

## Severn Bridge Tide Gauge

### Location

OS: 351580E 185927N

WGS84: *Latitude: 51° 34.207' N Longitude: 02° 42.001' W*

Mid-span of Second Severn Crossing

### Instrument

Rosemount WaveRadar REX

Security considerations mean that no photographs of the tide gauge installation on the Severn Bridge may be made public.

### Benchmarks

TGBM = 50.459 m above Ordnance Datum Newlyn

TGZ = 47.984 m above Ordnance Datum Newlyn

TGZ = 54.484 m above Chart Datum

TGZ = 2.475 m below TGBM

### Datum

All data are to Ordnance Datum Newlyn. The height of Chart Datum relative to Ordnance Datum at Avonmouth and Sudbury is -6.50m (Admiralty Tide Tables, Supplementary Table III).

### Survey information

The site was surveyed on 29 May 2008, using a 25 hour occupation to account for tidal loading.

### Site characteristics

The Bristol Channel/Severn estuary experiences large tides and strong tidal currents mid-stream. Spring tidal range is approx. 11.6m.

### Data quality

Recovery rate (%)	Sample interval
91	10 minutes

### Service history

The REX became operational on 01 August 2011 and is serviced at 9-monthly intervals. No re-calibration of the instrument is required.

### Measurements

Residuals and Elevations (OD and CD) for the whole year are shown in Figures 1 to 3 respectively. It should be noted that, given the very large tidal range at this site, tidal predictions are particularly difficult, both for elevation and especially for timing. Accordingly, there may be instances of apparent tidal surge and/or periodicity in the surge which are, in reality, an artefact of the predictions.

## Statistics

All times GMT

Month	Extreme maxima		Extreme minima	
	Elevation (OD)	Date/Time	Elevation (OD)	Date/Time
January	7.16	13-Jan-2016 09:30	-5.66	13-Jan-2016 04:10
February	8.03	11-Feb-2016 09:10	-6.22	11-Feb-2016 04:10
March	8.03	11-Mar-2016 09:00	-6.82	10-Mar-2016 15:50
April	8.16	09-Apr-2016 08:40	-6.54	08-Apr-2016 03:00
May	7.87	08-May-2016 20:30	-6.37	07-May-2016 14:50
June	7.30	05-Jun-2016 19:30	-6.12	06-Jun-2016 02:50
July	7.00	05-Jul-2016 20:10	-5.91	06-Jul-2016 03:20
August	7.74	20-Aug-2016 20:50	-5.91	21-Aug-2016 16:20
September	7.92	18-Sep-2016 20:30	-6.42	19-Sep-2016 04:00
October	8.05	17-Oct-2016 20:10	-6.24	19-Oct-2016 04:20
November	7.82	15-Nov-2016 19:50	-6.18	15-Nov-2016 15:00
December	7.49	15-Dec-2016 07:50	-6.04	15-Dec-2016 02:50

Month	Surge maxima		Surge minima	
	Value (m)	Date/Time	Value (m)	Date/Time
January	1.14	26-Jan-2016 17:10	-0.59	01-Jan-2016 08:00
February	1.81	08-Feb-2016 14:00	-0.74	23-Feb-2016 12:50
March	1.21	28-Mar-2016 05:30	-0.85	19-Mar-2016 23:30
April	1.03	01-Apr-2016 20:00	-0.74	21-Apr-2016 14:00
May	0.63	16-May-2016 15:50	-0.80	16-May-2016 21:50
June	0.94	28-Jun-2016 20:10	-0.77	09-Jun-2016 05:00
July	0.69	01-Jul-2016 08:20	-0.69	09-Jul-2016 05:10
August	0.99	20-Aug-2016 16:10	-0.66	06-Aug-2016 16:30
September	0.72	09-Sep-2016 18:50	-0.61	06-Sep-2016 16:50
October	0.67	18-Oct-2016 03:00	-0.74	06-Oct-2016 04:30
November	0.85	17-Nov-2016 15:40	-1.04	25-Nov-2016 11:00
December	0.73	23-Dec-2016 18:10	-0.88	28-Dec-2016 18:20

