National Tidal and Sea Level Facility

Annual Report for 2007 for the UK National Tide Gauge Network and Related Sea Level Science

Edited by Elizabeth Bradshaw

Proudman Oceanographic Laboratory
NATURAL ENVIRONMENT RESEARCH COUNCIL

BODC
British Oceanographic Data Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

NATURAL ENVIRONMENT RESEARCH COUNCIL

ENVIRONMENT AGENCY

National Tidal and Sea Level Facility

Annual Report for 2007 for the UK National Tide Gauge Network and Related Sea Level Science

Contributors to the Annual Report:

Les Bradley, POL	- Instrument documentation and site information
Dave Smith, POL	- Maps and site information
Peter Foden, POL	- South Atlantic Network Management
Simon Holgate, POL	- South Atlantic Network Management
Steve Loch, BODC	- Calculating statistics in Edteva
Richard Bingley, Univ. Of Nottingham	- Monitoring Vertical Land Movements at Tide Gauges

Editor of the Annual report: Elizabeth Bradshaw, BODC

NTSLF Coordination Committee Members and Main Interests:

Colin Bell, POL Applications	- Tide Gauge Data Products
Juan Brown, BODC	- Director BODC
David Blackman, POL	- Tide Gauge Data Products
Libby Macleod, BODC	- Tide Gauge Data Sets
Richard Downer, BODC	- Web Development and Management
Kevin Horsburgh, POL	- Operational Tide-Surge Models and Chair of NTSLF
Peter Foden, POL	- South Atlantic Network Management
Andrew Wilmott, POL	- Director POL
Simon Holgate, PSMSL	- Permanent Service for Mean Sea Level (PSMSL) Aspects
Philip Knight, POL	- Real-time systems development and management
Lesley Rickards, BODC	- Tide Gauge Data Sets
Dave Smith, POL	- Leader Tide Gauge Inspectorate
Simon Williams, POL	- GPS and Absolute Gravity Networks
Philip Woodworth, POL	- Director of the PSMSL (up to March 2007)

Thanks also to all those involved in the maintenance of the network, the data retrieval, processing, quality control and delivery.

Foreword

Global sea level is expected to rise by between 20 and 80 cm by the year 2100, resulting in changes to the frequency and severity of coastal flood events. Managing the risk and developing effective forecasting systems demands the best understanding of the science controlling sea level rise, storm surges and coastal flooding. The National Tidal and Sea Level Facility (NTSLF) is the UK centre of excellence for all scientific matters relating to tides, sea level change, and coastal forecasting. Based at the Proudman Oceanographic Laboratory, in collaboration with research partners in top universities and the Met Office, we provide unique expertise in sea level measurement and the computer modelling of tides and storm surges. Our work is of strategic importance to government, local authorities, the public and the scientific community. This report contains a summary of NTSLF activity for the period January-December 2007.

On the 9 November 2007, the east coast of the UK experienced the worst storm surge for 50 years. The operational flood warning system, designed by NTSLF scientists, provided accurate estimates of water levels throughout the event. Forecast surges were accurate to within 1cm at Lowestoft (where local minor flooding did occur) and 8 cm at Sheerness. Good predictions for Sheerness are a necessity since they determine the closure of the Thames Barrier. At the time of the storm an ensemble surge forecasting system was under evaluation. Ensemble forecasting makes use of multiple simulations to measure the inherent uncertainty in weather prediction, and the new system provided an increased level of confidence in the forecasts.

The NTSLF manages precision tide gauges at 44 sites around the UK. We are also responsible for monitoring sea level in the British Overseas Territories, and at strategic sites in the south Atlantic as part of out contribution to international climate research. Sophisticated telemetry systems make the data available in real time for operational coastal flood warning. The maintenance and development program has installed new data-logging systems at all but one of the sites in the national tide gauge network. Major projects this year included gauge relocation work at Immingham, Liverpool and Lowestoft in response to quayside engineering. A system of rapid sampling and data acquisition for tsunami warning has proven effective at three key sites. The new high frequency sampling will also improve coastal flood warning systems.

The NTSLF web pages (http://www.pol.ac.uk/ntslf) provide real time displays of UK sea levels, forecasts from the storm surge model, and measurements from the south Atlantic and Gibraltar. Tide gauge data are available free of charge from the British Oceanographic Data Centre (BODC). We also provide tidal predictions for over 700 coastal locations, conversions between commonly used datums, and extreme high and low water information.

The UK strategic tide gauge network and operational model developments are funded by the Environment Agency. We would also like to acknowledge the support of all those who contribute scientifically towards, and make use of, the NTSLF.

Dr Kevin Horsburgh
Head of NTSLF

Tide gauge instrument information, data processing procedures and gauge location

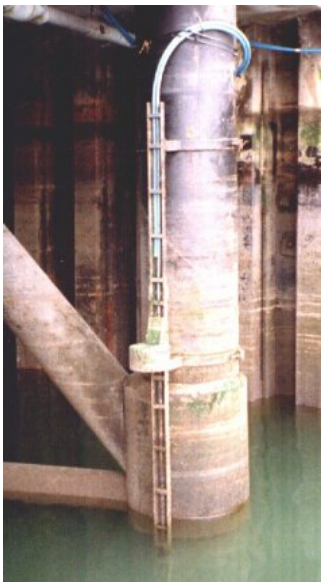
Instrument documentation

Bubbler tide gauge

The full tide bubbler system normally consists of two independent measuring systems. The pressure points are mounted approx 1m below Admiralty Chart Datum (ACD) so that negative surges may be recorded. The pressure points which you can see mounted underwater in the photograph are similar in appearance to an inverted bucket with a copper nozzle mounted on the side. This nozzle is the actual measuring point. A low flow of dry air (normally 7ml/min) is fed down an air tube to the top of the pressure point. When the air pressure in the air line equals the pressure exerted by the column of water above it, then the excess air is released as bubbles through the copper nozzle. This means that the pressure in the air line is proportional to the weight of the water column.

Mid-tide bubbler

The operation of the mid tide bubbler is similar to that of the full tide system, except that the measuring point is mounted at the mid tide height. This means that the pressure point is only immersed for half of the tidal cycle. The reason for this is that when the measuring point is exposed as in the photograph below it can be accurately levelled into the geodetic network. Once this is accomplished the full tide pressure points can be fitted to match the tidal curve produced by the mid tide pressure point, thereby connecting them to the geodetic network.

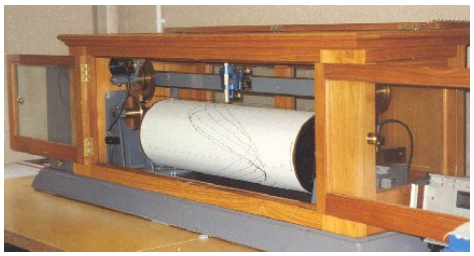


Pressure Transducer

These are differential transducers contained in a watertight housing. The reference port is vented to atmosphere via the power supply and signal cable tube, while the measuring port of the transducer is connected to a copper outlet nozzle on the top of the transducer housing. The copper nozzle, transducer measuring port and connecting tube are filled with oil so the pressure is transmitted to the crystal element via the oil, thus keeping the transducer components free from the effects of the saltwater.

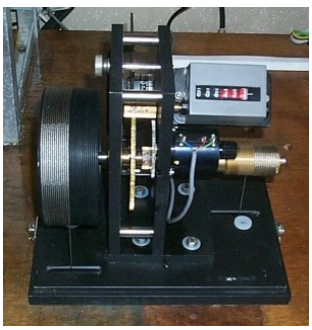
Munro float gauge

The Munro gauge measures sea level by means of a float in a stilling well. The float is about 45cm in diameter - the large diameter reduces inevitable errors in buoyancy due to friction of the gearing and small changes in the length of float wire. This wire is coiled round a drum on the end of the gauge and another drum contains a counter balance wire. The drum is geared to a slotted tape attached to a pen carriage which traces the tide curve on the chart during the rise and fall of the tide. A precision potentiometer is attached to the gauge to provide an input to the data logger.



Wellhead float gauge

The Wellhead gauge measures the sea level by means of a float in a stilling well. The float is usually of a smaller diameter than that used on a Munro gauge (about 45cm diameter), and has a counterweight attached to a smaller diameter pulley than that of the float so it is not immersed in the sea when the float rises. The Wellhead unit does not produce a chart but does give a readout of the height. It is interfaced to the data logger via a precision potentiometer.



Data Processing

The data are collected on demand each week at the Proudman Oceanographic Laboratory. The weekly files are then screened using our in-house visualisation package, Edteva. Suspect values are flagged and short gaps are interpolated where the accuracy is deemed not to be affected.

The weekly files are then concatenated into monthly files, with the residual added. These are then edited so that all values fall on the quarter hour and gaps are filled in with null values and marked with an 'N' flag. The files are placed on the web for users to download. Statistics are produced monthly, again using Edteva.

Finally, the monthly files are concatenated into yearly files and the metadata for the yearly files are then banked in a database.

Calculating Statistics in Edteva

There are essentially four types of summary information determined by Edteva:

- a history of when the tide gauge has been in operation (“history”)
- monthly extremes (“extremes”)
- monthly extreme surges (“surges”)
- monthly and daily mean sea level (“MSL”)

Gaps greater than 4.1 hours in the primary channel are registered as gaps in the history.

Extremes are the maximum and minimum calculated over all sampled data during the month. This excludes any interpolated data but may include rapidly sampled data. Extreme surges (residuals) are calculated in the same way from tidal residuals. Tidal residuals are defined to be the measured water level minus the predicted tide. The predictions derive from the database of tidal constants maintained by POL’s Applications Group (as defined at the time of the calculation) for the ports of UK and elsewhere.

Mean Sea Level is calculated from a filter working on quarter-hourly values derived from one or more cubic splines applied to the raw data. The filter is a convolution of Vassie’s 03B filter which converts 15-minute data to hourly values and Doodson’s X0 filter. Splines are not applied across gaps as defined above. Short gaps can therefore lead to the loss of a day of output data (the half length of the filter is 91 and a day is 96 samples). Provided there are some daily (@12:00Z) values these are then averaged to provide the monthly value.

Location of Tide Gauges Around the U.K.

Aberdeen Tide Gauge

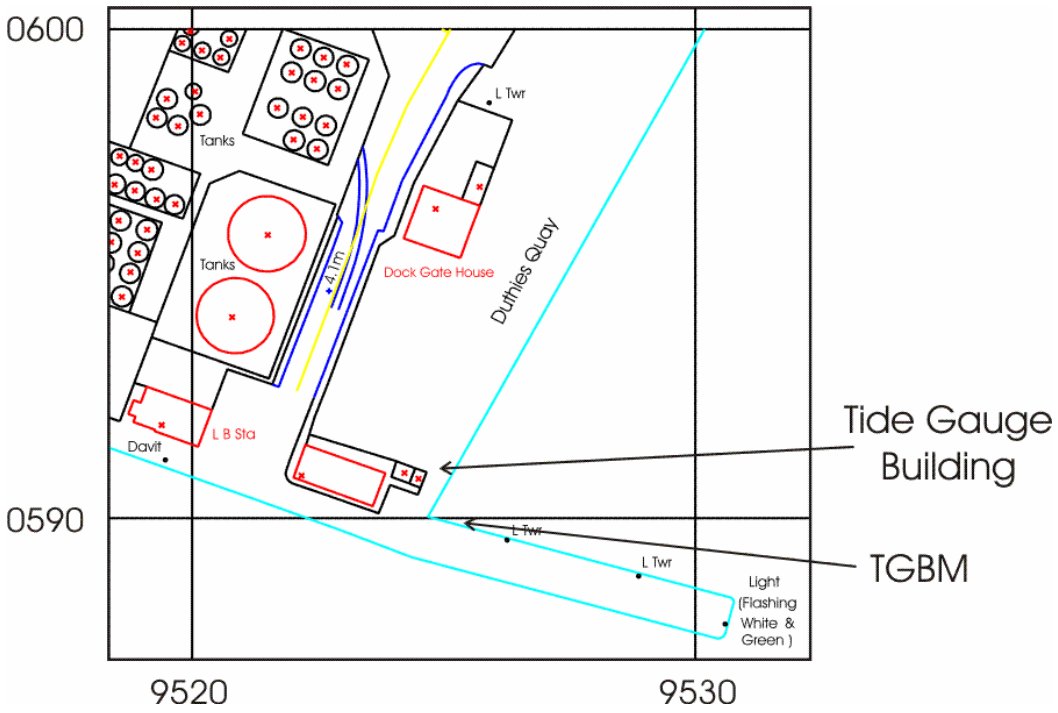
Latitude: 57° 08' 38.5" N Longitude: 02° 04' 38.5" W

Grid Reference: NJ 9525 0591

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is located on Waterloo Quay and the pressure points are located in the South West corner of Telford Dock.



Tide gauge location

Aerial view of site

Avonmouth Tide Gauge

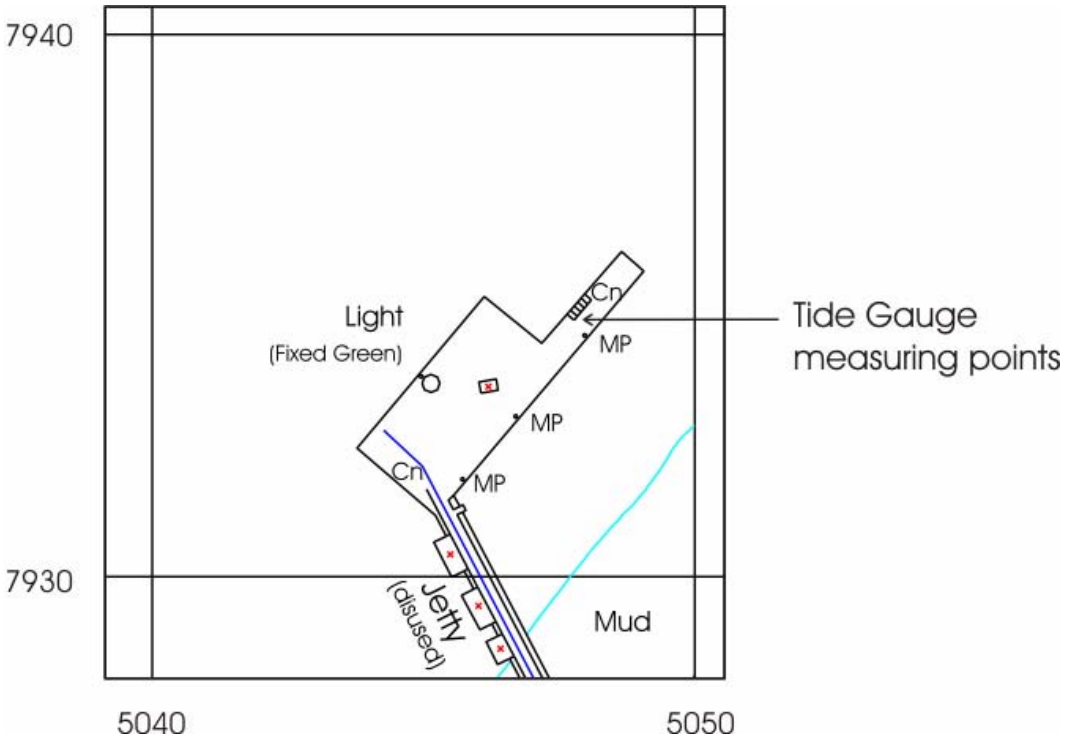
Latitude: 51° 30' 27.9" N Longitude: 02° 42' 45.9" W

Grid Reference: ST 5063 7900

Instrument type: Data acquisition system with dual underwater pressure transducers.

Site of Gauge:

The tide gauge building is located on land between the disused oil jetty and the fuel storage depot, with the measuring points being located at the seaward end of the jetty.



Bangor Tide Gauge

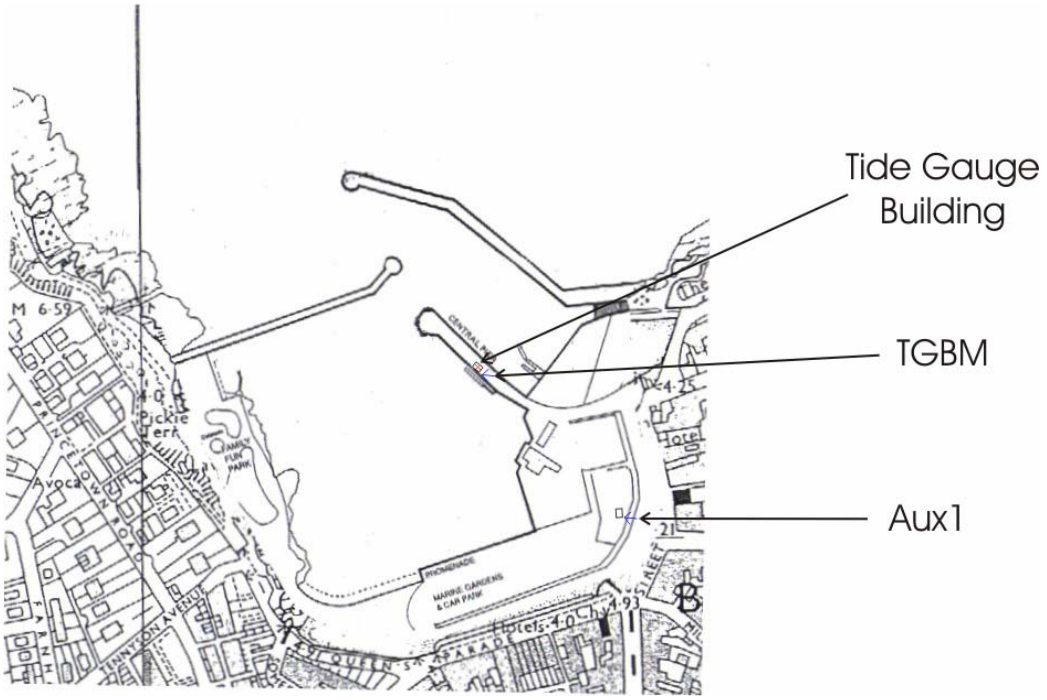
Latitude: 54° 39' 53.1" N Longitude: 05° 40' 10.1" W

Grid Reference: NW 6340 3620

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building and pressure points are located on Central Pier at Bangor Marina. The pressure points are on the seaward side of the open pier directly beneath the tide gauge building.



Barmouth Tide Gauge

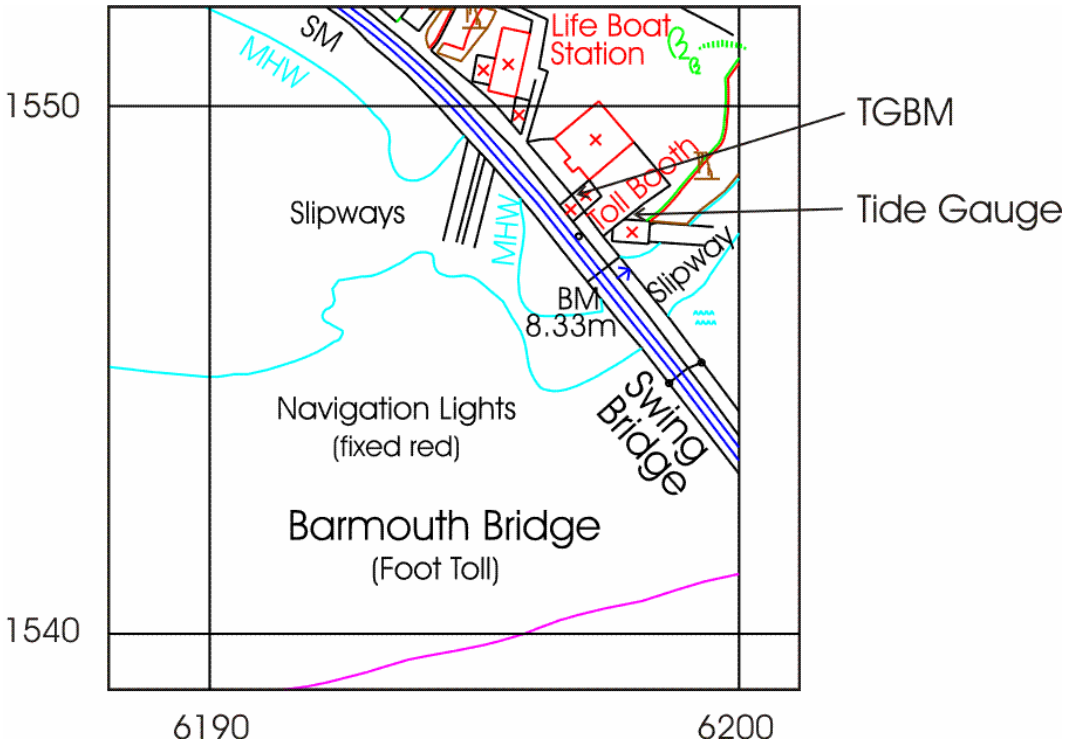
Latitude: 52° 43' 09.4" N Longitude: 04° 02' 41.9" W

Grid Reference: SH 6197 1548

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge cabinet is located in the toll booth on the north end of Barmouth railway bridge which crosses the river Mawddach. The pressure points are attached to the first leg of the railway bridge in the deep channel.



Bournemouth Tide Gauge

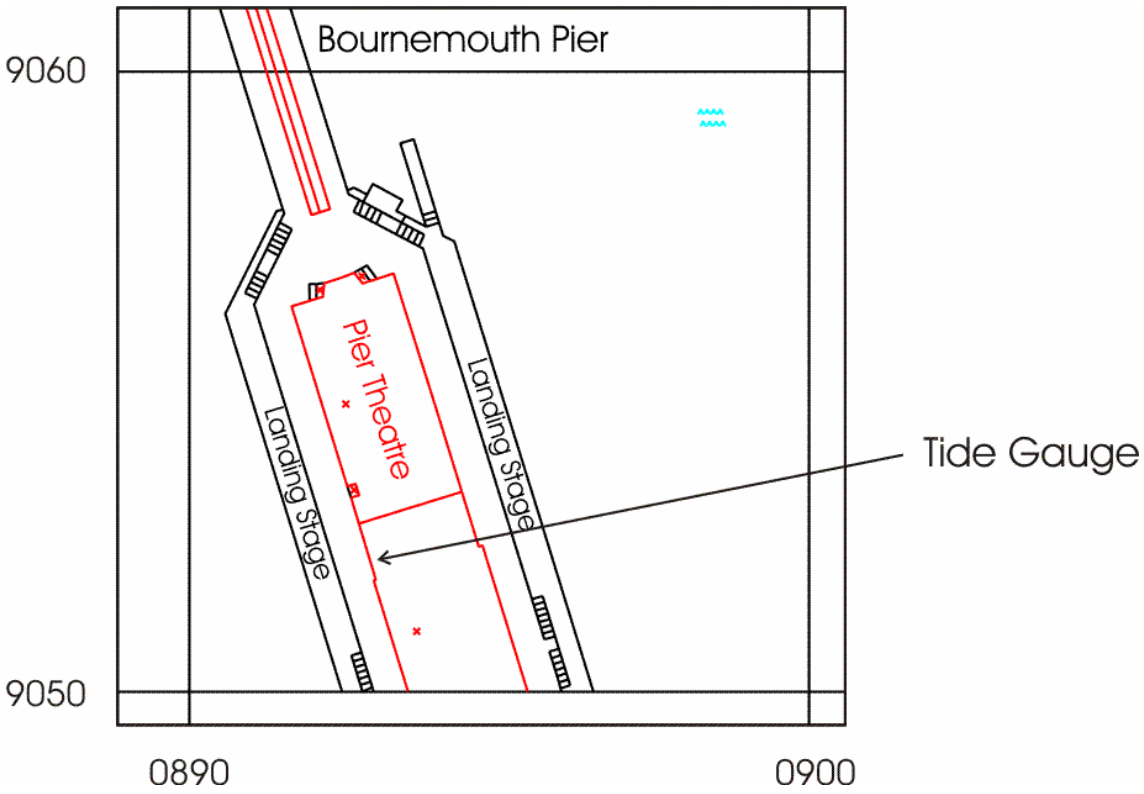
Latitude: 50° 42' 51.6" N Longitude: 01° 52' 29.5" W

Grid Reference: SZ 0893 9053

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge equipment is located in the pier electrical room at the west side of the South Pier. The measuring points are mounted directly below on one of the pier legs.



Cromer Tide Gauge

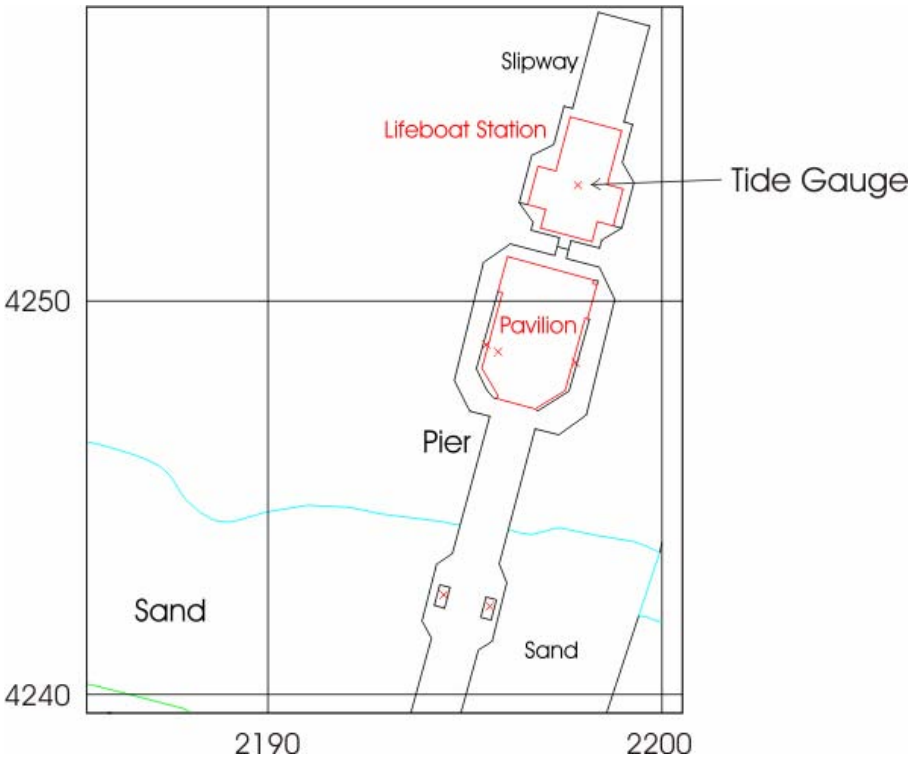
Latitude: 52° 56' 03.1" N Longitude: 01° 18' 06.1" E

Grid Reference: TG 2198 4253

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge cabinet is located within Cromer lifeboat station, with the pressure points attached to a leg of the lifeboat slipway.



