
- Close Ctrl+W
- Close All Ctrl+Shift+W
- Save Datafile... Ctrl+S
- Save Project... Ctrl+Shift+S
- Import Text Data... Ctrl+T
- Import Text File from HOBOLink...
- Export Details...
- Export Table Data... Ctrl+E
- Page Setup...
- Print Preview... Ctrl+P
- Print...
- Print Details...
- Print Points...
- Preferences... Ctrl+Comma
- Quit Ctrl+Q

Export

☒ All ☐ None Click column header to sort on field. Drag individual rows to desired order.

Select	Measurement	Units	S/N	Label
<input checked="" type="checkbox"/>	DO conc	mg/L	20172294	RUSSWOOD16M_DO
<input checked="" type="checkbox"/>	Water Temp	°C	20172294	
<input checked="" type="checkbox"/>	DO Adj Conc	mg/L	20172294-3	
<input checked="" type="checkbox"/>	DO Percent Sat	%	20172294-4	
<input checked="" type="checkbox"/>	Abs Pres	psi	20158141	RUSSWOODTREE_PRESSURE

Help Cancel Export...

Click 'Export'

Save the .csv file in the Data0_Original folder.
The file should look like this...

AutoSave Off RUSSWOOD--16M_DO_20180918_20190610 - Excel Search

File Home Insert Draw Page Layout Formulas Data Review View Help Nuance PDF Acrobat

Clipboard Font Alignment Number Styles

Clipboard: Cut, Copy, Paste, Format Painter

Font: Calibri, 11, Bold, Italic, Underline, Text Color, Background Color

Alignment: Left, Center, Right, Indent, Wrap Text, Merge & Center

Number: General, Currency, Percentage, Fraction, Decimals

Styles: Normal, Bad, Good, Neutral, Calculation, Check Cell, Explanatory, Input

J15

	A	B	C	D	E	F	G
1	Plot Title: RUSSWOOD16M_DO						
2	Date Time, GMT-04:00	DO conc, mg/L (LGR S/N: 20172294)	Water Temp, °C (LGR S/N: 20172294)	DO Adj Conc, mg/L (LGR S/N: 20172294)	DO Percent Sat, % (LGR S/N: 20172294)	Abs Pres, psi (LGR S/N: 20158141)	
3	10/11/2018 17:01	3.02	5.2	3.02	25.5	13.6984	
4	10/11/2018 18:01	3.04	5.24	3.04	25.7	13.6956	
5	10/11/2018 19:01	3.2	5.28	3.2	27.1	13.6927	
6	10/11/2018 20:01	3.78	5.3	3.78	32.1	13.6818	
7	10/11/2018 21:01	3.88	5.3	3.88	32.9	13.6727	
8	10/11/2018 22:01	3.71	5.26	3.71	31.5	13.6666	
9	10/11/2018 23:01	3.6	5.26	3.6	30.5	13.6708	
10	10/12/2018 0:01	3.52	5.26	3.52	29.9	13.6695	
11	10/12/2018 1:01	3.46	5.24	3.46	29.3	13.665	
12	10/12/2018 2:01	3.41	5.26	3.41	29	13.6523	
13	10/12/2018 3:01	3.7	5.28	3.7	31.4	13.6485	
14	10/12/2018 4:01	3.03	5.24	3.03	25.7	13.6467	