Month	Mean Level	
	No. of days	Elevation (OD)
January	27	0.459
February	29	0.435
March	29	0.228
April	30	0.354
May	30	0.380
June	30	0.435
July	30	0.436
August	31	0.456
September	30	0.431
October	30	0.272
November	30	0.270
December	30	0.275

Highest values in 2016			
Extreme		Surge	
Elevation (OD) (Surge component)	Date/Time	Value (m)	Date/Time
8.16 (0.24)	09-Apr-2016 08:40	1.81	08-Feb-2016 14:00
8.07 (0.38)	08-Apr-2016 08:00	1.30	06-Feb-2016 13:10
8.05 (0.02)	17-Oct-2016 20:10	1.27	06-Feb-2016 15:40
8.03 (0.06)	11-Mar-2016 09:00	1.21	28-Mar-2016 05:30
8.03 (0.34)	11-Feb-2016 09:10	1.20	08-Feb-2016 16:20
8.01 (0.22)	16-Oct-2016 19:20	1.19	07-Feb-2016 03:50
8.00 (0.20)	08-Apr-2016 20:10	1.17	08-Feb-2016 02:10
7.92 (0.00)	18-Sep-2016 20:30	1.14	26-Jan-2016 17:10
7.91 (0.07)	09-Apr-2016 20:50	1.13	02-Mar-2016 07:10
7.90 (0.14)	10-Apr-2016 09:20	1.13	04-Mar-2016 10:50

Year	Annual extreme maxima		Annual surge maxima		Z <sub>0</sub> (OD)	Annual recovery rate
	Elevation (OD) (Surge)	Date/Time	Value (m)	Date/Time		
2011	7.89 (-)	29-Sep-2011 20:40	-	-	-	59%
2012	8.15 (0.80)	17-Oct-2012 08:10	1.62	03-Jan-2012 05:40	0.340	99%
2013	7.80 (0.25)	22-Aug-2013 20:30	1.55	02-Nov-2013 14:20	-	98%
2014	8.50 (1.44)	03-Jan-2014 08:20	2.69	12-Feb-2014 16:20	-	98%
2015	8.12 (0.91)	21-Feb-2015 09:00	1.62	05-May-2015 16:20	-	99%
2016	8.16 (0.24)	09-Apr-2016 08:40	1.81	08-Feb-2016 14:00	-	91%

Tidal levels		
Observation period	August 2011 to December 2012	
Tide Level	Elevation (OD)	Elevation (CD)
HAT	8.07	14.57
MHWS	6.14	12.64
MHWN	3.11	9.61
MSL	0.34	6.84
MLWN	-2.44	4.06
MLWS	-5.46	1.04
LAT	-6.90	-0.40

## General

The time series of 10 minute tidal elevations for one year is quality-checked in accordance with ESEAS guidelines, flagged and archived. The archived time series is continuous and monotonic, with missing data given as 9999. The missing data shown are days where the entire 24 hours of data are missing.

Monthly **extreme maxima/minima** are the maximum and minimum water levels from all measured data for that month. Monthly **surge maxima/minima** (residuals) are calculated in a similar manner from the time series of residuals. Residuals are derived as the measured tidal elevation minus the predicted tidal elevation.

The monthly Mean Level is calculated as the average of all readings for the given month. The annual Z<sub>0</sub> is the value of Mean Sea Level derived by the harmonic analysis of the year's data. These values should not be used for any purpose without consideration of the recovery rate.

## Acknowledgements

Tidal predictions were produced using the TASK2000 software, kindly provided by the Permanent Service for Mean Sea Level (PSMSL), Proudman Oceanographic Laboratory. Tide levels were produced by Fugro EMU Limited. The WaveRadar REX is installed on the Severn Bridge by kind permission of Second Severn Crossing Partnership.