Devonport Tide Gauge

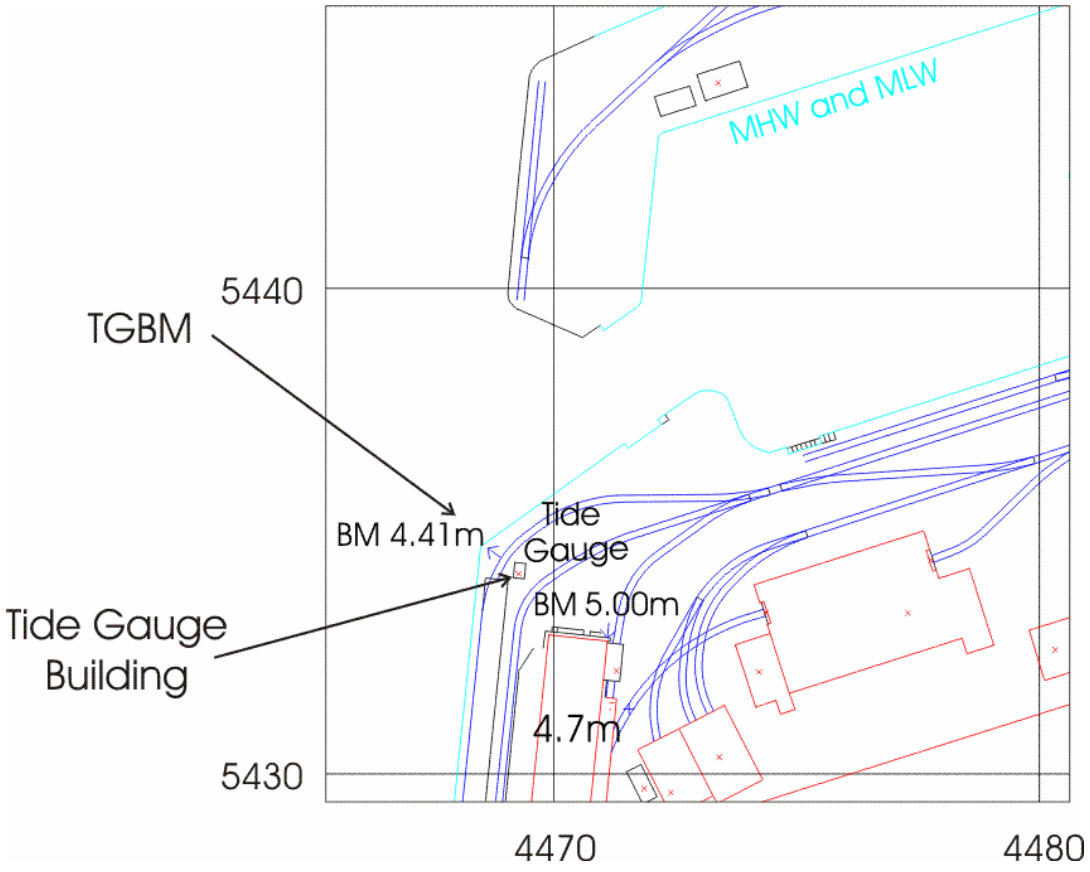
Latitude: 50° 22' 06. 3" N Longitude: 04° 11' 06.7" W

Grid Reference: SX 4469 5434

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge building is situated on No. 1 Jetty in Devonport Royal Naval base. The pressure points are attached to the stilling well beneath the building.



Dover Tide Gauge

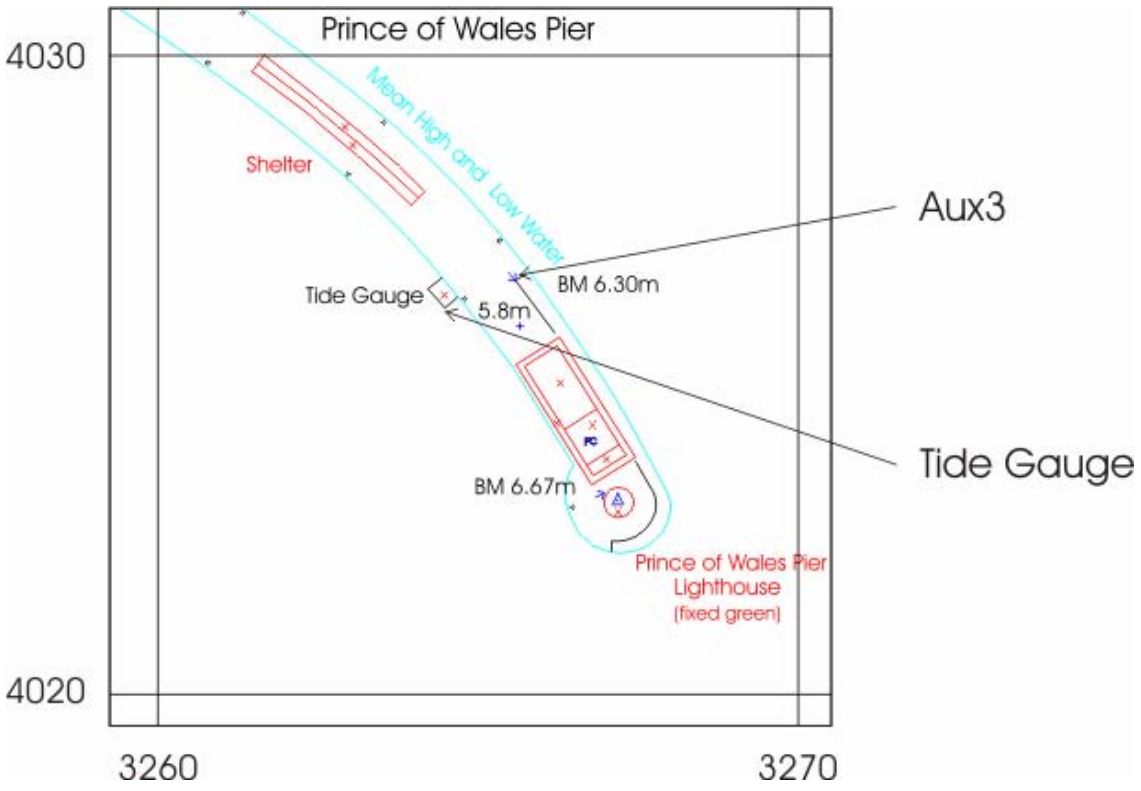
Latitude: 51° 06' 51.9" N Longitude: 01° 19' 21.2" E

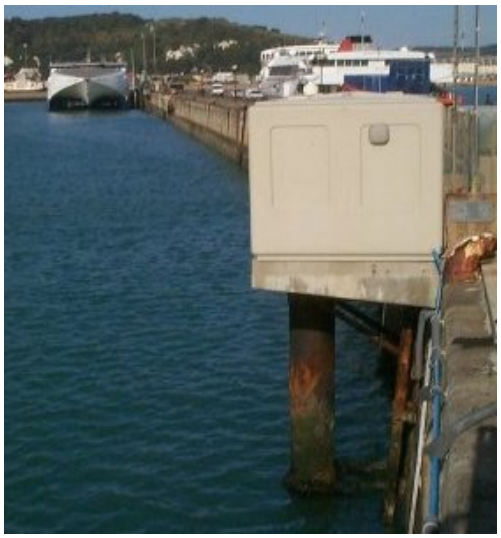
Grid Reference: TR 3264 4026

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is at the seaward end of Prince of Wales Pier, Western Dock, just before the lighthouse. The pressure points are attached to the stilling well.





Felixstowe Tide Gauge

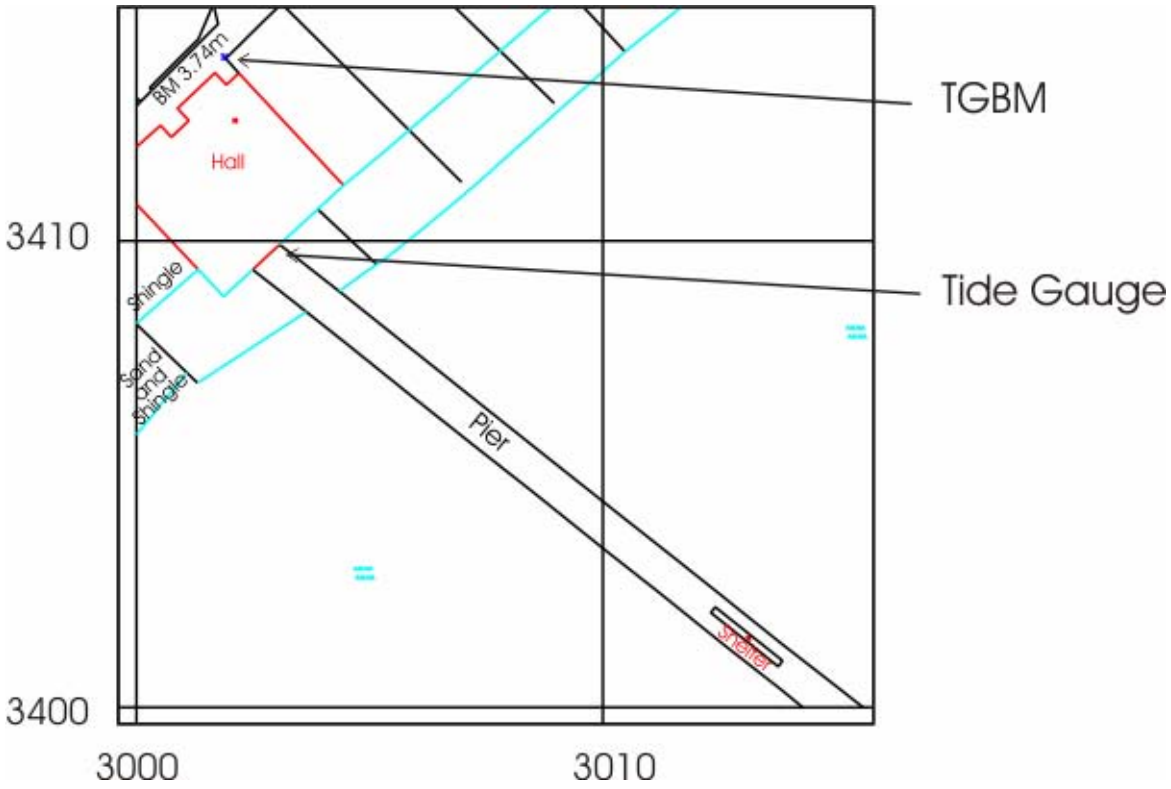
Latitude: 51° 57' 27.8" N Longitude: 01° 20' 47.4" E

Grid Reference: TM 3003 3409

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building and pressure points are located on Felixstowe pier. The equipment is located on the landward end and the pressure points are located in deep water at the seaward end.



Fishguard Tide Gauge

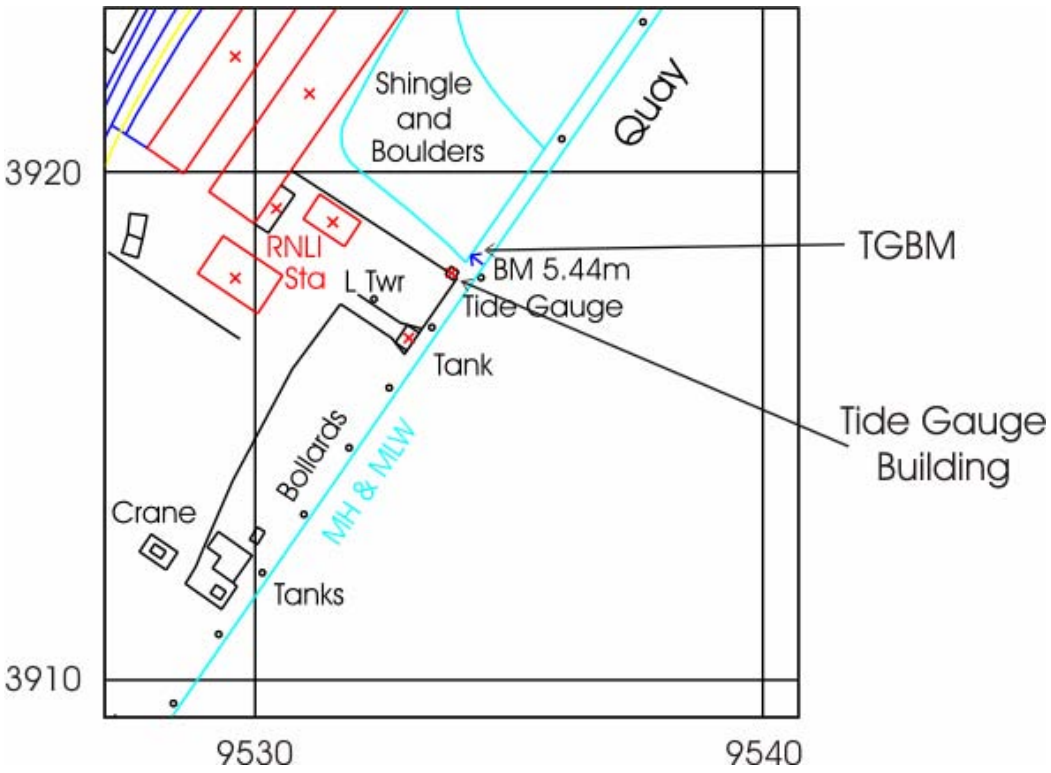
Latitude: 52° 00' 47.5" N Longitude: 04° 59' 01.4" W

Grid Reference: SM 9534 3918

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is located on Fishguard Quay adjacent to the RNLI station, and the pressure points are located approximately 10m from the end of the quay.



Harwich Tide Gauge

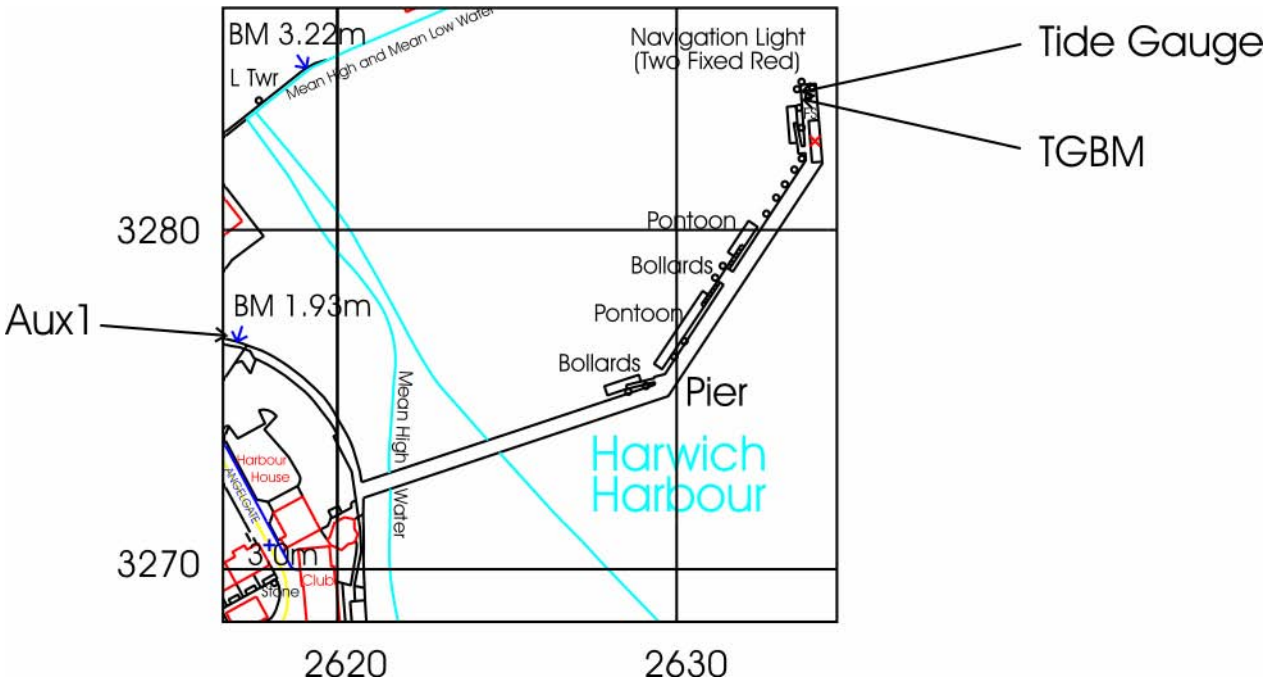
Latitude: 51° 56' 52.8" N Longitude: 01° 17' 31.4" E

Grid Reference: TM 2634 3284

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge cabinet is located on the seaward end of Harwich Haven Authority jetty. The pressure points are directly below the cabinet.



Heysham Tide Gauge

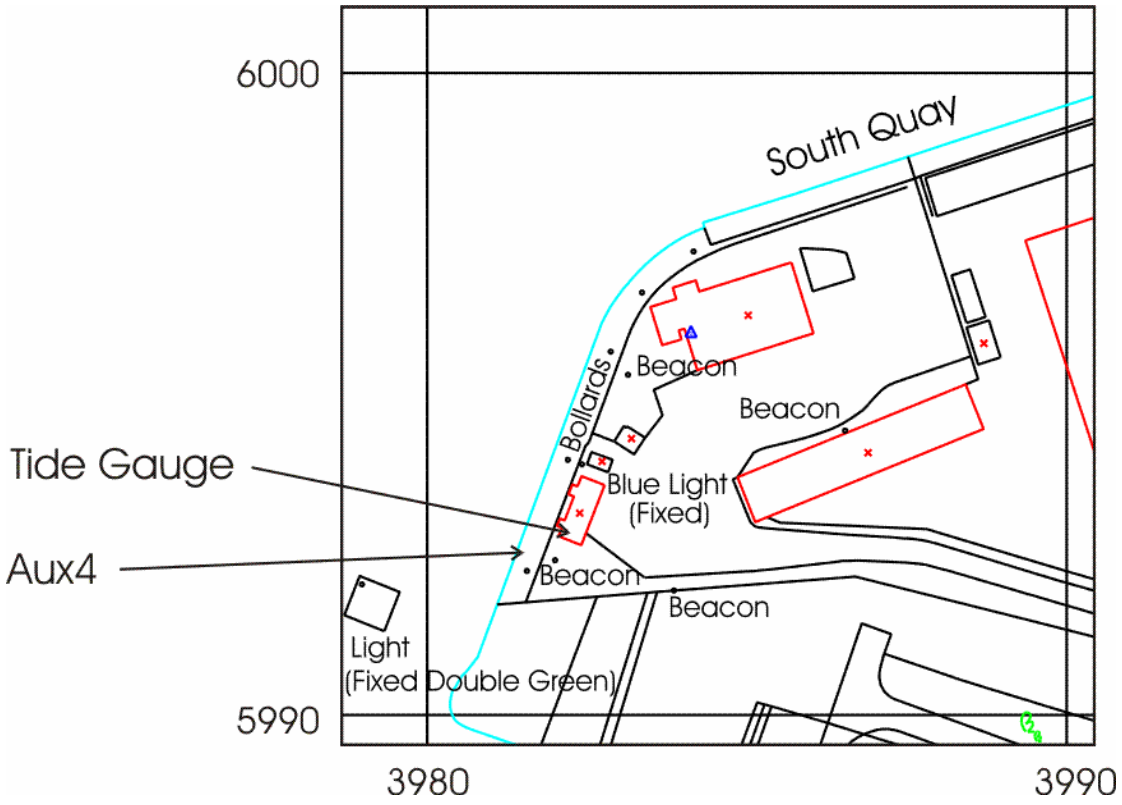
Latitude: 54° 01' 54.5" N Longitude: 02° 55' 12.9" W

Grid Reference: SD 3982 5993

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is located on the south side of the entrance to Heysham harbour.



Hinkley Point Tide Gauge

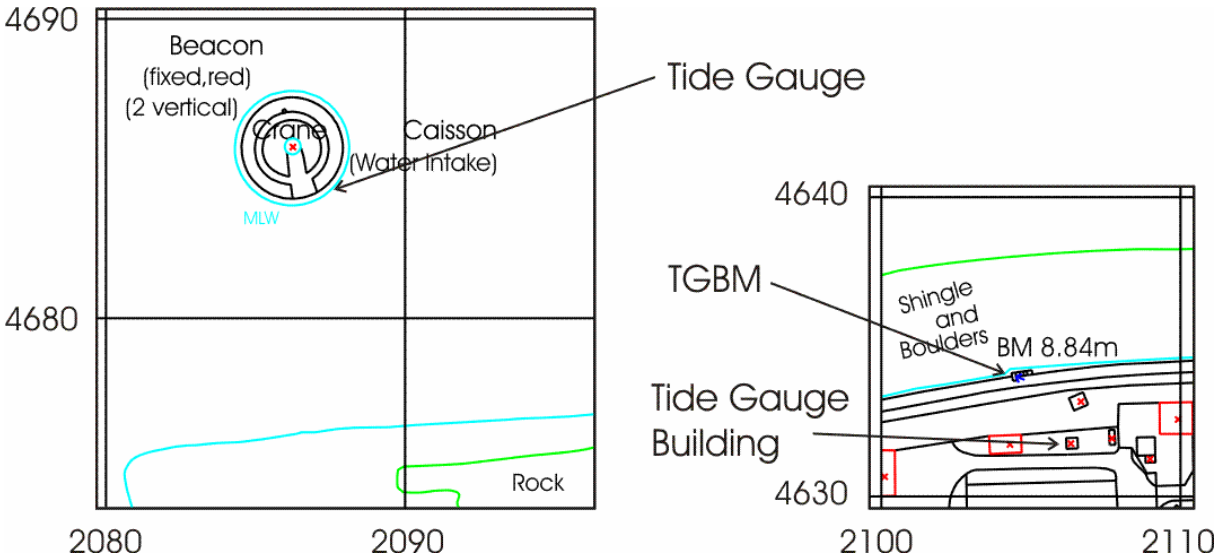
Latitude: 51° 12' 38.2" N Longitude: 03° 07' 52.6" W

Grid Reference: ST 2107 4632

Instrument type: Dataring system with dual underwater pressure transducers.

Site of Gauge:

The tide gauge building is located in the Hinkley Point "A" station. The transducers are located in underwater vented chambers, suspended from a steel pole attached to the structure of the water intake tower, some 400m offshore.



Holyhead Tide Gauge

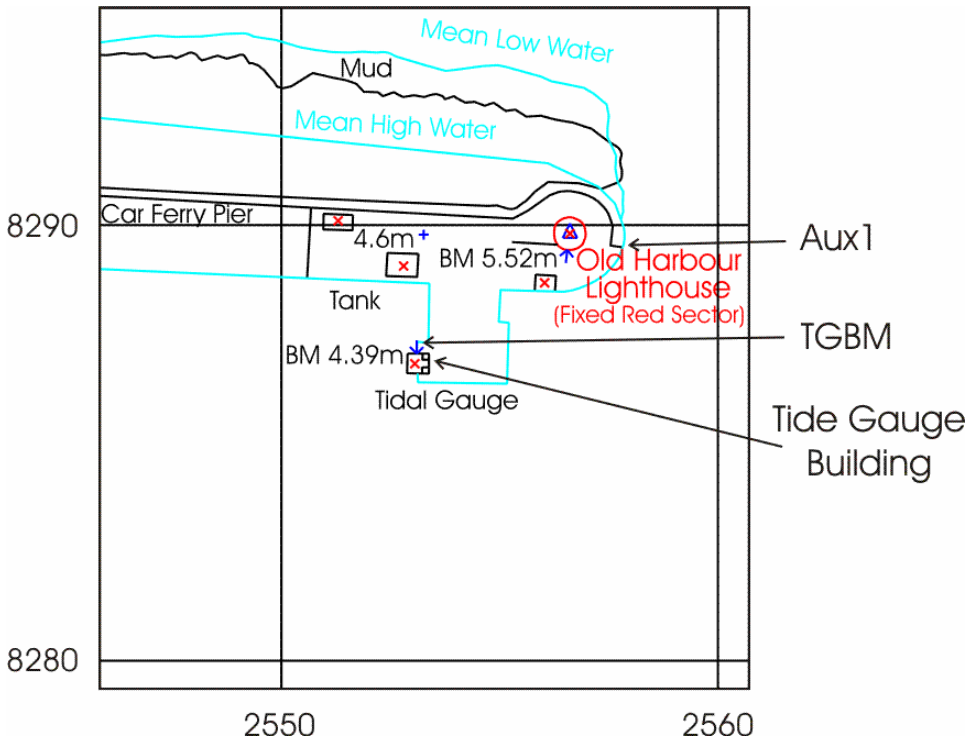
Latitude: 53° 18' 50.2" N Longitude: 04° 37' 13.5" W

Grid Reference: SH 2553 8287

Instrument type: Data acquisition system with a full tide and a mid-tide bubbler gauge and a back-up Munro float gauge installed. Wind speed and wind direction are also recorded.

Site of Gauge:

The tide gauge building, pressure points and stilling well are situated on Salt Island jetty, close to the old harbour lighthouse.



Ilfracombe Tide Gauge

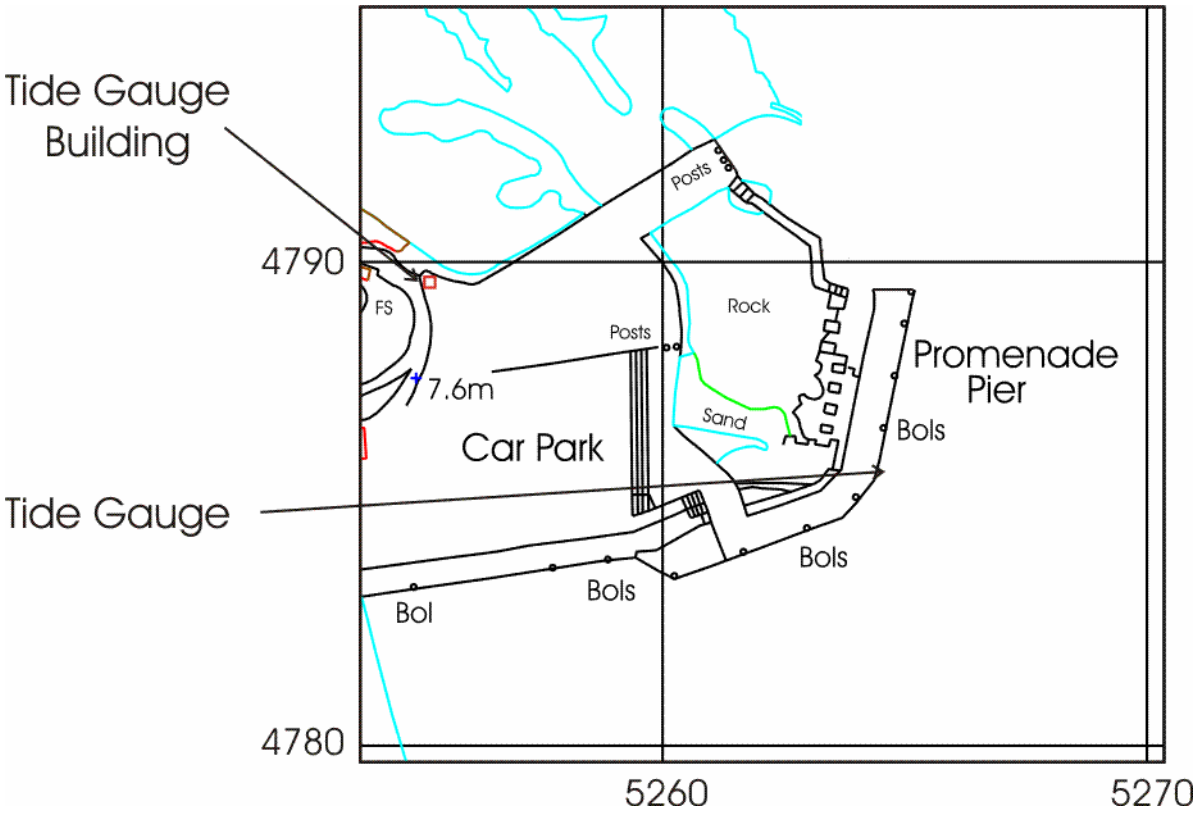
Latitude: 51° 12' 40.1" N Longitude: 04° 06' 44.3" W

Grid Reference: SS 5255 4789

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is located in the north west corner of the car park, east of Lantern Hill. The pressure points are located on the seaward side of Ilfracombe pier at the harbour entrance.



Immingham Tide Gauge

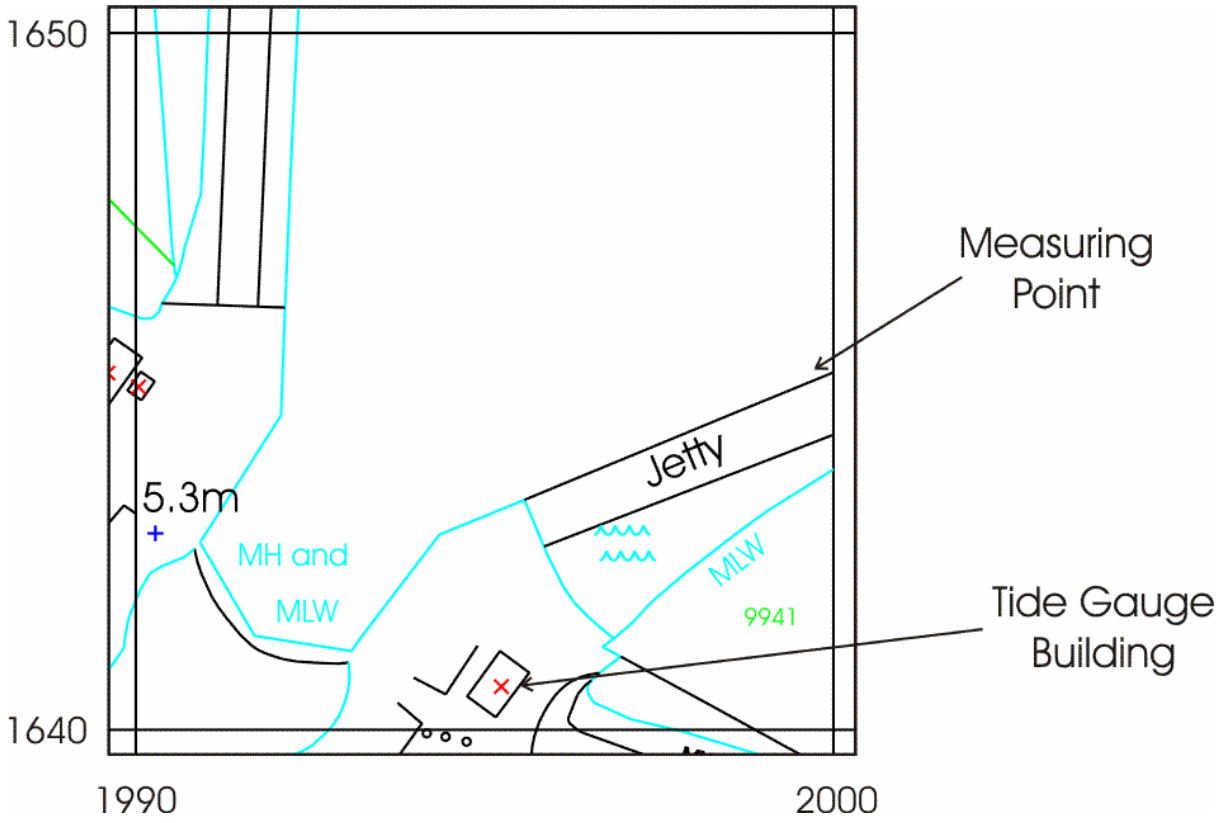
Latitude: 53° 37' 49.5" N Longitude: 00° 11' 15.1" W

Grid Reference: TA 1995 1640

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is east of the lock gates at the entrance to Immingham Docks. The pressure points are fixed to a leg of the lead-in jetty on the east side of the entrance to Immingham Docks.



Port Erin (Isle of Man) Tide Gauge

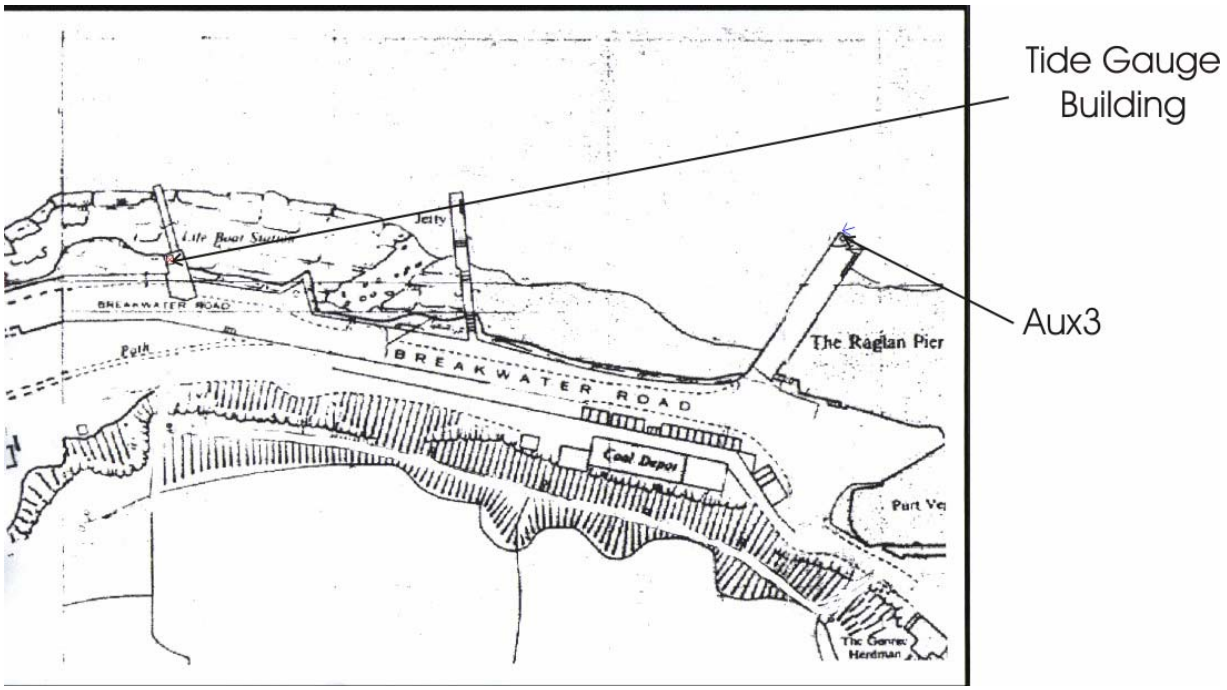
Latitude: 54° 05' 06.8" N Longitude: 04° 46' 05.0" W

Grid Reference: SC 1904 6902

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge cabinet is located in Port Erin lifeboat station and the pressure points are mounted close to the end of the lifeboat slipway. The mid-tide pressure point is mounted on steelwork attached to a concrete leg of the boathouse.



Port Ellen (Isle of Islay) Tide Gauge

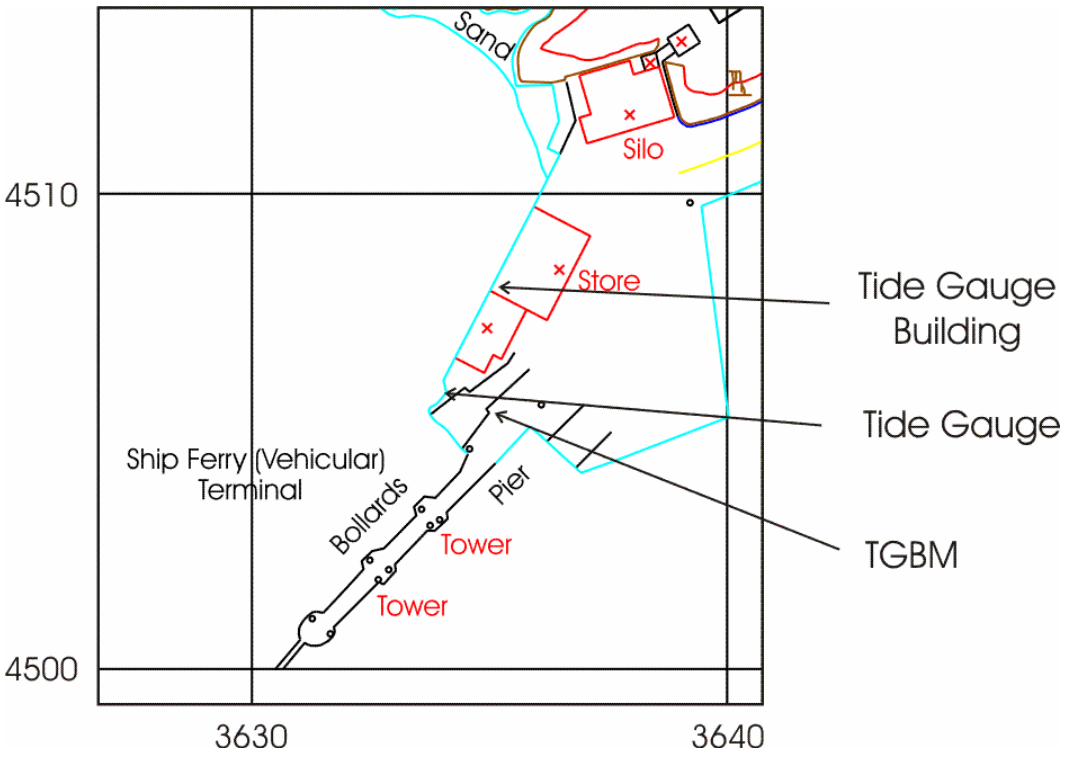
Latitude: 55° 37' 39.3" N Longitude: 06° 11' 23.7" W

Grid Reference: NR 3636 4508

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge cabinet is located in the Caledonian MacBrayne storeroom next to Port Ellen ferry terminal. The pressure points are located south west of the ferry terminal offices.



St. Helier (Jersey) Tide Gauge

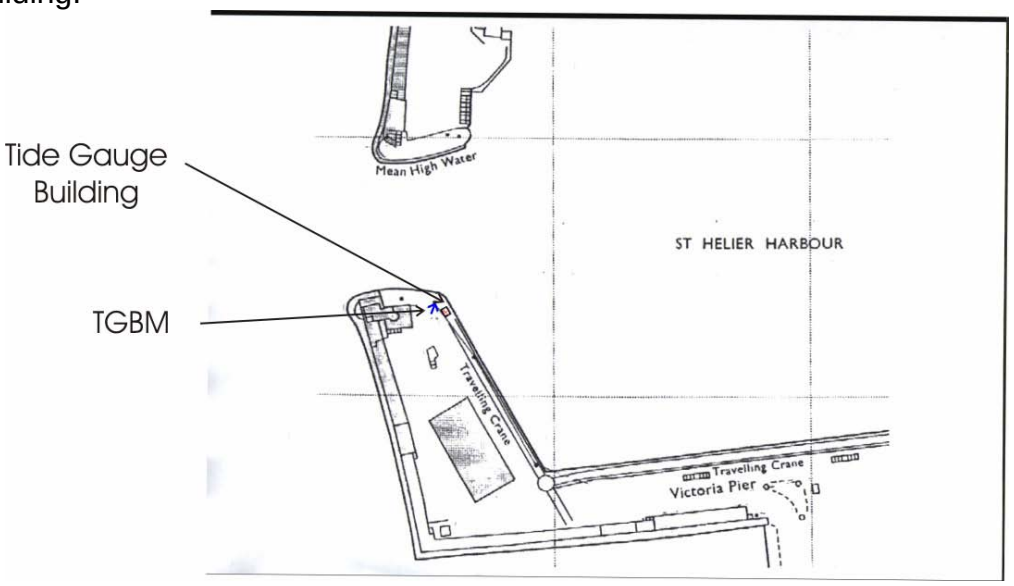
Latitude: 49° 11' 00" N Longitude: 02° 07' 00 " W

Grid Reference: 13/11 6466 4763

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is located on Victoria Pier, St. Helier, adjacent to the Port Control building. The pressure points are located on the inside wall of the pier, 2m from the tide gauge building.



Kinlochbervie Tide Gauge

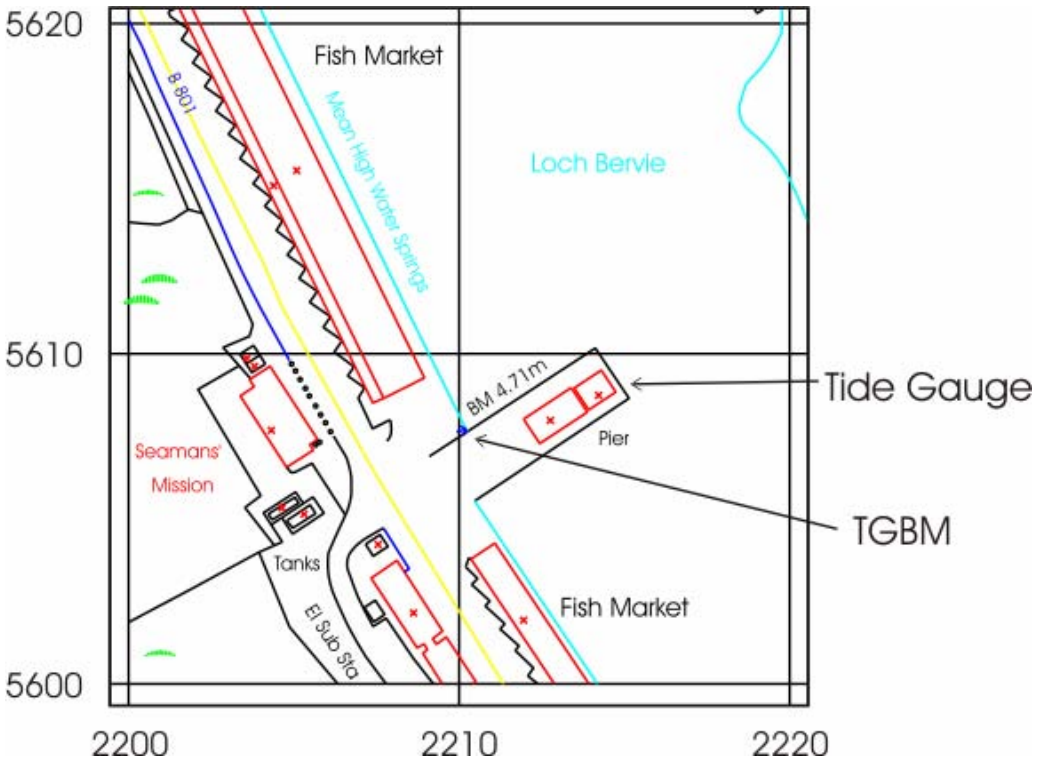
Latitude: 58° 27' 24.3" N Longitude: 05° 03' 00.8" W

Grid Reference: NC 2214 5609

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge cabinet is located in the ice plant, on the pier. The pressure points are mounted on a leg of the jetty beneath the ice plant.



Leith Tide Gauge

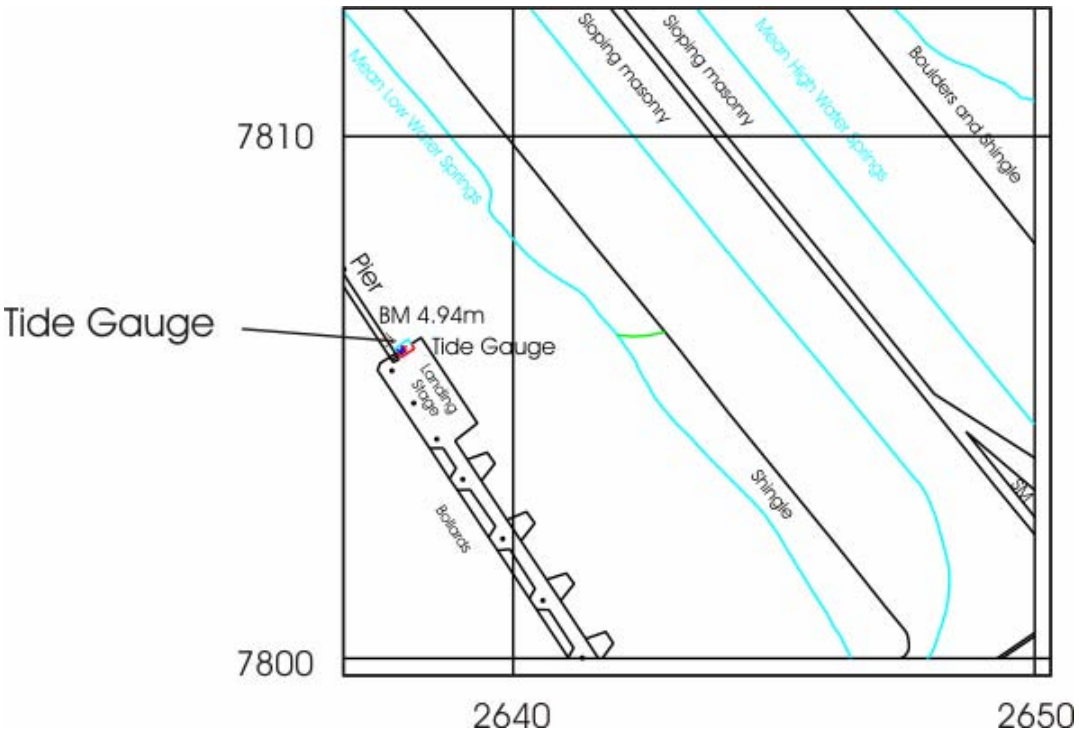
Latitude: 55° 59' 23.4"N Longitude: 03° 10' 54.1"W

Grid Reference: NT 2638 7806

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building and pressure points are located on the lead-in jetty, east of the entrance to Leith docks.



Lerwick Tide Gauge

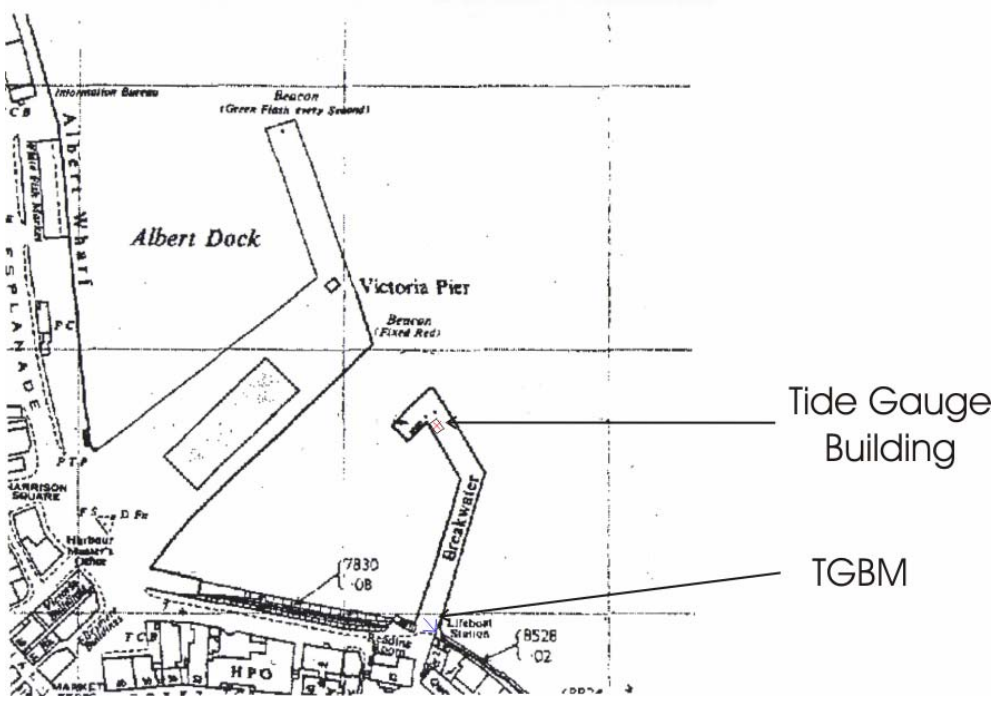
Latitude: 60° 09' 14.5" N Longitude: 01° 08' 25.1" W

Grid Reference: HU 4783 4137

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed. Wind speed and wind direction are also recorded.

Site of Gauge:

The tide gauge building and measuring points are located on the inner wall at breakwater entrance to the small boat harbour, south of Victoria Pier, Lerwick.



Liverpool Tide Gauge

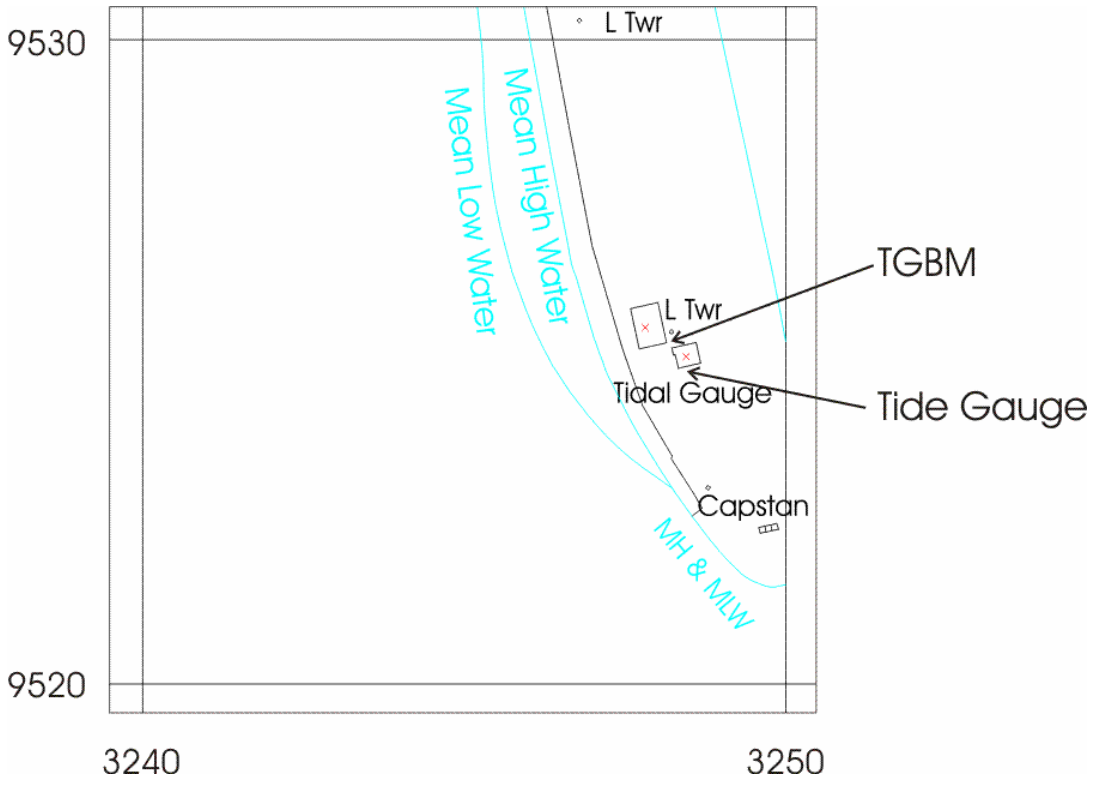
Latitude: 53° 26' 58.8" N Longitude: 03° 01' 05.3" W

Grid Reference: SJ 3248 9525

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The Tide Gauge is located within the old Lock Keeper's office at the entrance to Gladstone Dock. The pressure points are located on the seaward side of Gladstone Dock. The wind speed and direction instruments are mounted at the top of the light tower located next to the tide gauge building.



Llandudno Tide Gauge

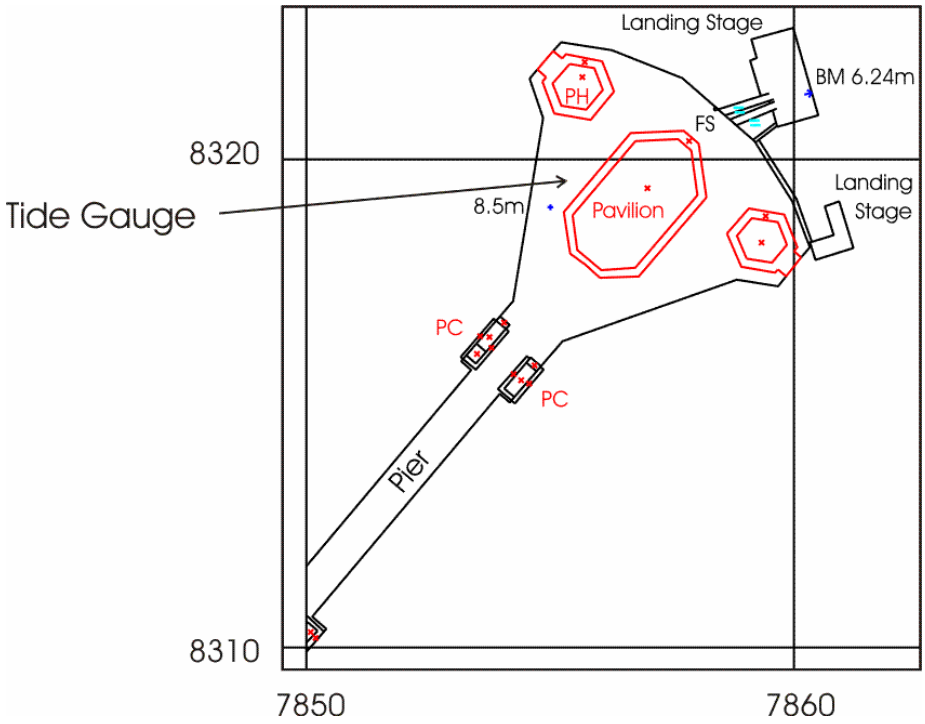
Latitude: 53° 19' 54.0" N Longitude: 03° 49' 30.8" W

Grid Reference: SH 7855 8319

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is located on the sub-platform under the pavilion at the seaward end of Llandudno pier. The pressure points are located on a leg of the pier below the tide gauge building.