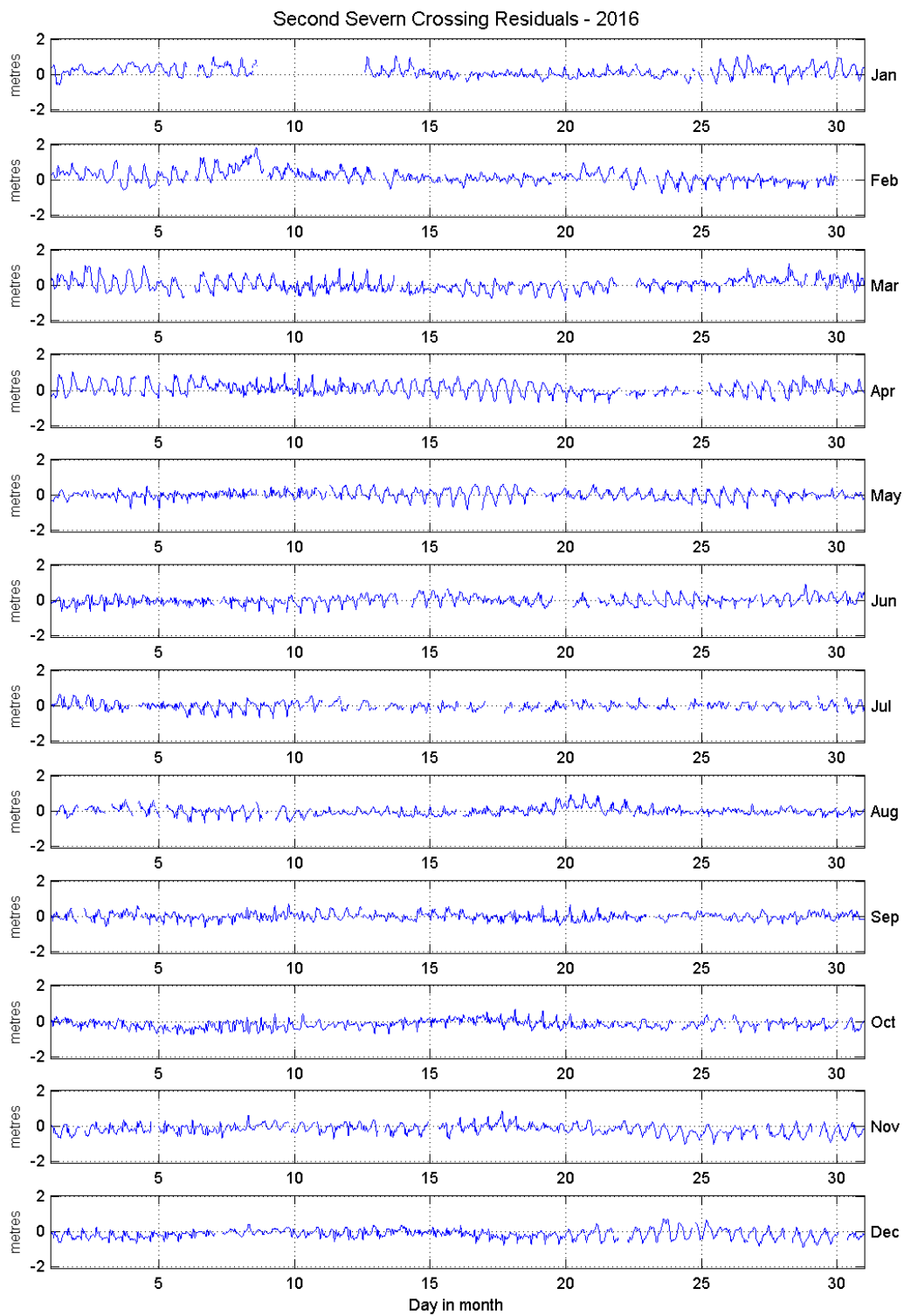


Figure 1: Severn Bridge residuals for 2016

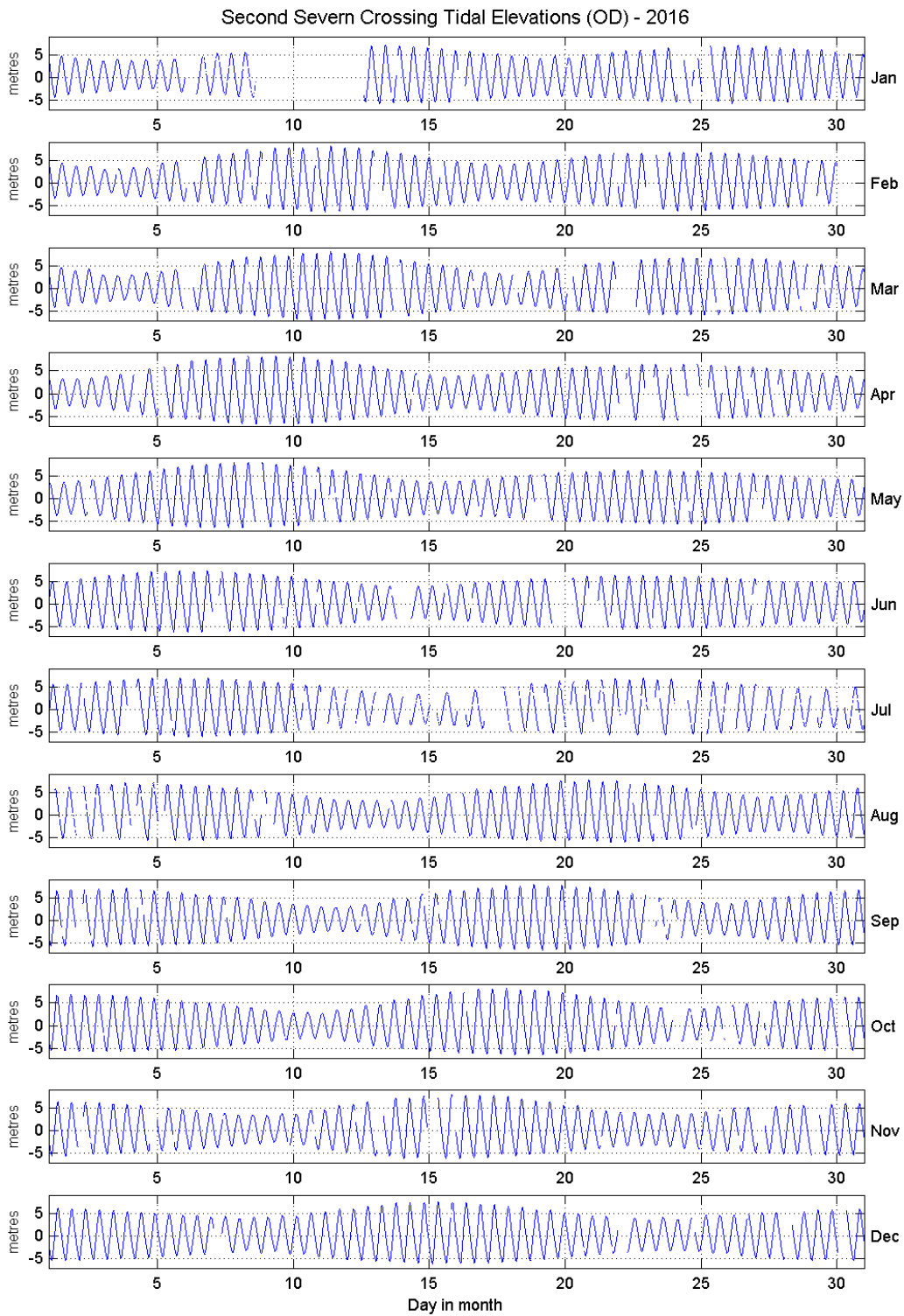