Lowestoft Tide Gauge

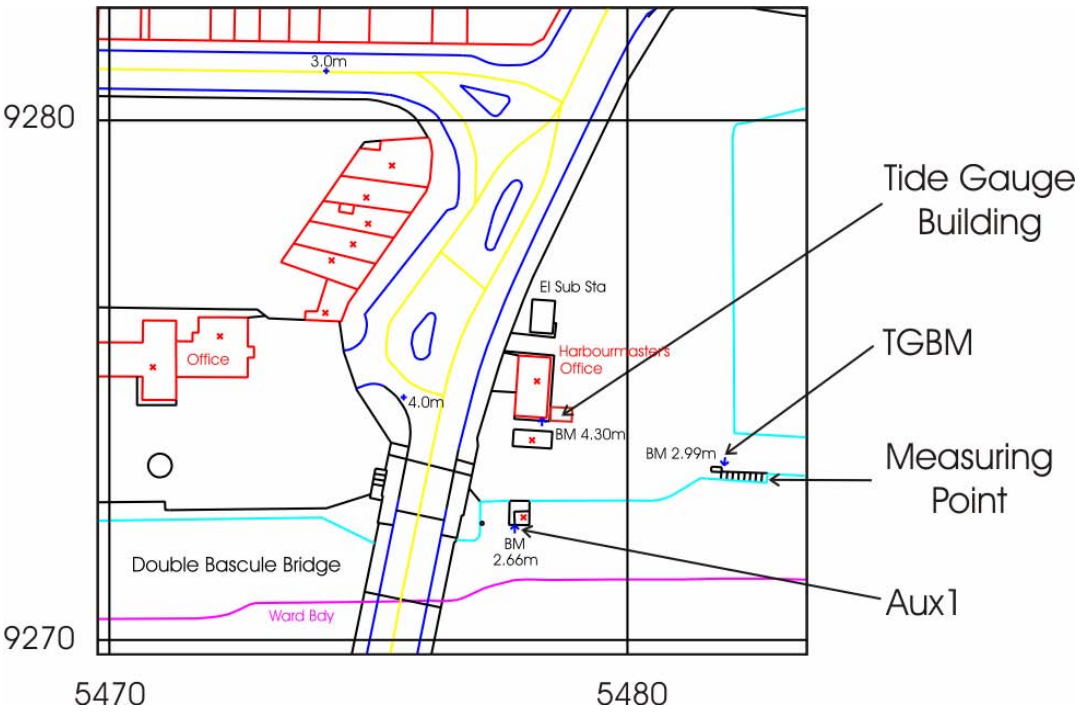
Latitude: 52° 28' 23.1" N Longitude: 01° 45' 00.9" E

Grid Reference: TM 5479 9274

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is situated east of the Harbour Master's office with the pressure points located on the quay wall, east of the tide gauge building.



Milford Haven Tide Gauge

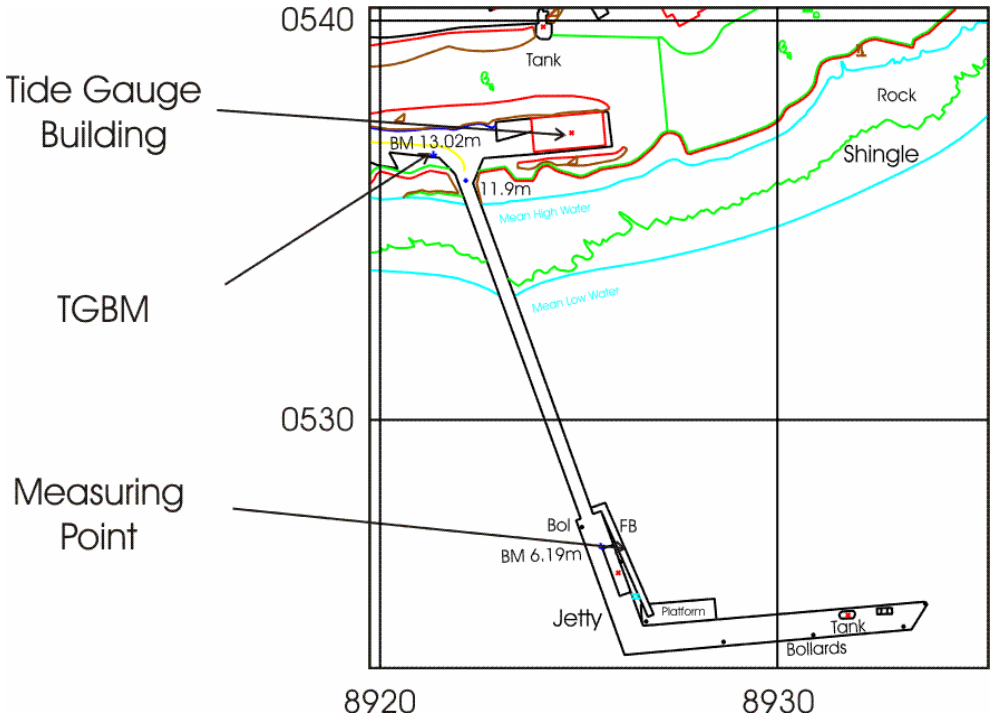
Latitude: 51° 42' 26.6" N Longitude: 05° 03' 06.4" W

Grid Reference: SM 8924 0537

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge is located in the store room at the shore end of Milford Haven Port Authority jetty. The pressure points are mounted at the seaward end of the jetty.



Millport Tide Gauge

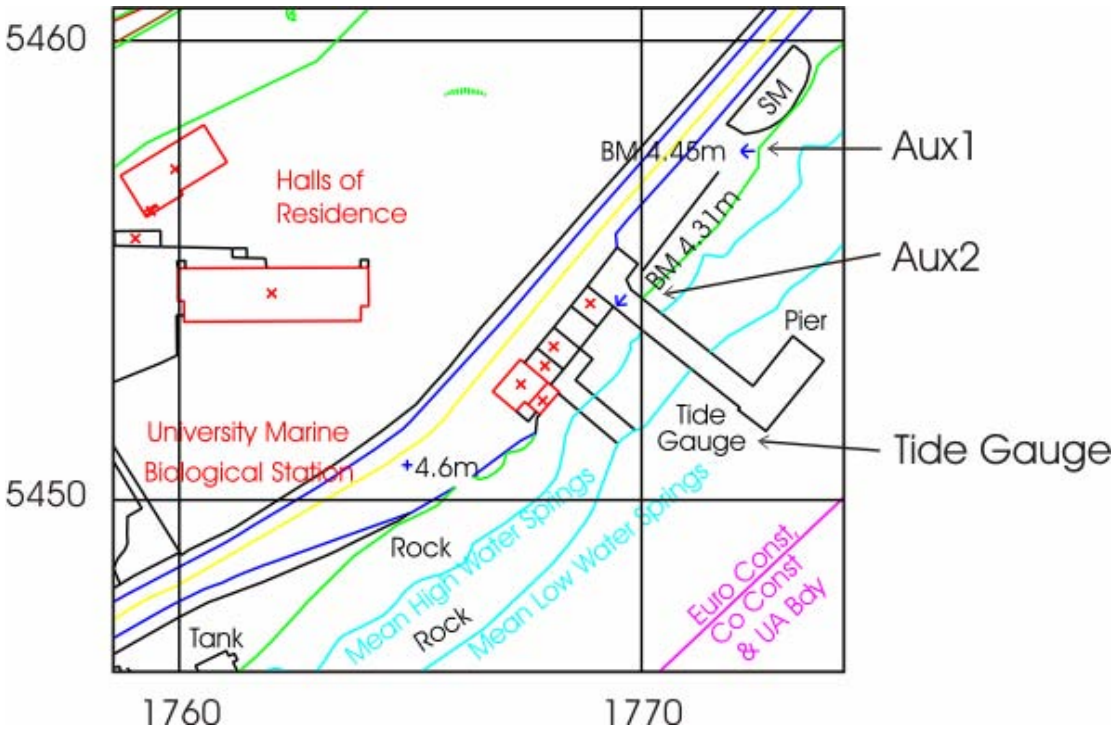
Latitude: 55° 44' 59.3" N Longitude: 04° 54' 22.8" W

Grid Reference: NS 1769 5454

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge is housed in a storeroom at the shore end of the University Marine Biological Station pier. The pressure points are mounted at the seaward end of the pier.



Mumbles (West Glamorgan) Tide Gauge

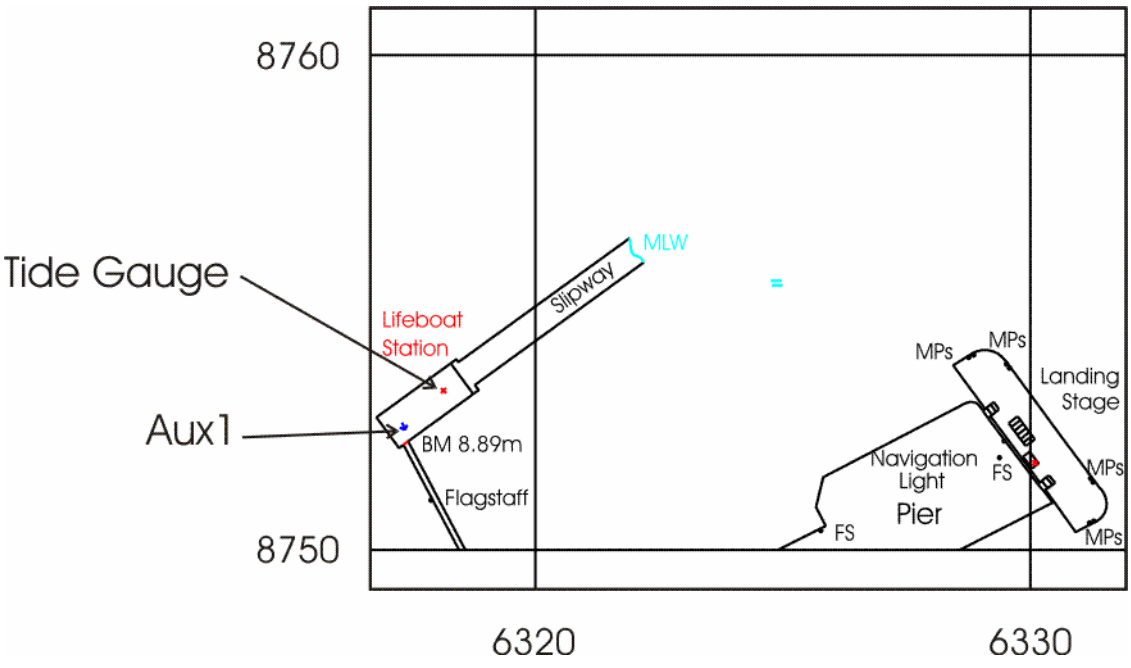
Latitude: 51° 34' 12.0" N Longitude: 03° 58' 31.7" W

Grid Reference: SS 6319 8753

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge cabinet is located in the Mumbles lifeboat station and the pressure points are mounted close to the end of the lifeboat slipway.



Newlyn Tide Gauge

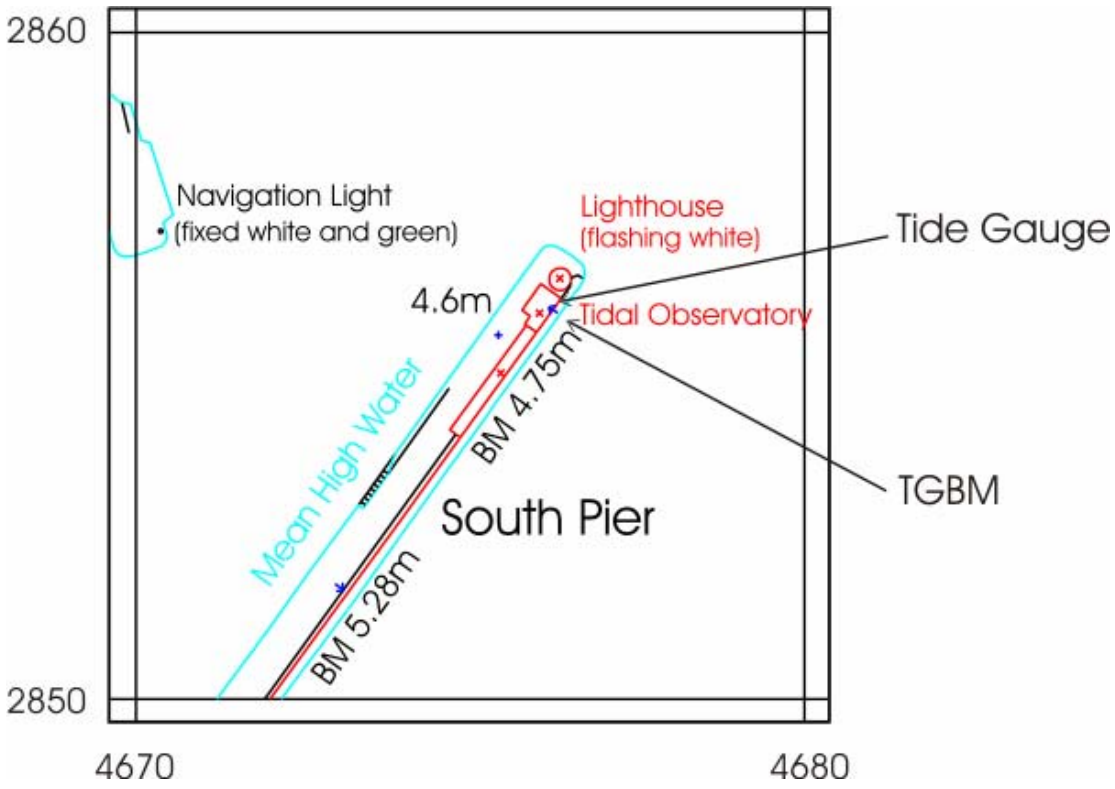
Latitude: 50° 06' 10.8" N Longitude: 05° 32' 33.9" W

Grid Reference: SW 4676 2856

Instrument type: Data acquisition system with a full tide and a mid-tide bubbler gauge and a back-up potentiometer attached to a Munro float gauge installed.

Site of Gauge:

The Tidal Observatory is located at the end of South Pier, next to the lighthouse. The pressure points are located on the seaward side of the pier, behind the lighthouse.



Newhaven (Sussex) Tide Gauge

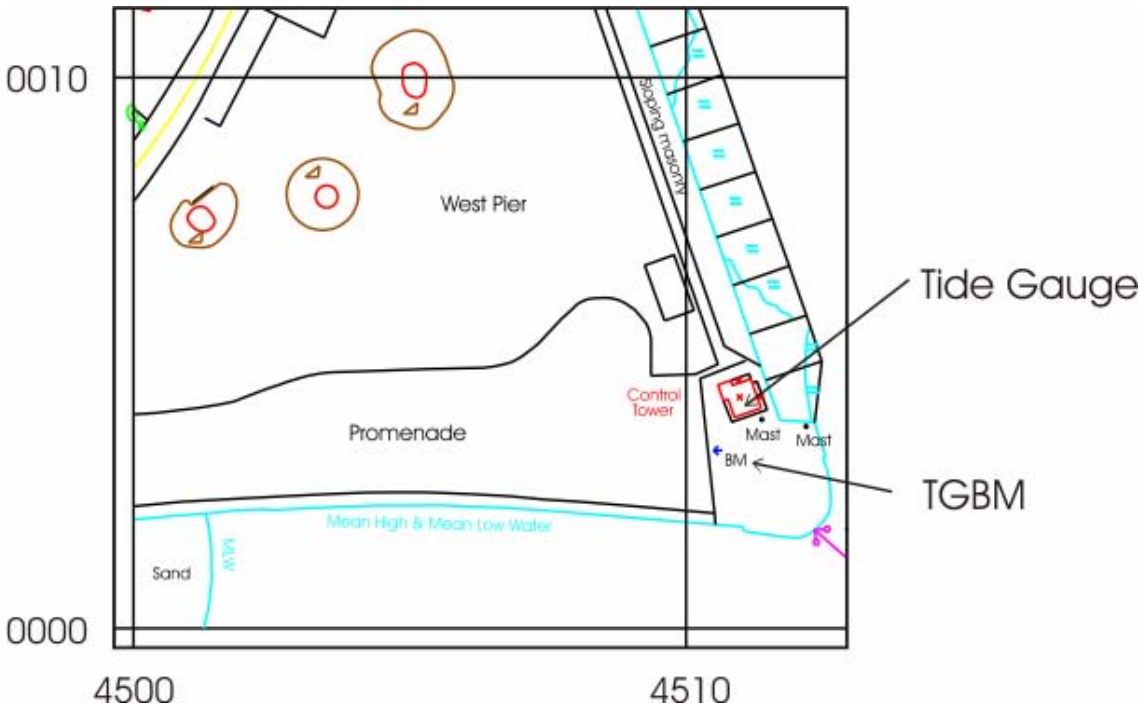
Latitude: 50° 46' 54.6" N Longitude: 00° 03' 25.3" E

Grid Reference: TQ 4511 0004

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge is located within the Port Control building on West Pier, and the pressure points are located on the pier wall, south east of the Port Control building. The anemometer and wind vane are located on the signals mast.



Newport (Wales) Tide Gauge

Latitude: 51° 33' 00.0" N Longitude: 02° 59' 14.6" W

Grid Reference: ST 3163 8392

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is located on the west side of the entrance to Newport Docks. The pressure points are attached to the dock wall on the west side of the dock entrance, close to the lock gates.

North Shields (Tyne and Wear) Tide Gauge

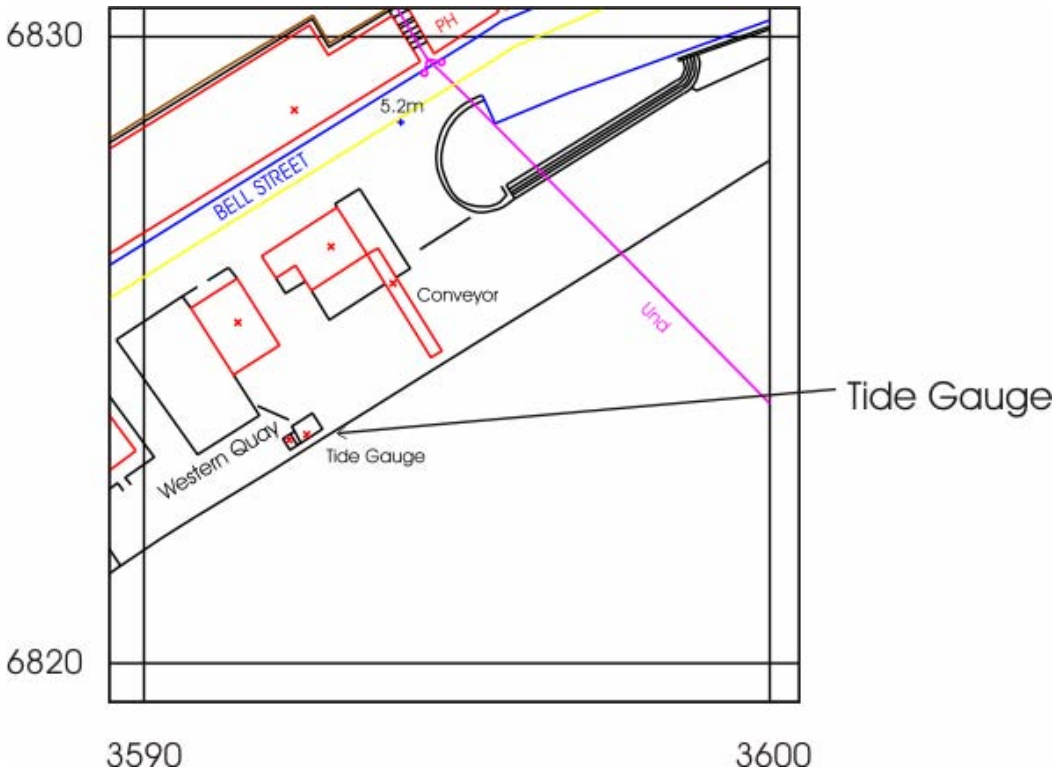
Latitude: 55° 00' 26.7" N Longitude: 01°26' 23.4" W

Grid Reference: NZ 3593 6824

Instrument type: Data acquisition system with potentiometers attached to the Munro float gauge and the Wellhead float gauge installed.

Site of Gauge:

The tide gauge building is located on the north side of the River Tyne, close to the Port of Tyne Authority offices.



Portpatrick (Scotland) Tide Gauge

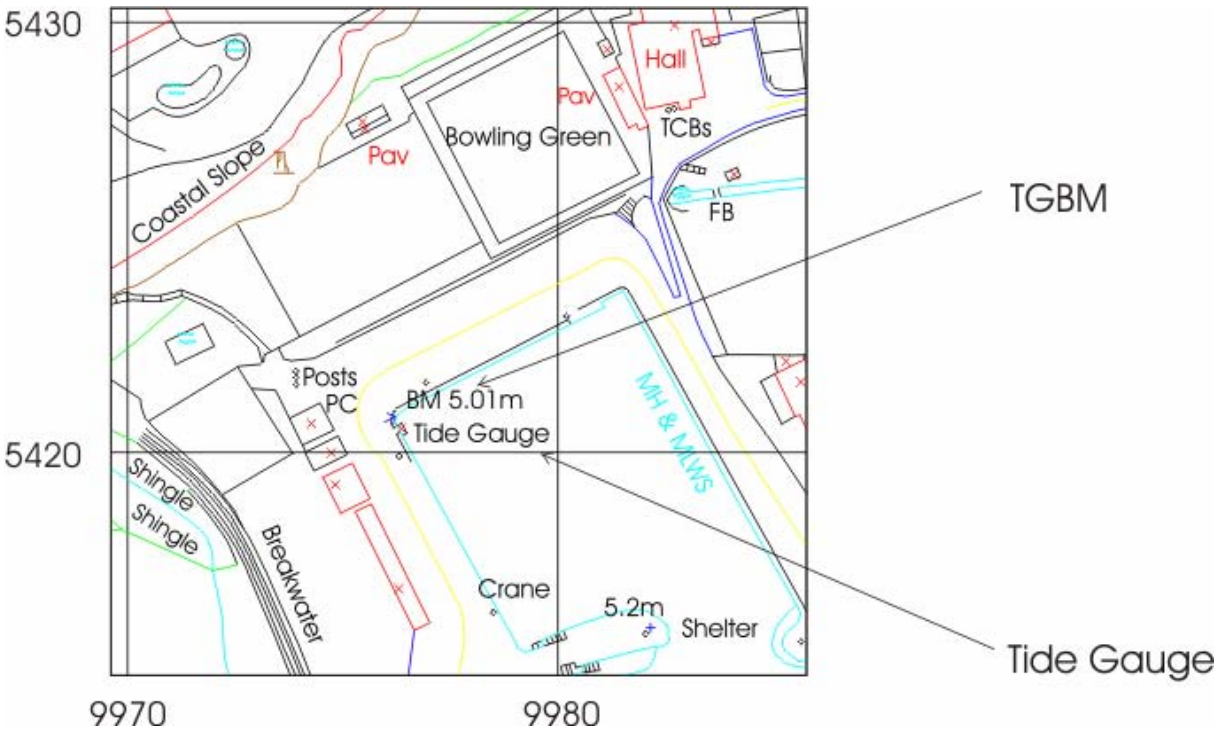
Latitude: 54° 50' 33.0" N Longitude: 05° 07' 12.1" W

Grid Reference: NW 9976 5421

Instrument type: Data acquisition system with a full tide bubbler gauge and a potentiometer attached to an installed Munro float gauge.

Site of Gauge:

The tide gauge building is mounted over the stilling well in the corner of Portpatrick harbour. The pressure point is located directly beneath the building.



Portrush (Northern Ireland) Tide Gauge

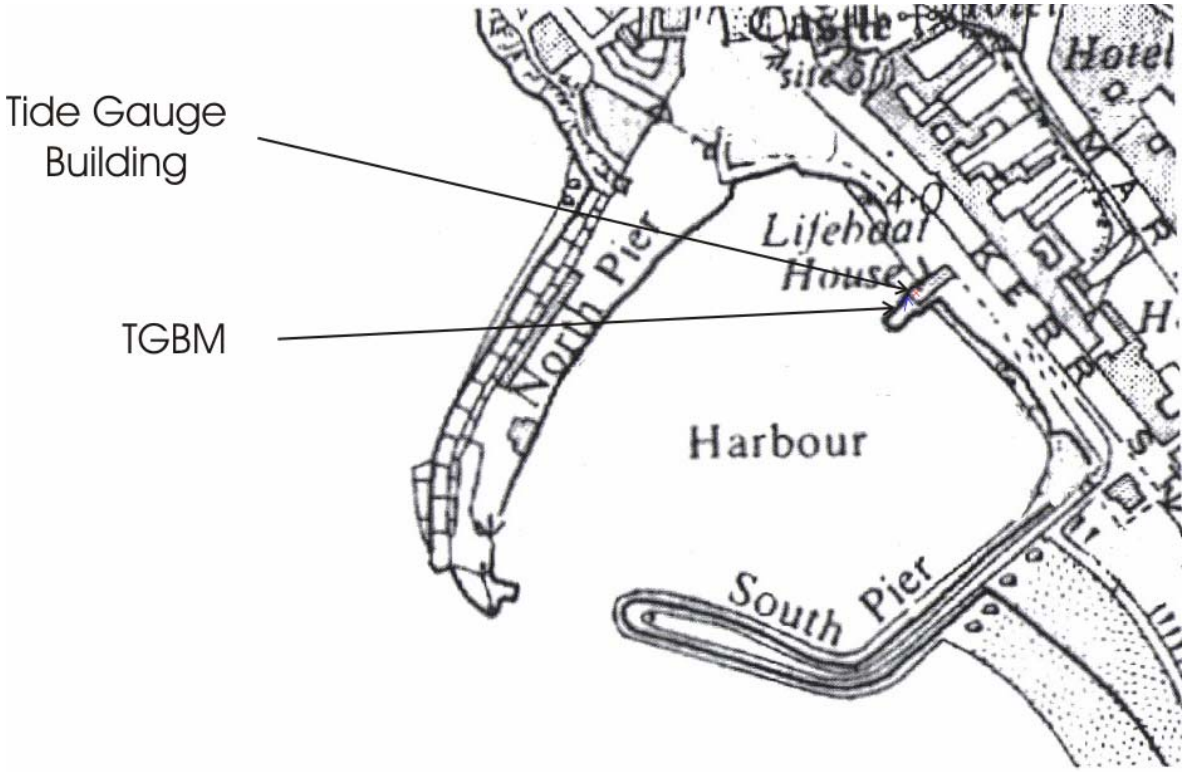
Latitude: 55° 12' 24.4" N Longitude: 06° 39' 24.6" W

Grid Reference: NW 0416 9952

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge cabinet is located in the RNLI boathouse, with the pressure points fixed to a leg of the slipway.



Portsmouth (Hampshire) Tide Gauge

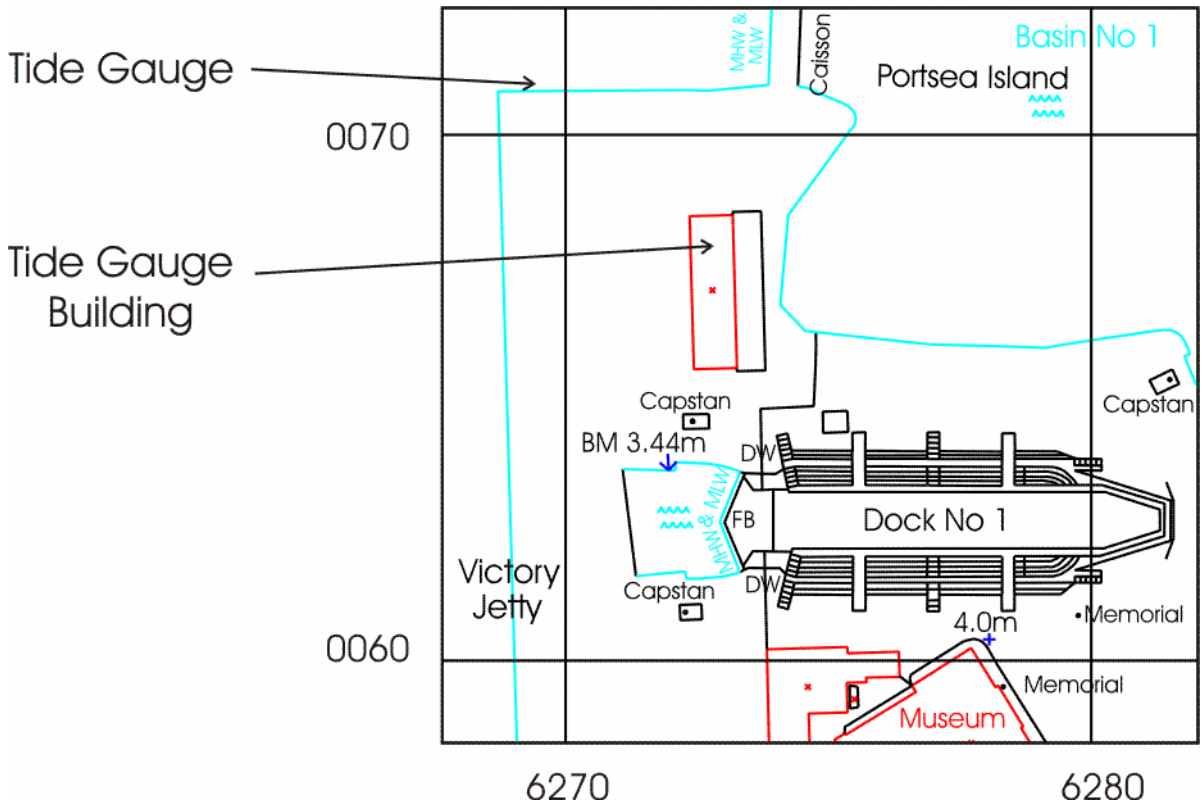
Latitude: 50° 48' 08.1" N Longitude: 01° 06' 40.5" W

Grid Reference: SU 6273 0067

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is located on Victory Jetty in the Royal Naval base. The pressure points are mounted on a leg at the north west corner of the jetty.



Sheerness (Kent) Tide Gauge

Latitude: 51° 26' 44.3" N Longitude: 00° 44' 36.1" E

Grid Reference: TQ 9074 7542

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is located on the jetty at Garrison Point, in the Port of Sheerness.

St. Mary's (Isles of Scilly) Tide Gauge

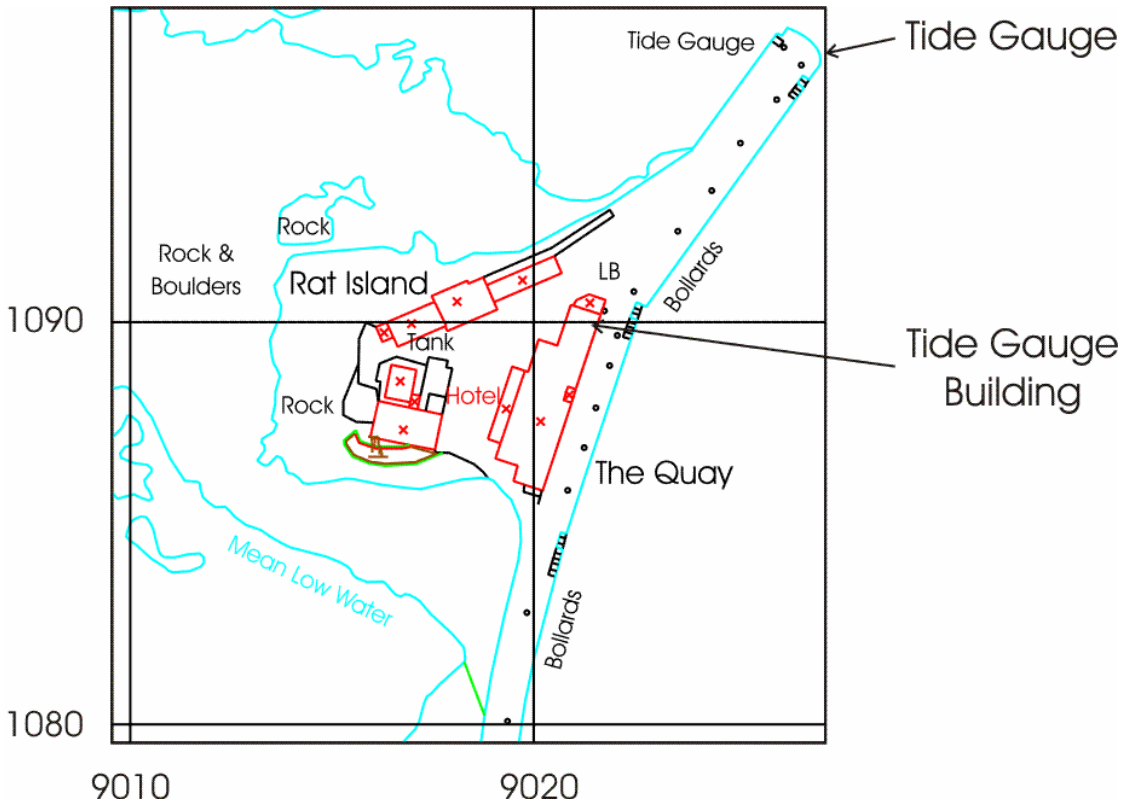
Latitude: 49° 55' 04.2" N Longitude: 06° 19' 01.7" W

Grid Reference: SV 9021 1090

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge cabinet is located in the Harbour Office storeroom on The Quay, Hugh Town. The pressure points are located on the nose of the quay.



Stornoway (Hebrides) Tide Gauge

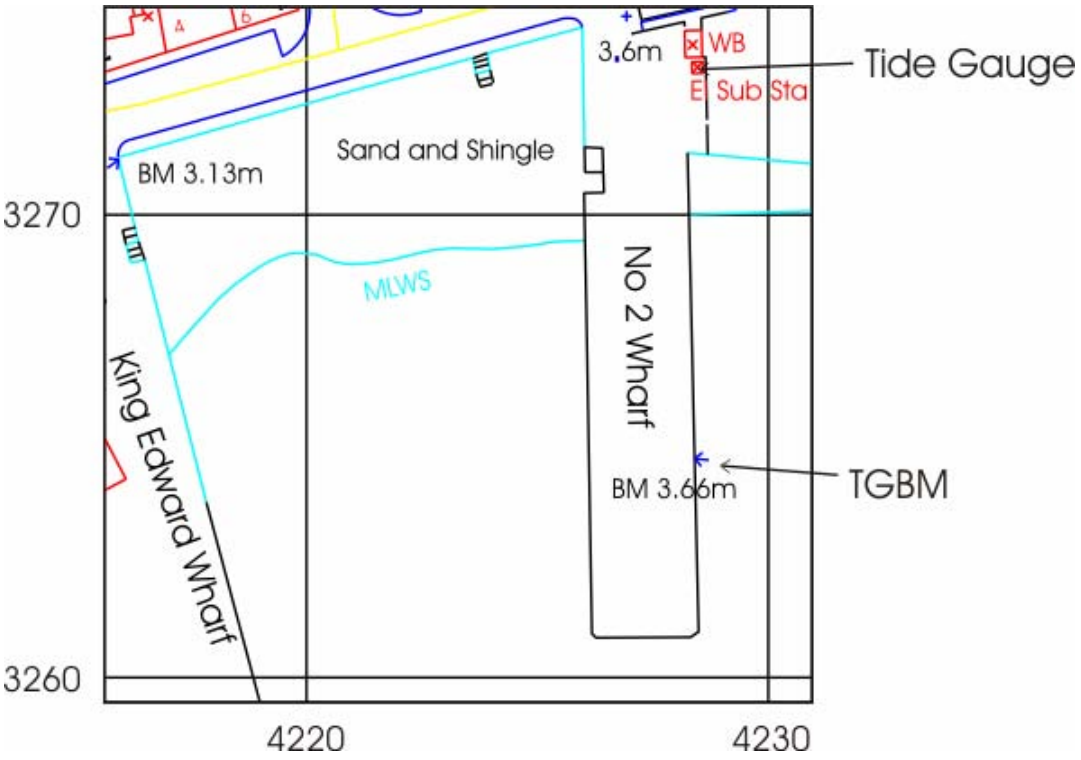
Latitude: 58° 12' 28.0" N Longitude: 06° 23' 20.0" W

Grid Reference: NB 4229 3273

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is located by the weighbridge at the entrance to Stornoway Port Authority, No. 2 wharf. The pressure points are attached to a leg on the east side of the wharf.



Tobermory (Mull) Tide Gauge

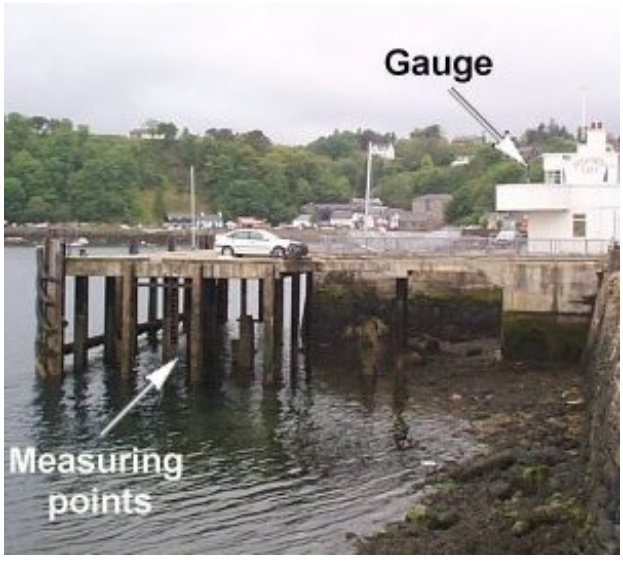
Latitude: 56° 37' 23.2" N Longitude: 06° 03' 51.2" W

Grid Reference: NM 5079 5531

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge cabinet is located in the Caledonian MacBrayne ferry terminal on Mishnish Pier, Tobermory, and the pressure points are located on one of the pier legs.



Ullapool (Scotland) Tide Gauge

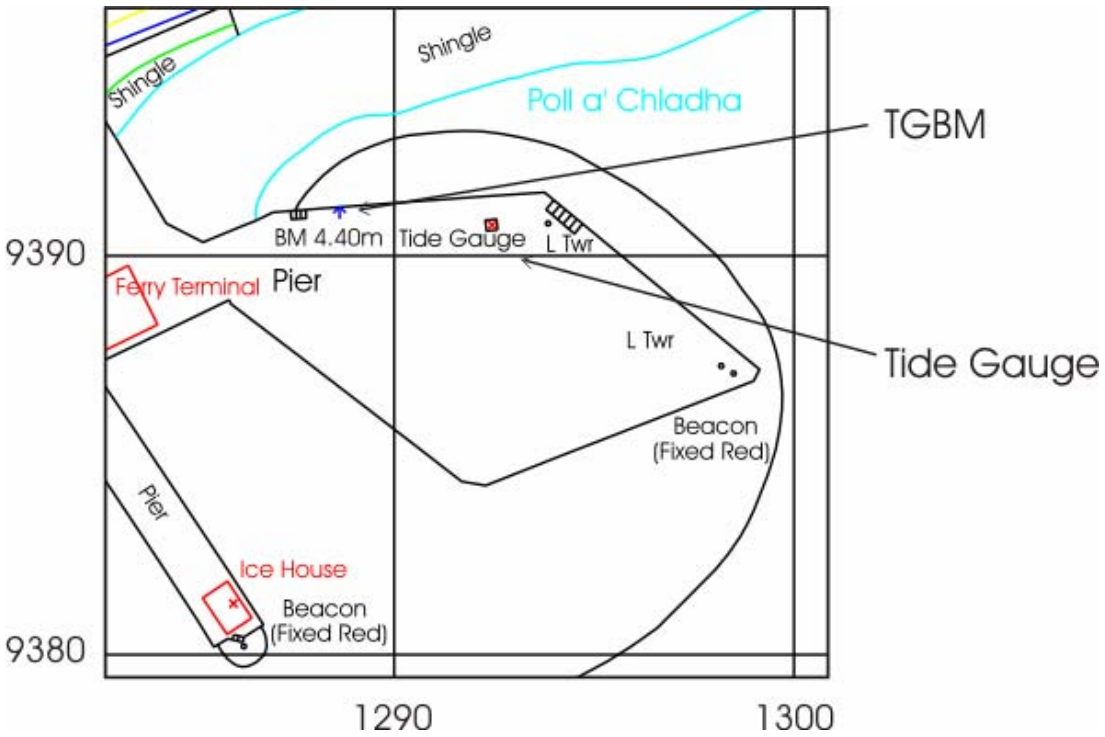
Latitude: 57° 53' 42.9" N Longitude: 05° 09' 28.8" W

Grid Reference: NH 1292 9391

Instrument type: Data acquisition system with a full tide and a mid-tide bubbler gauge and a back-up potentiometer attached to a Munro float gauge installed.

Site of Gauge:

The tide gauge building is located on the pier, Ullapool harbour. The pressure points are mounted below the tide gauge building.



Weymouth (Dorset) Tide Gauge

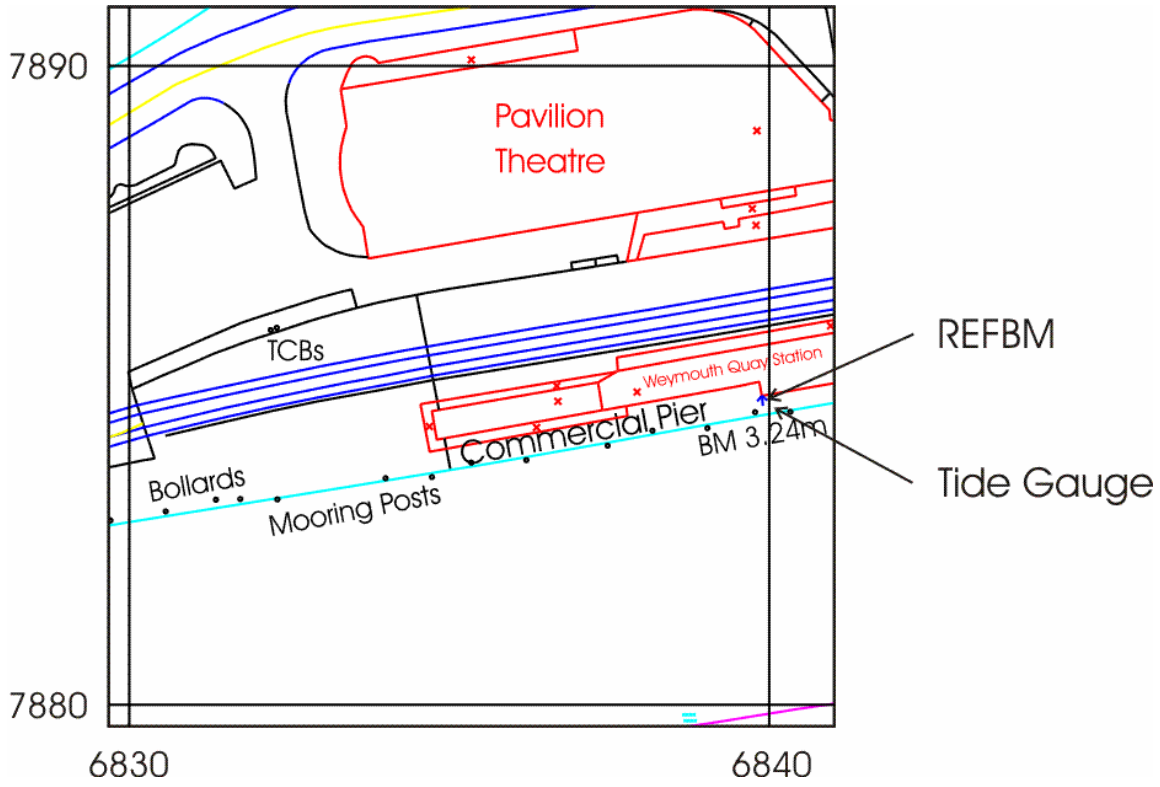
Latitude: 50° 36' 30.6" N Longitude: 02° 26' 52.6" W

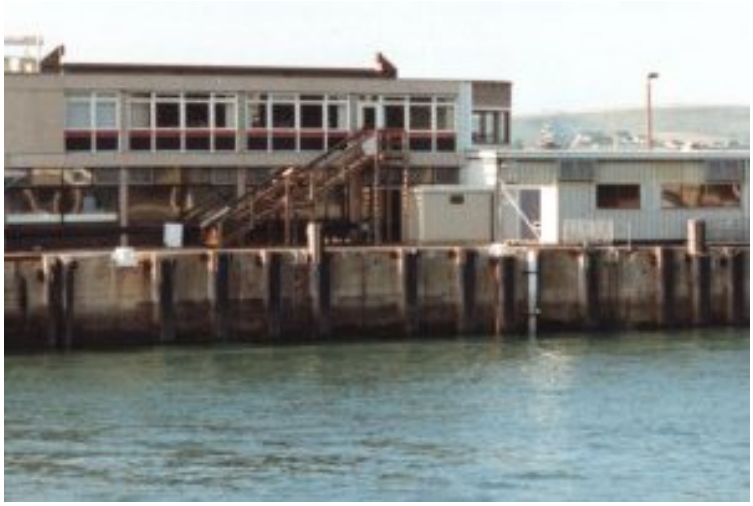
Grid Reference: SY 6840 7885

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge building is located on Commercial Pier, adjacent to the ferry terminal. The pressure points are located on the pier wall, directly in front of the tide gauge building.





Whitby (Yorkshire) Tide Gauge

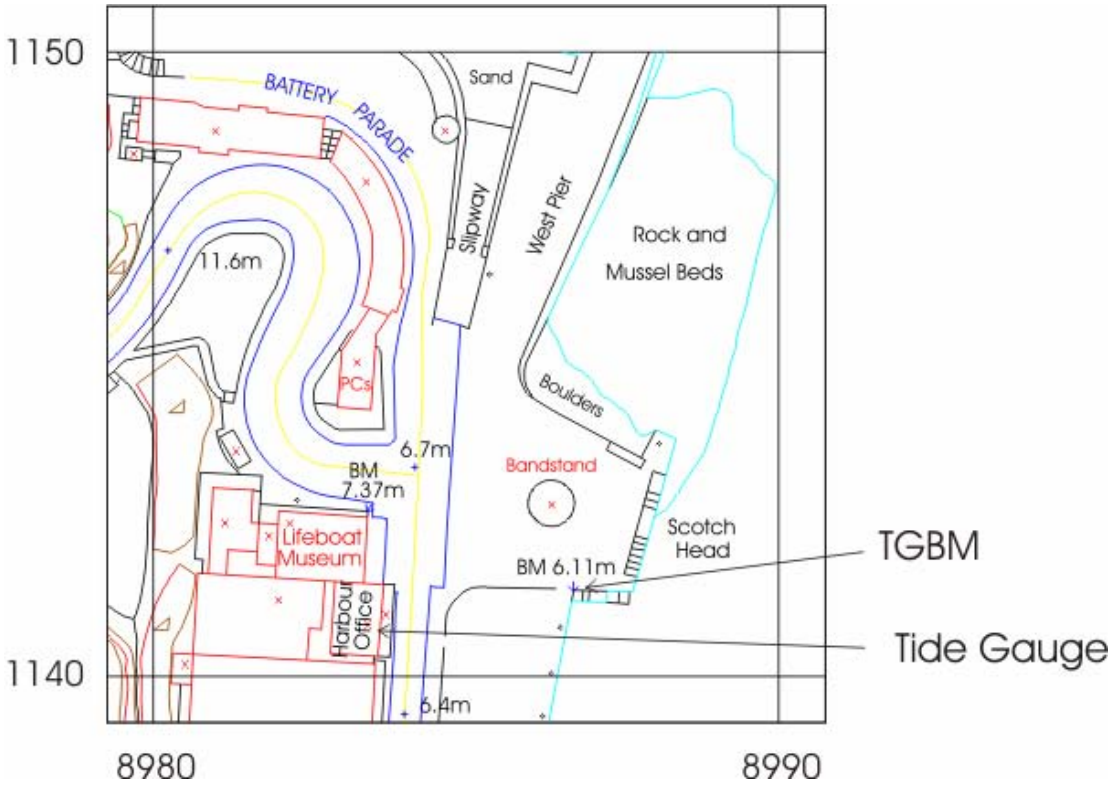
Latitude: 54° 29' 24.0" N Longitude: 00° 36' 52.9" W

Grid Reference: NZ 8986 1140

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge is located in the Harbour Master's office, Pier Road. The pressure points are positioned underneath the quay, adjacent to the Harbour Office.



Wick (Scotland) Tide Gauge

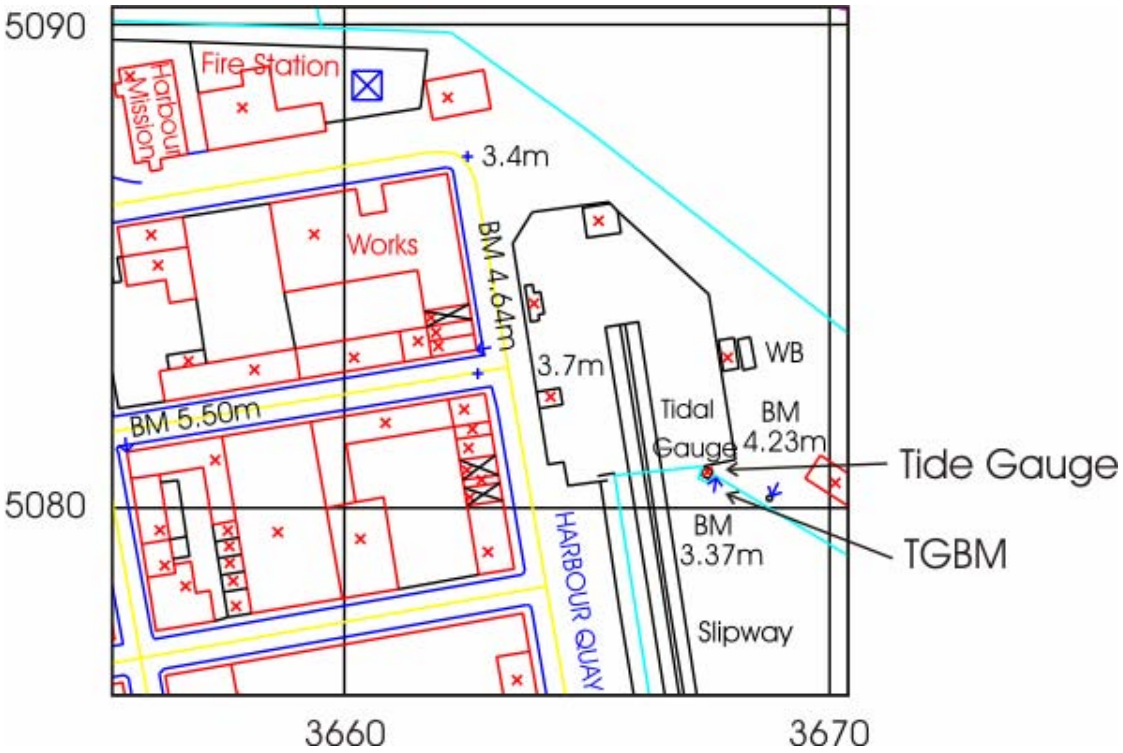
Latitude: 58° 26' 27.5" N Longitude: 03° 05' 11.0" W

Grid Reference: ND 3668 5081

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building is sited in the north west corner of Wick harbour next to the ship repair slipway. The pressure points are attached to an unused stilling well beneath the building.



Workington (Cumbria) Tide Gauge

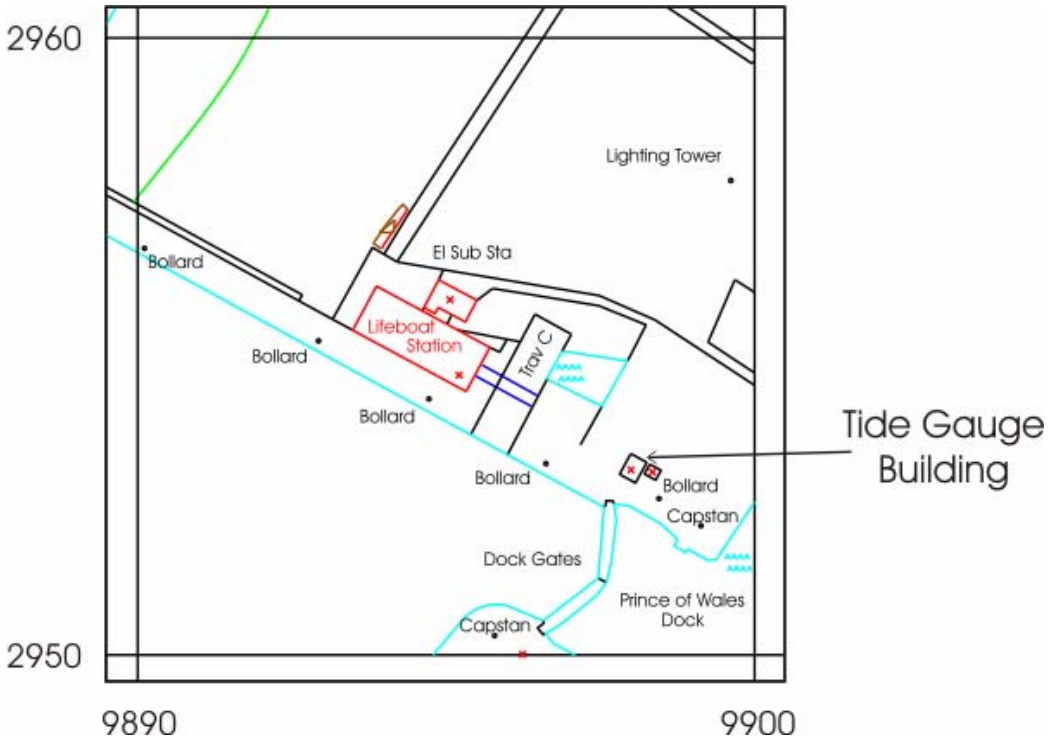
Latitude: 54° 39' 02.6" N Longitude: 03° 34' 01.8" W

Grid Reference: NX 9898 2953

Instrument type: Data acquisition system with two full tide bubbler gauges installed.