Figure 2: Severn Bridge tidal elevations for 2016 relative to Ordnance Datum

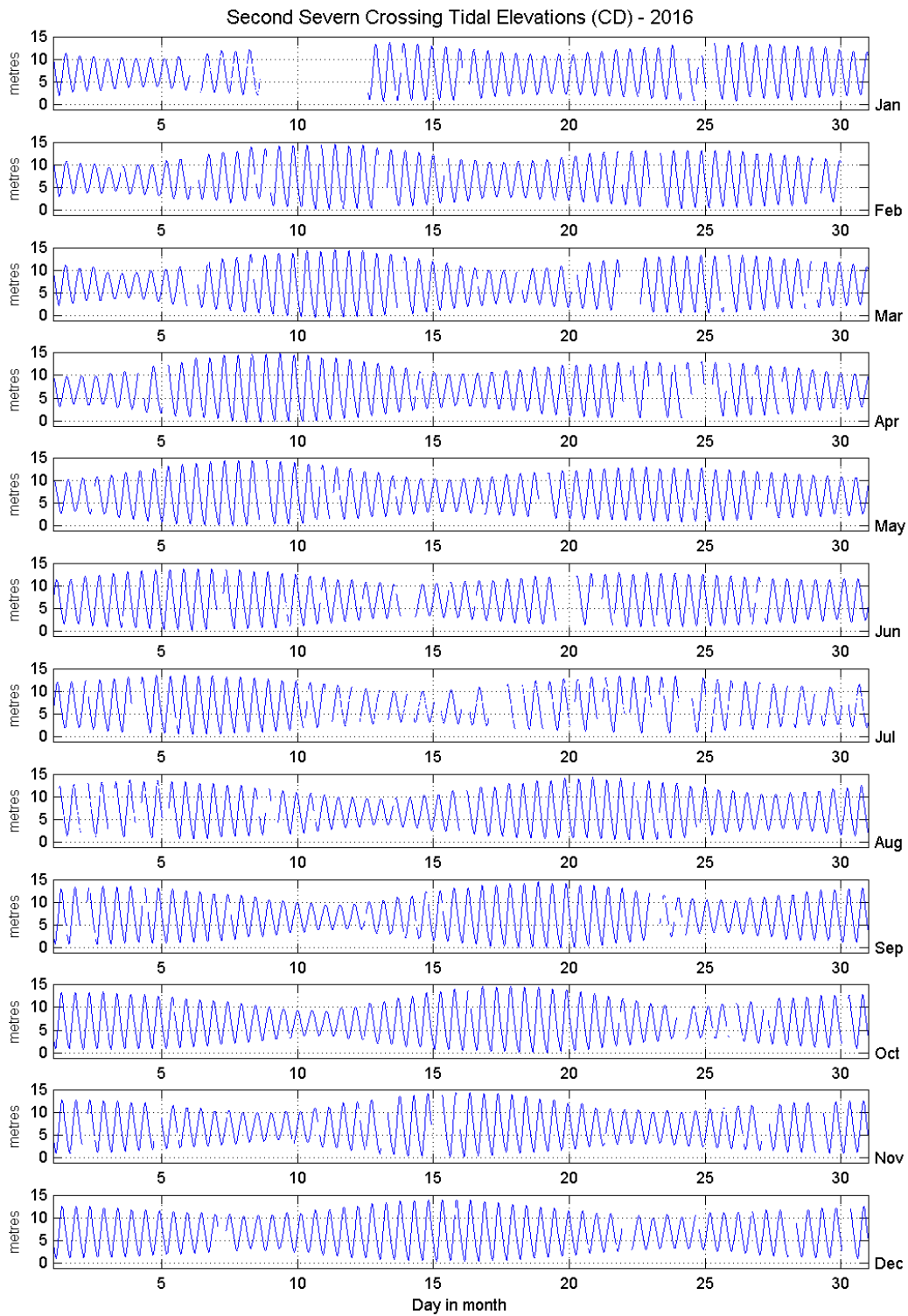


Figure 3: Severn Bridge tidal elevations for 2016 relative to Chart Datum