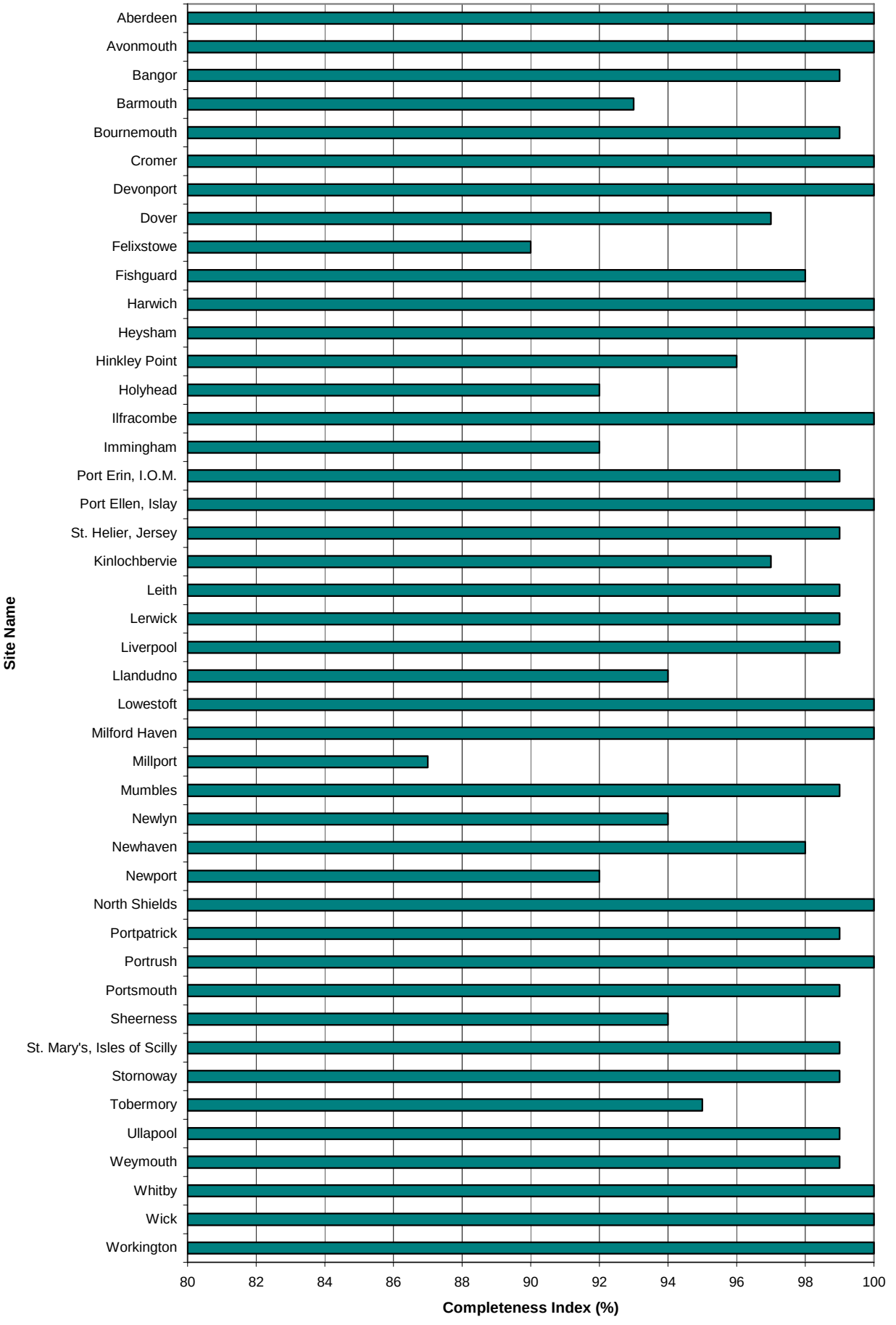
Site of Gauge:

The tide gauge is located in a concrete building on the north side of the dock entrance. The pressure points are located behind fender piles on the north seaward side of the dock gates. The wind speed and direction instruments are mounted at the top of the mast located next to the tide gauge building.



Report for 2007 on Data Quality and visits to sites

Histogram of Completeness Index (CI%) for UK Tide Gauge sites



Aberdeen Tide Gauge

Latitude: 57° 08' 38.5" N
Longitude: 02° 04' 38.5" W
Grid Reference: NJ 9525 0591

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NJ 9525 0590	New bolt N side jetty Waterloo Quay.
Aux1	NJ 9572 0593	Building NW side York Place SE face E angle
Aux2	NJ 9586 0571	Observatory Pocra Quay N face NW angle.
Aux3	NJ 9524 0600	Building NE side Waterloo Quay SW face S angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.25m below Ordnance Datum Newlyn (ODN)
TGZ = 6.318m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: Geodectic levelling performed on day 227.

T.G.I. visits to site: Day 227 TGI on site to carry out levelling and carry out general maintenance. System was purged.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	185-192,206-212

Statistics:

Surge maxima	Value	Day	Time
January	0.867	11	15:30:00
February	0.549	28	16:45:00
March	0.803	18	09:30:00
April	0.318	19	11:15:00
May	0.504	19	11:30:00
June	0.273	29	11:45:00
July	0.291	3	22:30:00
August	0.402	4	13:30:00
September	0.439	14	11:45:00
October	0.388	16	00:15:00
November	0.772	8	16:15:00
December	0.556	6	05:30:00

Surge minima	Value	Day	Time
January	-0.366	11	03:15:00
February	-0.247	3	20:30:00
March	-0.37	21	08:30:00
April	-0.366	1	09:00:00
May	-0.121	1	08:45:00
June	-0.121	2	09:00:00
July	-0.142	20	00:45:00
August	-0.303	21	13:45:00
September	-0.201	27	11:45:00
October	-0.212	24	12:00:00
November	-0.373	19	08:45:00
December	-0.353	11	13:15:00

Extreme maxima	Value	Day	Time
January	4.687	20	14:15:00
February	4.846	20	15:00:00
March	4.975	18	12:45:00
April	4.744	19	14:15:00
May	4.615	18	14:15:00
June	4.345	16	01:30:00
July	4.346	18	03:30:00
August	4.696	31	02:45:00
September	4.745	29	02:15:00
October	4.896	28	02:00:00
November	4.886	25	00:45:00
December	4.744	27	15:45:00

Extreme minima	Value	Day	Time
January	0.298	22	21:30:00
February	0.273	18	20:00:00
March	-0.188	20	20:15:00
April	0.151	17	19:15:00
May	0.494	15	18:00:00
June	0.667	18	09:30:00
July	0.581	17	09:00:00
August	0.285	30	08:30:00
September	0.062	28	07:45:00
October	0.391	26	06:45:00
November	0.449	26	20:00:00
December	0.68	25	20:15:00

Mean sea level	No days	MSL
January	31	2.734
February	28	2.619
March	31	2.568
April	30	2.443
May	31	2.562
June	30	2.54
July	14	2.588
August	30	2.567
September	30	2.617
October	31	2.639
November	30	2.626
December	31	2.678
	Sum	Avg
	347	2.598

Avonmouth Tide Gauge

Latitude: 51° 30' 27.9" N
Longitude: 02° 42' 45.9" W
Grid Reference: ST 5063 7900

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	ST 5057 7881	OSBM bolt at base of bollard
Aux1	ST 5072 7859	Rivet adjacent to transit shed NW face W angle
Aux2	ST 5063 7898	Rivet base building NW side S angle
Ref M	ST 5047 7934	Ref mark on seaward end of jetty

TGZ = Admiralty Chart Datum (ACD)
TGZ = 6.50 m below Ordnance Datum Newlyn (ODN)
TGZ = 15.711 m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site:		
	Day 142	On site for meeting to discuss new tide gauge site.
	Day 214	On site for a meeting with surveyors regarding new tide gauge site.
	Day 312	On site for meeting. General maintenance completed

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	None

Statistics:

Surge maxima	Value	Day	Time
January	1.629	18	05:30:00
February	1.614	11	19:30:00
March	1.223	6	04:30:00
April	0.913	10	18:45:00
May	1.196	9	18:30:00
June	0.934	29	01:45:00
July	1.143	5	18:30:00
August	1.169	14	18:30:00
September	1.038	20	06:30:00
October	0.706	19	06:15:00
November	0.836	30	19:30:00
December	1.516	8	14:00:00

Surge minima	Value	Day	Time
January	-0.855	30	11:00:00
February	-1.16	11	13:15:00
March	-0.882	20	03:15:00
April	-0.7	3	02:30:00
May	-0.712	21	16:45:00
June	-0.544	13	12:00:00
July	-0.661	17	01:45:00
August	-0.84	21	16:15:00
September	-0.837	12	00:00:00
October	-0.697	25	01:00:00
November	-0.725	23	00:15:00
December	-0.772	20	22:15:00

Extreme maxima	Value	Day	Time
January	13.66	21	08:45:00
February	14.552	20	09:00:00
March	14.506	21	08:45:00
April	14.229	18	07:45:00
May	13.763	17	07:15:00
June	13.265	16	20:00:00
July	13.281	31	20:15:00
August	14.113	30	20:45:00
September	14.523	28	20:15:00
October	14.323	27	20:00:00
November	13.787	25	19:45:00
December	13.555	25	07:45:00

Extreme minima	Value	Day	Time
January	0.351	22	16:30:00
February	0.501	20	16:30:00
March	-0.391	20	15:30:00
April	0.147	18	15:00:00
May	0.872	17	14:15:00
June	1.433	17	03:00:00
July	1.042	31	15:00:00
August	0.394	31	04:00:00
September	0.155	28	03:00:00
October	0.53	27	02:30:00
November	0.863	26	02:45:00
December	1.112	26	15:45:00

Mean sea level	No days	MSL
January	31	7.071
February	28	7.083
March	31	6.928
April	30	6.833
May	31	6.985
June	30	7.025
July	31	7.041
August	31	6.962
September	30	6.968
October	31	6.99
November	30	6.978
December	31	7.011
	Sum	Avg
	365	6.99

Bangor Tide Gauge

Latitude: 54° 39' 53.1" N
Longitude: 05° 40' 10.1" W
Grid Reference: NW 6340 3620

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	5043 8212 (Sheet 115)	S S Pin Tide gauge building Central Pier
Aux1	5038 8200 (Sheet 115)	Cut mark Clock tower

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.01m below Ordnance Datum Belfast (ODB)
TGZ = 5.592m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 339 TGI on site to purge system. General maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	178	002,014-015,017-019,022-023,026,057,059-063,077-078,129-137,145-156,167-169,174-178,178-180,184-188,191-192,201-205,209-212,214-223,237-253,257-260,262,264-266,268-271,273-278,294-308,314-339

Statistics:

Surge maxima	Value	Day	Time
January	1.048	11	09:00:00
February	0.675	15	16:30:00
March	0.946	6	01:45:00
April	0.225	24	01:00:00
May	0.516	19	04:30:00
June	8.431	27	13:00:00
July	0.386	26	04:45:00
August	0.34	14	23:15:00
September	0.275	23	03:30:00
October	0.293	28	02:15:00
November	0.2	8	08:30:00
December	0.581	8	19:00:00

Surge minima	Value	Day	Time
January	-0.505	2	18:30:00
February	-0.484	2	19:45:00
March	-0.658	20	11:00:00
April	-0.335	1	04:15:00
May	-0.174	21	10:00:00
June	-0.149	7	07:00:00
July	-0.17	10	06:45:00
August	-0.389	21	08:00:00
September	-0.378	25	21:30:00
October	-0.244	17	19:30:00
November	-0.457	9	00:30:00
December	-0.65	10	09:00:00

Extreme maxima	Value	Day	Time
January	3.981	20	11:45:00
February	4.094	20	13:00:00
March	3.935	6	00:30:00
April	3.556	19	12:15:00
May	3.891	19	00:30:00
June	9.892	27	06:00:00
July	3.746	17	00:30:00
August	3.872	4	02:15:00
September	3.698	30	00:45:00
October	3.957	27	23:30:00
November	3.373	8	10:00:00
December	4.092	28	14:00:00

Extreme minima	Value	Day	Time
January	-0.021	22	19:30:00
February	0.179	2	17:15:00
March	-0.313	19	17:15:00
April	0.003	16	16:00:00
May	0.354	20	07:00:00
June	0.498	10	12:30:00
July	0.415	31	05:45:00
August	0.353	2	07:00:00
September	0.271	29	06:15:00
October	0.492	10	04:15:00
November	0.425	9	04:15:00
December	0.325	10	17:30:00

Mean sea level	No days	MSL
January	17	2.167
February	25	2.108
March	25	1.953
April	30	1.859
May	13	1.986
June	12	1.995
July	13	2.09
August	12	1.986
September	5	1.995
October	15	2.044
November	5	1.962
December	25	2.063
	Sum	Avg
	197	2.017

Barmouth Tide Gauge

Latitude: 52° 43' 09.4" N
Longitude: 04° 02' 41.9" W
Grid Reference: SH 6197 1548

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SH 6197 1548	NBM rivet concrete 2.9M NE wall junction
Aux 1	SH 6173 1558	Rivet step NE side of road NW entrance path
Aux 2	SH 6186 1556	Rivet wall SE side road 17.6M E steps
Aux 3	SH 6196 1550	Rivet step E side lifeboat station

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.44m below ODN
TGZ = 10.363m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site:		
	Day 178	TGI on site to replace compressor and carry out general maintenance.
	Day 205	On site, reset data logger and general maintenance.
	Day 306	On site to fit new modem.
	Day 354	On site to replace faulty modem.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
93	15 minutes	199-205,304-306,346-365	073-079,082-184

Statistics:

Surge maxima	Value	Day	Time
January	1.627	11	06:00:00
February	0.952	28	15:00:00
March	1.27	6	02:45:00
April	0.176	19	04:15:00
May	0.498	19	00:45:00
June	0.259	30	21:45:00
July	0.589	5	20:00:00
August	0.515	14	18:15:00
September	0.461	21	10:30:00
October	0.46	28	07:15:00
November	0.552	30	20:30:00
December	0.926	7	02:00:00

Surge minima	Value	Day	Time
January	-0.651	22	12:45:00
February	-0.383	2	22:15:00
March	-0.671	20	11:45:00
April	-0.349	17	10:15:00
May	-0.17	21	02:15:00
June	0.068	14	09:45:00
July	-0.211	10	05:30:00
August	-0.369	21	09:30:00
September	-0.473	26	16:00:00
October	-0.335	30	13:00:00
November	-0.579	8	22:00:00
December	-0.709	10	11:15:00

Extreme maxima	Value	Day	Time
January	5.802	18	07:30:00
February	5.888	20	10:00:00
March	5.508	21	09:45:00
April	4.037	4	22:30:00
May	4.15	18	23:15:00
June	4.169	30	21:45:00
July	5.179	16	21:45:00
August	5.468	30	21:45:00
September	5.653	28	21:15:00
October	5.727	27	20:45:00
November	5.287	24	19:45:00
December	5.015	9	07:45:00

Extreme minima	Value	Day	Time
January	0.714	23	19:00:00
February	0.708	2	16:15:00
March	0.538	20	17:30:00
April	0.617	18	04:15:00
May	0.838	17	16:00:00
June	1.304	18	04:00:00
July	0.849	31	04:30:00
August	0.729	30	17:15:00
September	0.704	28	17:00:00
October	0.759	26	03:30:00
November	0.753	26	17:00:00
December	0.877	10	15:45:00

Mean sea level	No days	MSL
January	31	2.842
February	28	2.822
March	12	2.836
April		
May		
June		
July	18	2.729
August	31	2.658
September	30	2.658
October	29	2.697
November	27	2.679
December	10	2.935
	Sum	Avg
	216	2.762

Bournemouth Tide Gauge

Latitude: 50° 42' 51.6" N
Longitude: 01° 52' 29.5" W
Grid Reference: SZ 0893 9053

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
Aux1	SZ 0869 9066	Cut mark Wall
Aux2	SZ 0893 9083	Cut mark Pillar
REF A	SZ 0893 9052	Steelwork clamp
REF B	SZ 0893 9052	Mid-tide pressure point nozzle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.40m below ODN
TGZ = 5.96m below Aux1

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 206 On site to carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	206	None

Statistics:

Surge maxima	Value	Day	Time
January	0.651	18	10:15:00
February	0.742	12	09:15:00
March	0.801	6	01:15:00
April	0.212	20	02:45:00
May	0.354	27	08:45:00
June	0.316	20	07:00:00
July	0.359	26	14:15:00
August	0.386	15	05:15:00
September	0.315	24	05:30:00
October	0.214	16	18:30:00
November	0.444	9	11:30:00
December	0.562	8	12:15:00

Surge minima	Value	Day	Time
January	-0.549	23	02:00:00
February	-0.341	3	12:15:00
March	-0.273	20	04:45:00
April	-0.282	1	11:15:00
May	-0.172	23	14:00:00
June	-0.102	4	18:15:00
July	-0.098	10	22:45:00
August	-0.263	26	03:00:00
September	-0.245	5	04:30:00
October	-0.262	31	13:00:00
November	-0.466	7	03:00:00
December	-0.365	18	04:15:00

Extreme maxima	Value	Day	Time
January	2.609	18	08:00:00
February	2.682	19	09:45:00
March	2.542	6	02:00:00
April	2.35	19	22:15:00
May	2.367	16	20:00:00
June	2.439	15	21:00:00
July	2.363	15	21:15:00
August	2.47	14	21:30:00
September	2.585	28	21:30:00
October	2.494	28	09:45:00
November	2.493	9	07:30:00
December	2.478	9	09:00:00

Extreme minima	Value	Day	Time
January	0.148	23	06:30:00
February	0.194	3	16:45:00
March	-0.081	20	16:45:00
April	0.034	17	15:30:00
May	0.298	18	04:15:00
June	0.597	17	04:45:00
July	0.447	31	04:15:00
August	0.088	30	04:30:00
September	0.053	27	03:30:00
October	0.248	27	03:30:00
November	0.275	26	16:45:00
December	0.339	25	16:30:00

Mean sea level	No days	MSL
January	31	1.614
February	28	1.676
March	31	1.543
April	30	1.467
May	31	1.588
June	30	1.655
July	28	1.633
August	31	1.598
September	30	1.579
October	31	1.597
November	30	1.588
December	31	1.595
	Sum	Avg
	362	1.594

Cromer Tide Gauge

Latitude: 52° 56' 03.1" N
Longitude: 01° 18' 06.1" E
Grid Reference: TG 2198 4253

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TG 2193 4233	S Steel bolt on top of wall opposite E side of pier
Aux1	TG 2198 4253	Rivet on steps of catwalk NE angle of LB station
Aux2	TG 2195 4233	S Steel bolt bottom ramp S side at W corner

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.75m below Ordnance Datum Newlyn
TGZ = 10.117m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 018 On site survey for new instruments.
Day 277 On site to change compressor.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	234,253-254,261,269-273,277,312-317,327,329-331,339-345

Statistics:

Surge maxima	Value	Day	Time
January	1.394	12	00:45:00
February	0.618	17	03:30:00
March	1.376	18	14:45:00
April	0.717	19	16:45:00
May	0.563	28	00:00:00
June	0.758	26	00:00:00
July	0.464	30	03:30:00
August	0.478	22	07:30:00
September	0.793	10	14:00:00
October	0.385	16	06:00:00
November	1.879	8	21:30:00
December	0.841	7	14:45:00

Surge minima	Value	Day	Time
January	-1.641	11	08:30:00
February	-0.544	27	13:15:00
March	-0.705	6	08:15:00
April	-0.483	21	06:00:00
May	-0.277	6	04:15:00
June	-0.173	2	15:45:00
July	-0.222	25	18:30:00
August	-0.33	25	19:30:00
September	-0.379	16	02:30:00
October	-0.378	28	03:30:00
November	-0.714	24	12:00:00
December	-0.652	4	19:00:00

Extreme maxima	Value	Day	Time
January	5.698	4	18:45:00
February	5.65	20	20:30:00
March	6.101	18	18:00:00
April	5.811	19	19:30:00
May	5.211	19	20:15:00
June	5.06	16	06:45:00
July	5.276	30	06:30:00
August	5.551	31	08:00:00
September	5.515	1	08:30:00
October	5.604	27	06:15:00
November	5.451	9	05:00:00
December	5.382	29	22:30:00

Extreme minima	Value	Day	Time
January	0.412	11	06:45:00
February	0.444	20	03:00:00
March	0.26	22	03:00:00
April	0.222	19	02:00:00
May	0.571	18	01:45:00
June	0.857	17	14:45:00
July	0.696	31	14:15:00
August	0.545	3	16:15:00
September	0.557	27	13:30:00
October	0.448	26	13:00:00
November	0.094	24	12:15:00
December	0.474	27	03:00:00

Mean sea level	No days	MSL
January	31	3.08
February	28	2.974
March	31	2.998
April	30	2.871
May	31	2.978
June	30	2.997
July	31	3.017
August	28	2.999
September	19	3.018
October	31	3.007
November	18	3.001
December	23	2.97
	Sum	Avg
	331	2.993

Devonport Tide Gauge

Latitude: 50° 22' 06.3" N
Longitude: 04° 11' 06.7" W
Grid Reference: SX 4469 5434

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SX 4468 5434	Bolt on jetty wall. 6.6m NW angle T G building
Aux1	SX 4471 5433	Building N face NE angle
Aux2	SX 4487 5425	Bldg NW face W angle
Aux3	SX 4501 5454	Fl Br 11818 bldg W face NW angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.22m below ODN
TGZ = 7.631m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: There were no site visits in 2007.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	103-109,217-225,231-245,247-249,253-257,279,284-322

Statistics:

Surge maxima	Value	Day	Time
January	0.377	18	08:45:00
February	0.682	12	05:30:00
March	0.698	6	02:15:00
April	0.18	24	22:30:00
May	0.327	27	10:45:00
June	0.386	18	05:30:00
July	0.336	23	07:30:00
August	0.381	14	06:30:00
September	0.235	24	02:45:00
October	0.065	7	00:30:00
November	0.218	30	21:00:00
December	0.387	8	10:15:00

Surge minima	Value	Day	Time
January	-0.448	23	07:30:00
February	-0.326	3	10:30:00
March	-0.4	19	17:45:00
April	-0.289	11	00:30:00
May	-0.22	24	03:00:00
June	-0.113	4	20:45:00
July	-0.109	10	20:30:00
August	-0.135	19	12:45:00
September	-0.3	7	20:15:00
October	-0.277	31	03:45:00
November	-0.321	24	23:15:00
December	-0.388	10	06:30:00

Extreme maxima	Value	Day	Time
January	5.743	22	07:45:00
February	6.131	20	07:30:00
March	5.813	21	07:15:00
April	5.729	19	06:45:00
May	5.614	18	18:45:00
June	5.702	15	17:45:00
July	5.671	16	19:00:00
August	5.835	14	18:45:00
September	5.982	28	18:45:00
October	5.44	1	08:15:00
November	5.608	25	05:45:00
December	5.771	25	06:00:00

Extreme minima	Value	Day	Time
January	0.581	23	02:45:00
February	0.48	20	14:00:00
March	-0.047	20	12:45:00
April	0.327	19	13:15:00
May	0.581	18	00:30:00
June	1.075	17	01:00:00
July	0.928	31	00:30:00
August	0.705	2	01:45:00
September	0.279	28	00:30:00
October	0.963	10	23:30:00
November	0.594	24	23:30:00
December	0.767	26	13:30:00

Mean sea level	No days	MSL
January	31	3.394
February	28	3.49
March	31	3.331
April	22	3.285
May	31	3.373
June	30	3.447
July	31	3.416
August	7	3.392
September	18	3.368
October	9	3.415
November	12	3.426
December	31	3.394
	Sum	Avg
	281	3.394

Dover Tide Gauge

Latitude: 51° 06' 51.9" N
Longitude: 01° 19' 21.2" E
Grid Reference: TR 3264 4026

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TR 3193 4074	Fl Br G4868 building. East side of works entrance
Aux 1	TR 3195 4095	No 29 Waterloo Crescent SW face S angle
Aux 2	TR 3228 4053	Rivet pier wall NE side of pier F junction
Aux 3	TR 3265 4026	Rivet steps NE side P of W pier 1.0M SE W angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.67m below Ordnance Datum Newlyn (ODN)
TGZ = 10.491m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 205 On site, reset data logger, replaced compressor and carried out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
97	15 minutes	017-023,199-205	None

Statistics:

Surge maxima	Value	Day	Time
January	1.157	12	01:30:00
February	0.798	8	11:30:00
March	0.944	18	21:15:00
April	0.463	19	23:15:00
May	0.541	11	02:30:00
June	0.656	26	05:15:00
July	0.504	3	22:45:00
August	0.523	15	22:30:00
September	0.625	10	21:45:00
October	0.386	16	23:30:00
November	1.523	9	03:30:00
December	0.897	7	19:45:00

Surge minima	Value	Day	Time
January	-1.095	11	14:15:00
February	-0.366	3	09:30:00
March	-0.829	6	12:00:00
April	-0.373	21	11:00:00
May	-0.242	6	04:00:00
June	-0.146	2	16:45:00
July	-0.182	17	18:15:00
August	-0.302	26	00:00:00
September	-0.305	5	01:00:00
October	-0.396	28	12:00:00
November	-0.572	18	15:45:00
December	-0.458	18	02:15:00

Extreme maxima	Value	Day	Time
January	7.148	4	23:45:00
February	7.21	21	01:15:00
March	7.667	18	22:30:00
April	7.374	20	00:15:00
May	6.852	16	22:30:00
June	6.673	15	23:00:00
July	6.758	30	11:00:00
August	7.065	31	12:45:00
September	7.453	28	11:30:00
October	7.127	27	11:15:00
November	7.689	9	10:30:00
December	6.859	24	23:15:00

Extreme minima	Value	Day	Time
January	0.887	3	18:00:00
February	0.548	20	08:15:00
March	0.449	22	08:30:00
April	0.299	19	07:30:00
May	0.557	18	07:00:00
June	1.021	16	19:00:00
July	0.789	31	19:15:00
August	0.656	29	19:00:00
September	0.563	28	19:30:00
October	0.537	27	19:00:00
November	0.421	24	17:30:00
December	0.682	27	08:15:00

Mean sea level	No days	MSL
January	22	3.831
February	28	3.796
March	31	3.768
April	30	3.645
May	31	3.763
June	30	3.804
July	22	3.813
August	31	3.781
September	30	3.816
October	31	3.778
November	30	3.839
December	31	3.79
	Sum	Avg
	347	3.785

Felixstowe Tide Gauge

Latitude: 51° 57' 27.8" N
Longitude: 01° 20' 47.4" E
Grid Reference: TM 3003 3409

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TM 3001 3414	Bolt on the SE side of prom NE face of arcade
Aux1	TM 2956 3393	Flush Bracket 2071 on No. 25 Langer Road W angle NW face.
Aux3	TM 3003 3409	Rivet outside TG building

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.95m below ODN
TGZ = 5.69m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site:		
	Day 142	On site, system purged and general maintenance.
	Day 278	On site to change compressor and to assess fault on BT line.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
90	15 minutes	241-252,255-256,276-295,353-357	180-184,295-301

Statistics:

Surge maxima	Value	Day	Time
January	1.559	12	01:15:00
February	0.503	17	07:00:00
March	1.215	18	20:30:00
April	0.673	19	20:00:00
May	0.625	11	04:15:00
June	0.764	26	16:30:00
July	0.525	30	06:45:00
August	0.498	22	12:15:00
September	0.953	10	19:15:00
October	0.348	30	09:30:00
November	2.246	9	05:30:00
December	0.86	7	19:15:00

Surge minima	Value	Day	Time
January	-1.448	11	12:30:00
February	-0.653	27	16:15:00
March	-0.762	6	09:15:00
April	-0.37	21	08:45:00
May	-0.251	31	01:00:00
June	-0.231	29	00:15:00
July	-0.286	6	04:45:00
August	-0.29	15	02:30:00
September	-0.382	24	11:15:00
October	-0.262	31	12:00:00
November	-0.58	24	16:45:00
December	-0.579	4	23:15:00

Extreme maxima	Value	Day	Time
January	4.407	12	04:45:00
February	4.184	21	14:00:00
March	4.593	18	23:15:00
April	4.33	20	01:00:00
May	4.088	20	01:30:00
June	4.036	15	23:45:00
July	4.063	31	00:15:00
August	4.087	2	13:45:00
September	4.355	10	23:15:00
October	4.278	29	13:15:00
November	4.836	8	23:45:00
December	4.174	7	22:15:00

Extreme minima	Value	Day	Time
January	-0.33	11	11:15:00
February	0.166	4	06:45:00
March	-0.022	5	06:30:00
April	0.022	19	06:15:00
May	0.208	18	18:15:00
June	0.428	18	19:45:00
July	0.255	31	18:30:00
August	0.155	3	20:45:00
September	0.156	27	17:45:00
October	0.417	31	08:30:00
November	-0.149	24	16:30:00
December	0.107	27	07:30:00

Mean sea level	No days	MSL
January	31	2.173
February	28	2.099
March	31	2.109
April	30	2.001
May	31	2.098
June	28	2.11
July	27	2.141
August	27	2.143
September	17	2.202
October	3	2.163
November	30	2.196
December	24	2.144
	Sum	Avg
	307	2.132

Fishguard Tide Gauge

Latitude: 52° 00' 47.5" N
Longitude: 04° 59' 01.4" W
Grid Reference: SM 9534 3918

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SM 9534 3918	OSBM bolt on quay 3.6M NE end of railings (1987)
Aux1	SM 9513 3874	OS bolt con base railings 6.4M NW angle TG hut
Aux2	SM 9489 3849	Rivet step top of Goodwick Quay
Aux3	SM 9455 3820	Fl Br 11518 blding SW side railway bridge SE Face

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.44m below ODN
TGZ = 7.88m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: Geodectic levelling performed on day 198.

T.G.I. visits to site:		
	Day 023	On site to carry out general maintenance.
	Day 075	On site to carry out general maintenance.
	Day 197-198	On site to fit new data logger, cabinet, modem and compressor. Site levelled and system calibrated.
	Day 206	On site to fit new modem.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	192-200	None

Statistics:

Surge maxima	Value	Day	Time
January	0.896	11	06:00:00
February	0.648	15	14:45:00
March	0.945	6	01:15:00
April	0.284	25	00:15:00
May	0.435	30	12:15:00
June	0.516	20	07:00:00
July	0.383	1	04:00:00
August	0.377	14	18:00:00
September	0.177	24	02:15:00
October	0.261	28	06:15:00
November	0.31	30	17:15:00
December	0.416	2	09:45:00

Surge minima	Value	Day	Time
January	-0.369	2	16:00:00
February	-0.232	2	19:30:00
March	-0.416	20	02:00:00
April	-0.203	16	20:30:00
May	-0.162	28	05:15:00
June	-0.113	25	16:45:00
July	-0.087	29	21:15:00
August	-0.331	21	13:00:00
September	-0.331	26	14:45:00
October	-0.244	30	13:45:00
November	-0.51	8	22:30:00
December	-0.522	10	11:45:00

Extreme maxima	Value	Day	Time
January	5.163	20	08:00:00
February	5.601	20	09:00:00
March	5.248	21	08:45:00
April	5.167	18	07:30:00
May	5.025	18	20:15:00
June	4.971	17	21:00:00
July	4.835	31	20:15:00
August	5.119	30	20:30:00
September	5.356	28	20:15:00
October	5.303	28	08:15:00
November	4.952	25	19:45:00
December	5.07	27	09:15:00

Extreme minima	Value	Day	Time
January	0.523	22	16:15:00
February	0.613	18	14:15:00
March	-0.118	20	14:30:00
April	0.295	17	13:30:00
May	0.76	17	13:45:00
June	1.175	17	03:00:00
July	0.882	31	02:30:00
August	0.394	30	02:45:00
September	0.236	28	02:15:00
October	0.487	27	01:45:00
November	0.589	25	01:15:00
December	0.824	26	15:30:00

Mean sea level	No days	MSL
January	31	2.798
February	28	2.863
March	31	2.694
April	30	2.631
May	31	2.751
June	30	2.824
July	21	2.764
August	31	2.65
September	30	2.632
October	31	2.698
November	30	2.661
December	31	2.72
	Sum	Avg
	355	2.724

Harwich Tide Gauge

Latitude: 51° 56' 52.8" N
Longitude: 01° 17' 31.4" E
Grid Reference: TM 2634 3284

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TM 2634 3284	Bolt at base of flag staff
Aux1	TM 2617 3277	Cut mark quay edge
Aux2	TM 2608 3271	Cut mark NW face of Bank building
Aux3	TM 2610 3258	Cut mark N side of ent St Nicholas's church

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.02m below ODN
TGZ = 6.17m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 142 On site. Three systems purged and channels look better. Discussion regarding more frequent dredging of site.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	041-066,075-085,088-104,111,142,288-289,296-344

Statistics:

Surge maxima	Value	Day	Time
January	1.689	12	01:15:00
February	0.576	2	22:15:00
March	0.524	7	13:45:00
April	0.668	19	20:15:00
May	0.598	11	04:30:00
June	0.9	26	16:30:00
July	0.481	30	09:15:00
August	0.54	22	14:45:00
September	0.887	10	19:30:00
October	0.392	17	22:30:00
November			
December	0.702	30	06:15:00

Surge minima	Value	Day	Time
January	-1.396	11	12:45:00
February	-0.24	10	05:00:00
March	-0.345	28	02:45:00
April	-0.379	25	14:00:00
May	-0.358	31	00:15:00
June	-0.284	29	00:00:00
July	-0.419	25	22:15:00
August	-0.396	14	20:00:00
September	-0.433	15	23:30:00
October	-0.394	11	11:00:00
November			
December	-0.641	28	23:15:00

Extreme maxima	Value	Day	Time
January	4.57	18	23:00:00
February	4.145	5	13:45:00
March	4.378	7	13:45:00
April	4.461	20	01:15:00
May	4.276	19	00:45:00
June	4.272	15	23:45:00
July	4.254	31	00:15:00
August	4.29	31	13:30:00
September	4.54	10	23:30:00
October	4.229	1	14:30:00
November			
December	4.359	26	13:15:00

Extreme minima	Value	Day	Time
January	-0.315	11	11:30:00
February	0.168	4	06:45:00
March	0.376	9	08:15:00
April	0.008	19	06:30:00
May	0.197	18	18:30:00
June	0.443	18	20:00:00
July	0.251	31	18:30:00
August	0.138	3	20:45:00
September	0.201	28	18:15:00
October	0.404	9	16:30:00
November			
December	0.132	27	07:45:00

Mean sea level	No days	MSL
January	31	2.238
February	8	2.199
March	7	2.143
April	13	2.103
May	31	2.172
June	30	2.203
July	31	2.208
August	31	2.202
September	30	2.264
October	19	2.195
November		
December	20	2.1
	Sum	Avg
	251	2.184

Heysham Tide Gauge

Latitude: 54° 01' 54.5" N
Longitude: 02° 55' 12.9" W
Grid Reference: SD 3982 5993

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SD 4030 6012	OSBM bolt on south quay 40.8m SW from SE angle of dock.
Aux1	SD 4141 6005	Bridge parapet, E side of road.
Aux2	SD 4026 6033	Pivot pin harbour wall 6.1M SW N angle of harbour.
Aux3	SD 4026 6033	Rivet harbour wall 5.7M SW of N angle of Harbour.
Aux4	SD 3982 5992	Brass bolt quay edge.

TGZ = Admiralty Chart Datum (ACD)
TGZ = 4.90m below Ordnance Datum Newlyn (ODN)
TGZ = 12.098m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site:		
	Day 079	TGI on site to replace faulty battery charger and carry out general maintenance.
	Day 220	On site to replace compressor.
	Day 346	On site to meet with EA consultants and carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	050-053,218-220

Statistics:

Surge maxima	Value	Day	Time
January	2.028	18	14:00:00
February	0.913	15	18:30:00
March	1.504	6	04:45:00
April	0.366	25	11:45:00
May	0.713	19	06:00:00
June	0.563	28	19:15:00
July	0.708	5	23:15:00
August	0.558	14	22:30:00
September	0.718	24	14:00:00
October	0.595	28	05:15:00
November	0.467	24	15:15:00
December	1.066	8	17:15:00

Surge minima	Value	Day	Time
January	-0.713	2	18:45:00
February	-0.55	2	17:00:00
March	-0.808	20	06:45:00
April	-0.538	1	16:00:00
May	-0.471	27	16:30:00
June	-0.345	25	11:30:00
July	-0.225	20	20:00:00
August	-0.499	20	20:15:00
September	-0.515	26	18:00:00
October	-0.284	8	14:30:00
November	-0.634	19	05:15:00
December	-0.654	9	19:45:00

Extreme maxima	Value	Day	Time
January	10.239	20	12:00:00
February	10.035	18	11:45:00
March	10.416	21	12:45:00
April	10.353	19	12:15:00
May	10.269	19	00:15:00
June	9.692	17	00:15:00
July	9.673	17	00:45:00
August	10.357	31	00:30:00
September	10.504	29	00:15:00
October	10.685	27	23:45:00
November	10.149	24	10:30:00
December	9.996	26	00:15:00

Extreme minima	Value	Day	Time
January	0.424	22	20:15:00
February	0.52	18	18:30:00
March	-0.359	20	19:00:00
April	0.23	17	17:45:00
May	0.867	17	18:00:00
June	1.252	15	05:15:00
July	1.24	31	06:30:00
August	0.617	30	06:45:00
September	0.241	28	06:30:00
October	0.594	27	06:00:00
November	0.913	26	18:45:00
December	1.173	24	18:00:00

Mean sea level	No days	MSL
January	31	5.343
February	22	5.213
March	31	5.092
April	30	4.975
May	31	5.159
June	30	5.179
July	31	5.24
August	27	5.13
September	30	5.155
October	31	5.216
November	30	5.204
December	31	5.307
	Sum	Avg
	355	5.184

Hinkley Point Tide Gauge

Latitude: 51° 12' 38.2” N
Longitude: 03° 07' 52.6” W
Grid Reference: ST 2107 4632

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	ST 2104 4634	Bolt on wall 0.962m NE of SE corner of steps.
Aux1	ST 2078 4626	Rivet on sea wall 41.28m SW of corner of outfall.
Aux2	ST 2094 4631	Bolt on sea wall 31.245m SW of end of railings.
Aux3	ST 2123 4634	Bolt sea defence wall.

TGZ = Admiralty Chart Datum (ACD)
TGZ = 5.80m below Ordnance Datum Newlyn (ODN)
TGZ = 14.639m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 192 On site to meet with site engineers and to repair data logger.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
96	15 minutes	038,172,187-197,218,241,312	116,143,199-200,210-211,215-218,218-225,236-241,241-242,251-253,277-288,290,293-303,311,312-315,317-318,324-365

Statistics:

Surge maxima	Value	Day	Time
January	1.243	21	01:29:59
February	0.964	11	18:29:59
March	0.837	6	02:59:59
April	0.322	11	19:45:00
May	0.651	30	14:00:00
June	0.601	20	08:15:00
July	0.602	5	18:30:00
August	0.775	14	18:00:00
September	0.369	24	03:59:59
October	0.298	15	15:29:59
November	0.247	21	15:45:00

Surge minima	Value	Day	Time
January	-0.65	30	22:14:59
February	-0.661	3	11:59:59
March	-0.683	14	02:29:59
April	-0.537	11	14:15:00
May	-0.425	21	15:15:00
June	-0.305	26	06:15:00
July	-0.321	17	00:29:59
August	-0.601	21	14:45:00
September	-0.585	7	20:44:59
October	-0.48	20	01:44:59
November	-0.512	2	04:00:00

Extreme maxima	Value	Day	Time
January	12.125	21	08:14:59
February	12.911	20	08:44:59
March	12.824	21	08:15:00
April	12.572	18	07:15:00
May	12.153	17	06:45:00
June	11.779	15	18:45:00
July	11.785	31	19:44:59
August	12.511	30	20:14:59
September	12.87	28	19:44:59
October	12.626	26	18:45:00
November	12.166	25	19:15:00

Extreme minima	Value	Day	Time
January	0.437	22	15:14:59
February	0.319	20	14:59:59
March	-0.43	20	14:00:00
April	-0.048	18	13:30:00
May	0.681	17	13:00:00
June	1.315	16	13:30:00
July	1.015	31	13:44:59
August	0.263	31	02:44:59
September	0.025	28	01:44:59
October	0.372	27	13:30:00
November	0.927	25	12:45:00

Mean sea level	No days	MSL
January	31	6.296
February	28	6.316
March	31	6.169
April	28	6.086
May	31	6.221
June	30	6.265
July	15	6.302
August	16	6.228
September	29	6.195
October	9	6.17
November	10	6.14
December		
	Sum	Avg
	258	6.217

Holyhead Tide Gauge

Latitude: 53° 18' 50.2" N
Longitude: 04° 37' 13.5" W
Grid Reference: SH 2553 8287

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SH 2553 8287	Bolt on concrete foundation, N side of T G building.
Aux1	SH 2556 8289	Cut mark lighthouse.
Aux3	SH 2506 8292	Bolt Salt Island bridge.

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.05m below Ordnance Datum Newlyn (ODN)
TGZ = 7.436m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site:		
	Day 205	On site. BT line fault fixed but now the compressor is faulty.
	Day 213	On site but still unable to contact gauge.
	Day 228	Testing for software problems.
	Day 230	On site to reinstall old software and check modem.
	Day 248	On site to install radar gauge.
	Day 340	On site to test acoustic gauge resulting in gap in data.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
92	15 minutes	199-212,213-230	None

Statistics:

Surge maxima	Value	Day	Time
January	1.053	11	06:15:00
February	0.77	15	16:30:00
March	1.098	6	02:15:00
April	0.265	25	07:15:00
May	0.373	19	05:00:00
June	0.425	20	08:00:00
July	0.436	5	22:00:00
August	0.311	18	09:15:00
September	0.284	24	15:30:00
October	0.355	28	06:15:00
November	0.326	30	19:15:00
December	0.511	5	03:00:00

Surge minima	Value	Day	Time
January	-0.515	2	17:15:00
February	-0.433	2	18:00:00
March	-0.604	19	23:45:00
April	-0.341	1	17:00:00
May	-0.354	27	14:00:00
June	-0.144	25	17:30:00
July	-0.1	10	05:15:00
August	-0.365	21	10:15:00
September	-0.369	26	17:00:00
October	-0.227	30	08:45:00
November	-0.532	8	23:30:00
December	-0.59	10	11:15:00

Extreme maxima	Value	Day	Time
January	6.17	20	11:00:00
February	6.472	20	12:00:00
March	6.017	21	11:45:00
April	5.993	19	11:15:00
May	5.957	18	11:00:00
June	5.81	18	00:00:00
July	5.815	16	23:45:00
August	6.018	30	23:30:00
September	6.166	28	23:15:00
October	6.25	27	22:45:00
November	5.838	24	09:15:00
December	5.953	27	12:15:00

Extreme minima	Value	Day	Time
January	0.127	22	18:45:00
February	0.308	18	16:45:00
March	-0.415	20	17:15:00
April	0.002	17	16:00:00
May	0.502	17	16:15:00
June	0.871	16	04:45:00
July	0.833	15	04:30:00
August	0.239	30	05:15:00
September	0.062	28	04:45:00
October	0.324	27	04:30:00
November	0.458	26	17:15:00
December	0.663	24	16:15:00

Mean sea level	No days	MSL
January	31	3.355
February	28	3.361
March	31	3.191
April	30	3.105
May	31	3.238
June	30	3.314
July	16	3.326
August	13	3.135
September	30	3.215
October	31	3.287
November	30	3.247
December	31	3.318
	Sum	Avg
	332	3.258

Ilfracombe Tide Gauge

Latitude: 51° 12' 40.1" N
Longitude: 04° 06' 44.3" W
Grid Reference: SS 5255 4789

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SS 5263 4791	OSBM Bolt on concrete pier, S.angle of T G hut.
Aux1	SS 5245 4782	Pier Hotel, The Quay
Aux2	SS 5251 4789	St Nicholas chapel N face 6.1M from NW angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 4.80m below Ordnance Datum Newlyn (ODN)
TGZ = 12.379m below TGBM
TGZ = 10.76m below Aux1
TGZ = 32.541m below Aux2

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 192 TGI on site to carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	018,020-023,077-079,269-270,343

Statistics:

Surge maxima	Value	Day	Time
January	0.863	18	04:00:00
February	0.706	12	05:00:00
March	0.862	5	23:15:00
April	0.281	24	23:15:00
May	0.583	30	14:15:00
June	0.491	20	07:00:00
July	0.482	5	18:30:00
August	0.61	14	16:45:00
September	0.343	24	02:15:00
October	0.242	15	17:00:00
November	0.411	30	17:15:00
December	0.699	9	07:45:00

Surge minima	Value	Day	Time
January	-0.432	23	10:30:00
February	-0.376	2	10:30:00
March	-0.408	20	10:15:00
April	-0.36	17	21:30:00
May	-0.279	21	13:15:00
June	-0.229	4	23:30:00
July	-0.118	29	21:30:00
August	-0.348	21	13:30:00
September	-0.379	8	20:30:00
October	-0.273	20	00:30:00
November	-0.403	14	23:00:00
December	-0.391	10	01:30:00

Extreme maxima	Value	Day	Time
January	9.41	20	06:30:00
February	10.184	20	07:45:00
March	10.016	21	07:30:00
April	9.836	18	06:15:00
May	9.456	18	06:45:00
June	9.252	15	18:00:00
July	9.261	31	19:00:00
August	9.78	30	19:15:00
September	10.099	28	19:00:00
October	9.931	27	18:30:00
November	9.504	25	18:15:00
December	9.407	25	06:30:00

Extreme minima	Value	Day	Time
January	0.747	23	14:45:00
February	0.393	20	14:00:00
March	-0.063	21	01:00:00
April	0.051	18	12:15:00
May	0.634	17	12:00:00
June	1.35	17	00:45:00
July	1.09	31	12:30:00
August	0.306	31	01:15:00
September	0.099	28	00:15:00
October	0.394	26	23:45:00
November	0.706	24	23:30:00
December	1.033	26	13:30:00

Mean sea level	No days	MSL
January	24	5.006
February	28	5.075
March	26	4.945
April	30	4.847
May	31	4.967
June	30	5.04
July	31	5.036
August	31	4.952
September	30	4.928
October	31	4.985
November	30	4.961
December	28	5.006
	Sum	Avg
	350	4.979

Immingham Tide Gauge

Latitude: 53° 37' 49.5" N
Longitude: 00° 11' 15.1" W
Grid Reference: TA 1995 1640

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TA 1989 1630	Docks office, north angle, north east face
Aux1	TA 2005 1631	Customs house, east angle, north east face
Aux2	TA 1994 1640	Bolt on concrete base of tide gauge building
Aux3	TA 2000 1648	Stud in camera tower

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.90m below ODN
TGZ = 9.131m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site:		
	Day 085	TGI on site to replace faulty compressor.
	Day 094	TGI on site for meeting with ABP Estates. All equipment removed for the redevelopment of the site
	Day 143-144	Temporary system installed during building works on site, (pressure points remain the same). However no BT line as yet.
	Day 164	TGI on site to install GSM modem

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
92	15 minutes	135-164	None

Statistics:

Surge maxima	Value	Day	Time
January	1.272	11	23:45:00
February	0.656	17	02:45:00
March	0.915	19	00:45:00
April	0.623	19	16:45:00
May	0.47	14	11:00:00
June	0.563	25	23:15:00
July	0.418	30	13:15:00
August	0.537	15	15:45:00
September	0.661	10	12:15:00
October	0.436	16	05:45:00
November	1.672	8	23:00:00
December	0.658	6	10:45:00

Surge minima	Value	Day	Time
January	-1.72	11	07:15:00
February	-0.579	27	20:15:00
March	-0.66	6	08:45:00
April	-0.369	21	03:00:00
May	-0.252	5	23:15:00
June	-0.179	28	20:15:00
July	-0.28	25	18:30:00
August	-0.478	25	18:45:00
September	-0.354	19	01:15:00
October	-0.33	28	06:15:00
November	-0.748	24	11:30:00
December	-0.702	4	19:15:00

Extreme maxima	Value	Day	Time
January	7.678	4	18:15:00
February	7.959	20	20:00:00
March	8.112	18	17:15:00
April	8.06	19	19:00:00
May	7.121	14	15:30:00
June	7.256	15	18:00:00
July	7.25	16	07:00:00
August	7.664	31	07:30:00
September	7.922	29	07:15:00
October	7.851	27	06:00:00
November	8.217	25	05:30:00
December	7.523	24	18:00:00

Extreme minima	Value	Day	Time
January	0.756	20	13:00:00
February	0.54	20	02:00:00
March	0.322	22	02:15:00
April	0.306	19	01:15:00
May	1.083	14	22:30:00
June	1.112	17	13:45:00
July	0.909	31	13:15:00
August	0.655	31	14:15:00
September	0.697	1	15:00:00
October	0.578	27	12:45:00
November	0.316	24	11:30:00
December	0.797	26	01:30:00

Mean sea level	No days	MSL
January	31	4.268
February	28	4.224
March	31	4.212
April	30	4.118
May	13	4.2
June	16	4.287
July	31	4.233
August	31	4.225
September	30	4.283
October	31	4.252
November	30	4.285
December	31	4.238
	Sum	Avg
	333	4.235

Port Erin (Isle of Man) Tide Gauge

Latitude: 54° 05' 06.8" N
Longitude: 04° 46' 05.0" W
Grid Reference: SC 1904 6902

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SC 1904 6901	Bolt SE corner of the RNLI boathouse
Aux 2		Bolt on seawall NW of Marine labs
Aux 3	SC 1928 6903	Bolt base of light tower Raglan pier

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.75m below Ordnance Datum Local (ODL)
TGZ = 9.288m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 017 On site to replace modem.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	001-005,031	078

Statistics:

Surge maxima	Value	Day	Time
January	1.057	11	08:00:00
February	0.829	15	17:45:00
March	1.103	6	02:45:00
April	0.287	25	05:30:00
May	0.477	19	04:45:00
June	0.421	28	20:00:00
July	0.448	26	05:15:00
August	0.418	14	23:45:00
September	0.295	24	16:45:00
October	0.328	28	03:45:00
November	0.322	30	20:00:00
December	0.629	5	04:00:00

Surge minima	Value	Day	Time
January	-0.459	22	20:15:00
February	-0.421	2	19:30:00
March	-0.641	19	23:15:00
April	-0.298	1	06:30:00
May	-0.33	27	15:00:00
June	-0.152	4	18:45:00
July	-0.093	10	06:30:00
August	-0.358	21	09:30:00
September	-0.376	26	19:45:00
October	-0.241	30	10:45:00
November	-0.434	14	04:45:00
December	-0.573	9	21:15:00

Extreme maxima	Value	Day	Time
January	5.842	20	12:00:00
February	6.075	20	13:00:00
March	5.762	6	00:45:00
April	5.595	19	12:15:00
May	5.667	19	00:30:00
June	5.456	18	01:00:00
July	5.481	17	00:45:00
August	5.657	15	00:15:00
September	5.717	29	00:15:00
October	5.926	28	00:00:00
November	5.522	24	10:30:00
December	5.722	28	14:15:00

Extreme minima	Value	Day	Time
January	-0.158	22	19:45:00
February	0.076	18	18:00:00
March	-0.646	20	18:15:00
April	-0.224	17	17:00:00
May	0.247	15	15:45:00
June	0.516	16	05:45:00
July	0.423	31	06:00:00
August	-0.028	30	06:15:00
September	-0.182	28	05:45:00
October	0.062	27	05:15:00
November	0.178	26	18:15:00
December	0.38	24	17:15:00

Mean sea level	No days	MSL
January	23	3.021
February	28	3.005
March	31	2.837
April	30	2.749
May	31	2.88
June	30	2.921
July	31	2.943
August	31	2.861
September	30	2.846
October	31	2.932
November	30	2.882
December	31	2.982
	Sum	Avg
	357	2.905

Port Ellen (Isle of Islay) Tide Gauge

Latitude: 55° 37' 39.3" N
Longitude: 06° 11' 23.7" W
Grid Reference: NR 3636 4508

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NR 3635 4507	Bolt SE side Booking Office
Aux1	NR 3642 4515	Rivet angle wall NW side entrance to pier
Aux2	NR 3651 4526	Police Station SE side of road SW face W angle
Aux3	NR 3635 4521	Sea Farm C gable NW face W angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 0.19m below Ordnance Datum Newlyn (ODN)
TGZ = 2.839m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: There were no visits to site in 2007.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	005

Statistics:

Surge maxima	Value	Day	Time
January	1.158	11	10:00:00
February	0.797	15	17:30:00
March	1.047	6	00:45:00
April	0.342	24	00:00:00
May	0.619	19	02:30:00
June	0.389	20	13:30:00
July	0.456	26	04:00:00
August	0.42	4	01:15:00
September	0.405	23	03:00:00
October	0.356	28	02:15:00
November	0.295	30	17:00:00
December	0.654	8	20:15:00

Surge minima	Value	Day	Time
January	-0.442	22	22:00:00
February	-0.383	2	19:15:00
March	-0.689	19	19:15:00
April	-0.27	1	04:45:00
May	-0.29	28	05:45:00
June	-0.19	25	20:45:00
July	-0.087	10	15:30:00
August	-0.324	21	06:30:00
September	-0.35	25	22:30:00
October	-0.179	17	19:30:00
November	-0.437	9	02:00:00
December	-0.704	10	07:45:00

Extreme maxima	Value	Day	Time
January	1.76	11	08:15:00
February	1.473	20	07:00:00
March	1.721	5	04:30:00
April	1.003	23	18:30:00
May	1.211	18	16:15:00
June	1	30	17:45:00
July	1.087	1	18:15:00
August	1.105	3	20:30:00
September	1.057	24	15:45:00
October	1.253	27	17:45:00
November	1.116	30	06:00:00
December	1.511	27	05:00:00

Extreme minima	Value	Day	Time
January	-0.428	23	00:45:00
February	-0.354	2	23:30:00
March	-0.839	19	23:30:00
April	-0.319	17	22:45:00
May	-0.077	27	17:45:00
June	-0.002	7	12:15:00
July	-0.036	18	13:15:00
August	-0.226	30	11:45:00
September	-0.26	26	10:15:00
October	-0.033	10	10:00:00
November	-0.057	6	08:00:00
December	-0.293	9	23:00:00

Mean sea level	No days	MSL
January	28	0.609
February	28	0.599
March	31	0.434
April	30	0.332
May	31	0.475
June	30	0.502
July	31	0.539
August	31	0.464
September	30	0.462
October	31	0.57
November	30	0.486
December	31	0.621
	Sum	Avg
	362	0.508

St. Helier (Jersey) Tide Gauge

Latitude: 49° 11' 00" N
Longitude: 02° 07' 00 " W
Grid Reference: 13/11 6466 4763

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	6465 4764 Plan 13/11	Pin bollard Victoria Pier
Aux1	6516 4764 Plan 13/11	Cut mark wall N side of road Mount Bingham
Aux2	6509 4780 Plan 13/11	"J" stone E face wall car park South Hill
Aux3	6507 4779 Plan 13/11	Cut mark S face wall car park South Hill
Aux4	6506 4784 Plan 13/11	Cut mark E face wall E side Commercial Rd

TGZ = Admiralty Chart Datum (ACD)
TGZ = 5.88m below Ordnance Datum Local (ODL)
TGZ = 13.658m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: There were no visits to site in 2007.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	199-202	042

Statistics:

Surge maxima	Value	Day	Time
January	0.743	18	13:15:00
February	1.203	12	08:00:00
March	0.774	6	04:30:00
April	0.172	24	22:45:00
May	0.457	10	20:45:00
June	0.522	18	06:00:00
July	0.502	17	05:45:00
August	0.697	15	04:45:00
September	0.379	16	18:15:00
October	0.228	16	17:15:00
November	0.428	30	20:45:00
December	0.938	9	11:30:00

Surge minima	Value	Day	Time
January	-0.521	23	02:15:00
February	-0.438	3	12:30:00
March	-0.38	14	01:45:00
April	-0.356	10	23:00:00
May	-0.305	23	04:15:00
June	-0.236	7	11:45:00
July	-0.221	30	21:45:00
August	-0.344	20	23:30:00
September	-0.482	7	20:00:00
October	-0.38	19	23:15:00
November	-0.405	14	10:00:00
December	-0.478	18	00:00:00

Extreme maxima	Value	Day	Time
January	11.216	22	08:30:00
February	11.985	20	08:15:00
March	11.888	21	08:00:00
April	11.655	18	06:45:00
May	11.212	17	06:30:00
June	10.909	15	18:30:00
July	10.904	31	19:30:00
August	11.639	30	19:45:00
September	11.978	28	19:30:00
October	11.629	27	19:00:00
November	11.157	25	06:15:00
December	11.091	25	07:00:00

Extreme minima	Value	Day	Time
January	0.956	23	03:30:00
February	0.578	20	15:00:00
March	-0.006	20	14:00:00
April	0.285	18	13:30:00
May	0.965	18	01:30:00
June	1.706	16	01:15:00
July	1.53	31	01:30:00
August	0.602	31	02:30:00
September	0.454	28	01:30:00
October	0.64	27	01:15:00
November	1.009	26	14:00:00
December	1.245	26	14:30:00

Mean sea level	No days	MSL
January	31	6.03
February	25	6.08
March	31	5.944
April	30	5.869
May	31	6.004
June	30	6.07
July	26	6.06
August	31	5.997
September	30	5.971
October	31	6.004
November	30	5.979
December	31	6.025
	Sum	Avg
	357	6.003

Kinlochbervie Tide Gauge

Latitude: 58° 27' 24.3" N
Longitude: 05° 03' 00.8" W
Grid Reference: NC 2214 5609

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NC 2206 5613	Bolt S side harbour 19.5M SE angle of building
Aux1	NC 2210 5612	Rivet iceplant 7.45M from S angle of building
Aux2	NC 2210 5614	Rivet inside iceplant 3.5M E door
Aux3	NC 2203 5626	Rivet 12.3M SE N angle of building
Aux4	NC 2213 5621	Rivet 2.5M NW inside corner NE steps

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.50m below Ordnance Datum Newlyn (ODN)
TGZ = 7.213m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 226 On site to fit new compressor and carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
97	15 minutes	129-136,157-162	093-101

Statistics:

Surge maxima	Value	Day	Time
January	1.117	11	13:30:00
February	0.649	15	13:45:00
March	0.986	5	10:00:00
April	0.355	24	02:00:00
May	0.729	19	03:00:00
June	0.231	2	19:30:00
July	0.31	26	03:15:00
August	0.41	3	23:30:00
September	0.44	23	03:00:00
October	0.328	15	13:15:00
November	0.528	8	08:45:00
December	0.647	5	13:30:00

Surge minima	Value	Day	Time
January	-0.577	22	22:15:00
February	-0.357	2	20:00:00
March	-0.732	20	03:15:00
April	-0.307	1	00:45:00
May	-0.227	28	06:45:00
June	-0.199	5	05:15:00
July	-0.157	19	01:30:00
August	-0.397	21	13:45:00
September	-0.464	26	07:15:00
October	-0.274	18	02:15:00
November	-0.564	19	03:15:00
December	-0.623	10	09:00:00

Extreme maxima	Value	Day	Time
January	5.43	20	08:00:00
February	5.795	20	09:00:00
March	5.749	5	08:00:00
April	5.203	18	07:15:00
May	5.335	18	20:30:00
June	4.792	16	20:00:00
July	5.132	31	20:15:00
August	5.288	30	20:30:00
September	5.268	28	19:45:00
October	5.501	27	19:30:00
November	5.255	24	06:30:00
December	5.32	27	09:00:00

Extreme minima	Value	Day	Time
January	0.107	22	15:30:00
February	0.301	18	14:00:00
March	-0.412	20	14:15:00
April	0.035	17	13:15:00
May	0.589	17	13:30:00
June	0.748	16	02:00:00
July	0.661	16	02:30:00
August	0.188	31	03:00:00
September	-0.126	28	02:00:00
October	0.387	27	01:30:00
November	0.452	25	13:15:00
December	0.876	10	14:00:00

Mean sea level	No days	MSL
January	31	3.064
February	28	2.974
March	31	2.879
April	20	2.769
May	21	2.885
June	22	2.828
July	31	2.865
August	31	2.832
September	30	2.852
October	31	2.948
November	30	2.862
December	31	3.022
	Sum	Avg
	337	2.898

Leith Tide Gauge

Latitude: 55° 59' 23.4"N
Longitude: 03° 10' 54.1"W
Grid Reference: NT 2638 7806

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NT 2643 7797	OSBM Bolt SE end of TG pier 0.9m N angle of pier.
Aux1	NT 2648 7797	Rivet on top step SW side of road 1.6m S angle of building.
Aux2	NT 2653 7789	Rivet top step SW side of road 11.9M W angle of building

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.90m below Ordnance Datum Newlyn (ODN)
TGZ = 7.84mm below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 135 On site and replaced data logger.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	131-136	129

Statistics:

Surge maxima	Value	Day	Time
January	0.865	16	04:00:00
February	0.55	28	16:45:00
March	0.875	18	19:15:00
April	0.415	19	11:00:00
May	0.434	10	18:30:00
June	0.331	16	07:30:00
July	0.342	26	10:00:00
August	0.442	15	11:30:00
September	0.544	14	12:45:00
October	0.366	16	00:45:00
November	0.897	8	16:45:00
December	0.633	6	11:15:00

Surge minima	Value	Day	Time
January	-0.771	11	04:00:00
February	-0.325	3	20:15:00
March	-0.373	21	08:45:00
April	-0.444	1	09:15:00
May	-0.251	6	09:45:00
June	-0.187	2	06:45:00
July	-0.158	20	01:00:00
August	-0.293	24	15:15:00
September	-0.324	18	09:15:00
October	-0.279	31	01:00:00
November	-0.608	24	05:30:00
December	-0.447	4	14:00:00

Extreme maxima	Value	Day	Time
January	5.975	21	16:00:00
February	6.165	20	16:30:00
March	6.15	18	14:00:00
April	6.164	19	15:45:00
May	5.928	18	15:30:00
June	5.759	16	02:45:00
July	5.644	16	03:30:00
August	5.921	31	04:00:00
September	6.112	29	03:30:00
October	6.122	27	02:30:00
November	6.207	25	02:15:00
December	5.919	24	14:30:00

Extreme minima	Value	Day	Time
January	0.443	22	23:00:00
February	0.275	18	21:30:00
March	-0.214	20	21:45:00
April	0.064	18	21:00:00
May	0.521	18	09:30:00
June	0.818	17	10:00:00
July	0.63	31	09:30:00
August	0.226	30	09:45:00
September	0.074	28	09:15:00
October	0.317	26	08:15:00
November	0.292	24	07:15:00
December	0.581	25	21:45:00

Mean sea level	No days	MSL
January	31	3.281
February	28	3.23
March	31	3.169
April	30	3.065
May	23	3.177
June	30	3.206
July	31	3.236
August	31	3.185
September	30	3.211
October	31	3.228
November	30	3.216
December	31	3.25
	Sum	Avg
	357	3.205

Lerwick Tide Gauge

Latitude: 60° 09' 14.5" N
Longitude: 01° 08' 25.1" W
Grid Reference: HU 4783 4137

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	HU 4783 4129	OSBM bolt on breakwater wall.
Aux1	HU 4784 4125	Queen's Hotel 7.5m SW face south angle.
Aux2	HU 4777 4110	Lerwick Parish Church North face NW angle.

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.22m below Ordnance Datum Local (ODL)
TGZ = 4.57m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site:		
	Day 195	On site with divers to clear pressure points and remove blockage. Replaced wind vane and anemometer.
	Day 344	On site to replace compressor and carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	161,353-354	001-122,124-161,161-195,239-242

Statistics:

Surge maxima	Value	Day	Time
January			
February			
March			
April			
May	0.017	3	00:00:00
June			
July	0.265	26	18:15:00
August	0.287	4	11:15:00
September	0.304	16	10:15:00
October	0.288	16	09:30:00
November	0.309	8	09:45:00
December	0.435	5	23:30:00

Surge minima	Value	Day	Time
January			
February			
March			
April			
May	-0.08	3	14:15:00
June			
July	-0.121	20	04:45:00
August	-0.295	21	07:30:00
September	-0.285	27	08:15:00
October	-0.212	24	11:30:00
November	-0.346	26	19:00:00
December	-0.325	11	11:30:00

Extreme maxima	Value	Day	Time
January			
February			
March			
April			
May	1.923	3	23:30:00
June			
July	2.262	31	23:45:00
August	2.376	2	00:30:00
September	2.344	2	01:45:00
October	2.603	27	23:45:00
November	2.451	24	22:15:00
December	2.554	27	13:00:00

Extreme minima	Value	Day	Time
January			
February			
March			
April			
May	0.445	4	05:45:00
June			
July	0.309	16	06:15:00
August	0.173	31	06:30:00
September	-0.022	27	04:45:00
October	0.279	25	03:45:00
November	0.184	26	18:00:00
December	0.421	11	17:30:00

Mean sea level	No days	MSL
January		
February		
March		
April		
May		
June		
July	17	1.316
August	26	1.312
September	30	1.336
October	31	1.375
November	30	1.329
December	28	1.44
	Sum	Avg
	162	1.351

Liverpool Tide Gauge

Latitude: 53° 26' 58.8" N
Longitude: 03° 01' 05.3" W
Grid Reference: SJ 3248 9525

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SJ 3249 9525	NBM rivet NE face E angle base of building
Aux1	SJ 3250 9523	Rivet E side of quay above hinge SW dock gate
Aux2	SJ 3244 9538	Building wall E face SE angle
Aux3	SJ 3294 9558	Rivet concrete adjacent to building No 335

TGZ = Admiralty Chart Datum (ACD)
TGZ = 4.93m below Ordnance Datum Newlyn (ODN)
TGZ = 14.475m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site:		
	Day 044	On site to install oil-less compressor for evaluation.
	Day 054	On site checking software problem resulting in a 2 hour gap.
	Day 169	TGI on site to reset data logger and carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	054	079

Statistics:

Surge maxima	Value	Day	Time
January	2.244	18	14:00:00
February	1.278	28	17:15:00
March	1.267	6	05:15:00
April	0.366	25	12:30:00
May	0.68	19	07:15:00
June	0.532	28	19:30:00
July	0.757	5	22:45:00
August	0.617	14	20:30:00
September	0.704	24	14:30:00
October	0.631	28	07:15:00
November	0.647	8	11:45:00
December	1.1	2	12:15:00

Surge minima	Value	Day	Time
January	-0.576	2	18:15:00
February	-0.448	2	19:45:00
March	-0.717	20	07:45:00
April	-0.361	2	05:15:00
May	-0.363	27	16:30:00
June	-0.177	25	21:30:00
July	-0.148	19	20:00:00
August	-0.383	20	20:00:00
September	-0.427	26	18:00:00
October	-0.228	18	07:30:00
November	-0.528	19	05:00:00
December	-0.567	9	19:30:00

Extreme maxima	Value	Day	Time
January	10.06	20	11:45:00
February	10.506	20	12:45:00
March	10.139	21	12:30:00
April	10.058	19	12:00:00
May	9.894	18	12:00:00
June	9.484	17	00:00:00
July	9.517	6	02:45:00
August	10.059	31	00:30:00
September	10.211	29	00:00:00
October	10.298	27	23:30:00
November	9.85	24	22:30:00
December	9.781	26	00:00:00

Extreme minima	Value	Day	Time
January	0.499	22	20:30:00
February	0.539	20	20:15:00
March	0.051	20	06:30:00
April	0.248	17	17:45:00
May	0.869	17	18:00:00
June	1.34	15	05:15:00
July	1.277	31	06:30:00
August	0.62	30	07:00:00
September	0.291	28	06:30:00
October	0.617	27	06:00:00
November	0.952	26	19:00:00
December	1.181	24	18:00:00

Mean sea level	No days	MSL
January	31	5.502
February	28	5.391
March	29	5.307
April	30	5.155
May	31	5.307
June	30	5.341
July	31	5.386
August	31	5.314
September	30	5.324
October	31	5.365
November	30	5.373
December	31	5.44
	Sum	Avg
	363	5.35

Llandudno Tide Gauge

Latitude: 53° 19' 54.0" N
Longitude: 03° 49' 30.8" W
Grid Reference: SH 7855 8319

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SH 7834 8292	Rivet stone butt gate entrance
Aux1	SH 7827 8255	OSBM bolt concrete step SE side of slipway
Aux2	SH 7840 8243	OSBM bolt bottom concrete step
Aux3	SH 7864 8229	OSBM bolt concrete ramp 6.5M NW C slipway

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.85m below Ordnance Datum Newlyn (ODN)
TGZ = 12.558m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site:		
	Day 078	On site to move tubing on pier and purge system.
	Day 172	On site to replace the compressor battery and carry out general maintenance.
	Day 186	On site to replace battery charger.
	Day 207	On site to replace batteries.
	Day 213	On site to replace modem.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
94	15 minutes	192-213	073-079,158-172,181-186

Statistics:

Surge maxima	Value	Day	Time
January	1.079	11	05:45:00
February	0.799	15	17:45:00
March	1.027	6	04:00:00
April	0.264	24	01:45:00
May	0.454	30	19:45:00
June	0.409	28	20:15:00
July	0.428	5	22:45:00
August	0.487	14	22:45:00
September	0.386	24	16:30:00
October	0.42	28	06:15:00
November	0.363	30	22:30:00
December	0.646	5	03:45:00

Surge minima	Value	Day	Time
January	-0.749	2	19:00:00
February	-0.536	2	17:15:00
March	-0.806	20	12:45:00
April	-0.446	1	15:45:00
May	-0.482	27	14:15:00
June	-0.46	25	20:30:00
July	-0.157	10	06:45:00
August	-0.427	20	19:00:00
September	-0.47	25	18:45:00
October	-0.293	30	09:30:00
November	-0.711	9	00:45:00
December	-0.75	10	06:45:00

Extreme maxima	Value	Day	Time
January	8.077	20	11:15:00
February	8.611	20	12:15:00
March	8.216	21	12:00:00
April	8.149	19	11:30:00
May	8.033	18	11:30:00
June	7.201	2	23:30:00
July	7.468	6	02:15:00
August	8.21	31	00:00:00
September	8.326	28	23:30:00
October	8.432	27	23:15:00
November	7.917	24	10:00:00
December	7.915	24	10:15:00

Extreme minima	Value	Day	Time
January	-0.26	22	19:30:00
February	-0.055	20	19:15:00
March	-0.879	20	18:00:00
April	-0.346	17	16:45:00
May	0.222	17	17:15:00
June	0.971	4	06:45:00
July	0.978	6	09:00:00
August	-0.047	30	06:00:00
September	-0.308	28	05:30:00
October	0.021	27	05:15:00
November	0.238	25	04:45:00
December	0.463	24	17:15:00

Mean sea level	No days	MSL
January	31	4.116
February	28	4.119
March	23	4.002
April	30	3.881
May	31	4.013
June	13	4.04
July	3	4.003
August	29	4.044
September	30	4.029
October	31	4.112
November	30	4.049
December	31	4.135
	Sum	Avg
	310	4.045

Lowestoft Tide Gauge

Latitude: 52° 28' 23.1" N
Longitude: 01° 45' 00.9" E
Grid Reference: TM 5479 9274

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TM 5482 9273	Bolt on quay wall S side of pier.
Aux1	TM 5477 9272	Bolt on concrete jetty at SW corner of TG building
Aux2	TM 5478 9274	CM Harbour Masters Office SE angle S face

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.50m below Ordnance Datum Newlyn (ODN)
TGZ = 4.483m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site:

Day 143	On site to repair leaking compressor and carry out general maintenance.
Day 277	On site to change compressor.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	143,277

Statistics:

Surge maxima	Value	Day	Time
January	1.455	12	00:45:00
February	0.531	17	05:30:00
March	1.219	18	17:00:00
April	0.621	19	18:30:00
May	0.455	28	00:15:00
June	0.737	26	10:15:00
July	0.461	30	12:45:00
August	0.37	22	09:15:00
September	0.747	10	18:45:00
October	0.394	17	23:30:00
November	2.094	9	03:00:00
December	0.874	7	23:15:00

Surge minima	Value	Day	Time
January	-1.18	11	10:30:00
February	-0.506	11	07:00:00
March	-0.669	6	11:00:00
April	-0.413	21	07:15:00
May	-0.272	6	11:00:00
June	-0.192	2	17:15:00
July	-0.204	25	22:00:00
August	-0.265	15	02:45:00
September	-0.346	16	03:30:00
October	-0.39	28	10:00:00
November	-0.628	24	13:30:00
December	-0.66	4	21:45:00

Extreme maxima	Value	Day	Time
January	3.64	12	02:45:00
February	2.894	20	23:30:00
March	3.655	18	20:30:00
April	3.128	19	22:30:00
May	2.726	14	18:45:00
June	2.717	26	18:00:00
July	2.94	30	09:15:00
August	2.903	2	11:15:00
September	3.17	28	10:00:00
October	2.931	29	11:15:00
November	4.132	9	08:15:00
December	3.116	7	20:15:00

Extreme minima	Value	Day	Time
January	-0.217	11	09:30:00
February	0.252	19	04:45:00
March	0.011	5	04:30:00
April	0.135	19	04:30:00
May	0.324	18	04:15:00
June	0.507	18	18:15:00
July	0.364	17	17:45:00
August	0.257	3	18:45:00
September	0.336	27	16:00:00
October	0.267	26	15:30:00
November	-0.027	24	14:45:00
December	0.167	27	05:45:00

Mean sea level	No days	MSL
January	31	1.765
February	28	1.655
March	31	1.678
April	30	1.553
May	30	1.656
June	30	1.689
July	31	1.709
August	31	1.7
September	30	1.77
October	30	1.697
November	30	1.782
December	31	1.69
	Sum	Avg
	363	1.695

Milford Haven Tide Gauge

Latitude: 51° 42' 26.6" N
Longitude: 05° 03' 06.4" W
Grid Reference: SM 8924 0537

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SM 8921 0536	OSBM Bolt on wall W side of entrance to jetty
Aux1	SM 8918 0541	Fl Br G4977 office buildings. SW face NW angle.
Aux2	SM 9001 0601	OSBM bolt wall Victoria Road

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.71m below Ordnance Datum Newlyn (ODN)
TGZ = 16.734m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: Geodetic levelling performed on day 198.

T.G.I. visits to site:		
	Day 023	On site to carry out general maintenance.
	Day 074	On site to carry out general maintenance.
	Day 198	On site, replaced compressor and carried out leveling and general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	332-339

Statistics:

Surge maxima	Value	Day	Time
January	0.766	18	05:00:00
February	0.668	12	05:15:00
March	0.98	6	00:45:00
April	0.328	25	00:15:00
May	0.493	30	13:15:00
June	0.567	20	06:30:00
July	0.484	5	18:30:00
August	0.541	14	17:15:00
September	0.304	24	01:30:00
October	0.303	28	05:45:00
November	0.26	21	13:45:00
December	0.567	8	11:00:00

Surge minima	Value	Day	Time
January	-0.353	2	15:15:00
February	-0.224	2	10:45:00
March	-0.513	20	02:15:00
April	-0.206	16	19:30:00
May	-0.159	28	02:00:00
June	-0.166	25	16:15:00
July	-0.035	10	07:15:00
August	-0.272	21	12:00:00
September	-0.261	26	15:15:00
October	-0.158	30	11:45:00
November	-0.39	8	21:30:00
December	-0.398	10	01:15:00

Extreme maxima	Value	Day	Time
January	7.287	20	07:00:00
February	7.883	20	08:00:00
March	7.628	21	07:30:00
April	7.511	18	06:30:00
May	7.286	18	07:00:00
June	7.141	15	18:15:00
July	7.122	16	19:30:00
August	7.488	30	19:30:00
September	7.78	28	19:15:00
October	7.701	28	07:00:00
November	7.311	25	18:30:00
December	7.294	25	06:45:00

Extreme minima	Value	Day	Time
January	0.432	22	14:45:00
February	0.47	18	13:00:00
March	-0.365	20	13:15:00
April	0.11	18	12:45:00
May	0.614	17	12:30:00
June	1.178	16	00:30:00
July	0.983	31	01:00:00
August	0.302	31	02:00:00
September	0.152	28	00:45:00
October	0.443	27	00:30:00
November	0.604	25	00:00:00
December	0.898	26	14:00:00

Mean sea level	No days	MSL
January	31	3.948
February	28	4.02
March	31	3.833
April	30	3.777
May	31	3.889
June	30	3.961
July	31	3.947
August	31	3.864
September	30	3.85
October	31	3.93
November	26	3.878
December	26	3.93
	Sum	Avg
	356	3.902

Millport Tide Gauge

Latitude: 55° 44' 59.3" N
Longitude: 04° 54' 22.8" W
Grid Reference: NS 1769 5454

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NS 1757 5449	Fl Br G4602 Marine station
Aux1	NS 1772 5457	OSBM bolt rock SE side Rd 5M NE end wall
Aux2	NS 1769 5454	Rivet pier 0.8M prod SE face of TG building
Aux3	NS 1718 5451	No 45 Marine Parade NW angle N face

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.62m below Ordnance Datum Newlyn (ODN)
TGZ = 7.825m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site:

Day 130	On site and replaced modem.
Day 254	On site to change compressor and carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
87	15 minutes	053-059,073-089,108-125,192-197,199-204	None

Statistics:

Surge maxima	Value	Day	Time
January	1.3	11	08:15:00
February	0.931	15	15:30:00
March	1.108	6	00:30:00
April	0.019	9	16:00:00
May	0.673	19	03:15:00
June	0.404	20	14:00:00
July	0.432	26	05:45:00
August	0.415	3	23:45:00
September	0.373	23	03:15:00
October	0.458	28	00:30:00
November	0.318	17	14:15:00
December	0.68	8	18:45:00

Surge minima	Value	Day	Time
January	-0.558	22	07:15:00
February	-0.491	2	18:00:00
March	-0.443	31	13:45:00
April	-0.4	1	07:30:00
May	-0.381	28	07:00:00
June	-0.304	25	20:15:00
July	-0.189	10	06:30:00
August	-0.456	21	07:30:00
September	-0.452	26	21:45:00
October	-0.257	25	08:15:00
November	-0.574	8	23:00:00
December	-0.845	9	23:15:00

Extreme maxima	Value	Day	Time
January	4.298	18	11:15:00
February	4.012	20	14:15:00
March	4.109	6	01:45:00
April	3.237	4	13:15:00
May	3.994	19	01:45:00
June	3.653	18	02:00:00
July	3.665	17	01:30:00
August	3.786	15	01:15:00
September	3.665	2	03:15:00
October	4.071	28	01:00:00
November	3.87	28	14:30:00
December	4.134	28	15:00:00

Extreme minima	Value	Day	Time
January	-0.235	22	20:15:00
February	0.074	2	18:00:00
March	0.132	31	17:00:00
April	-0.186	17	17:30:00
May	0.084	15	16:15:00
June	0.335	10	13:15:00
July	0.262	31	06:30:00
August	-0.019	30	06:45:00
September	-0.14	28	06:15:00
October	0.149	27	05:45:00
November	0.015	23	03:45:00
December	0.199	10	18:00:00

Mean sea level	No days	MSL
January	31	2.147
February	20	2.05
March	12	2.136
April	16	1.753
May	26	1.969
June	30	1.947
July	17	2.014
August	31	1.914
September	30	1.919
October	31	2.033
November	30	1.957
December	31	2.09
	Sum	Avg
	305	1.994

Mumbles (West Glamorgan) Tide Gauge

Latitude: 51° 34' 12.0" N
Longitude: 03° 58' 31.7" W
Grid Reference: SS 6319 8753

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SS 6298 8743	OSBM bolt living rock S side of road
Aux1	SS 6317 8752	OSBM bolt lifeboat station Mumbles Pier
Aux2	SS 6284 8750	OSBM bolt concrete base bollard Lifeboat Cottages
Aux3	SS 6258 8760	Rivet SE side concrete chamber

TGZ = Admiralty Chart Datum (ACD)
TGZ = 5.00m below Ordnance Datum Newlyn (ODN)
TGZ = 13.821m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site:

Day 024	On site, both systems purged but may be sitting in soft silt which has drifted in recent storms. Divers may be required to clear the blockage.
Day 074	On site to purge system and reconnect mid-tide sensor.
Day 341	On site; purged system to clear blockage. System still blocked. Divers required.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	056,073-074	016-073,074-075,079-089,092-113,143-146,149-150,157,159-164,199-205,208-247,250-251,253-254,257-269,271-308,312-315,317-318,321-324,328-365

Statistics:

Surge maxima	Value	Day	Time
January	0.777	11	03:45:00
February			
March	0.244	18	01:45:00
April	0.269	25	00:00:00
May	0.469	30	14:45:00
June	0.452	20	07:15:00
July	0.482	5	19:15:00
August	0.167	5	10:30:00
September	0.173	29	04:30:00
October	0.194	25	17:30:00
November	0.157	21	14:45:00
December			

Surge minima	Value	Day	Time
January	-0.527	2	15:00:00
February			
March	-0.618	20	02:45:00
April	-0.382	1	09:45:00
May	-0.346	21	14:00:00
June	-0.307	25	17:00:00
July	-0.2	10	22:00:00
August	-0.04	1	06:00:00
September	-0.439	8	20:45:00
October	-0.344	19	01:00:00
November	-0.469	14	23:30:00
December			

Exteme maxima	Value	Day	Time
January	9.399	5	07:15:00
February			
March	10.266	21	07:45:00
April	10.082	18	06:30:00
May	9.748	18	07:00:00
June	9.513	15	18:15:00
July	9.498	31	19:15:00
August	9.717	1	20:00:00
September	10.091	27	18:30:00
October	10.106	25	17:30:00
November	9.51	23	17:00:00
December			

Extreme minima	Value	Day	Time
January	1.425	6	01:30:00
February			
March	-0.172	20	00:45:00
April	0.971	3	00:15:00
May	0.768	17	12:15:00
June	1.423	16	12:45:00
July	1.325	16	13:15:00
August	3.592	1	04:00:00
September	0.222	28	00:45:00
October	0.662	25	23:30:00
November	0.841	25	00:00:00
December			

Mean sea level	No days	MSL
January	15	5.328
February		
March	4	5.001
April	8	5.091
May	27	5.171
June	21	5.276
July	17	5.238
August		
September	5	5.092
October	2	5.186
November	9	5.149
December		
	Sum	Avg
	108	5.17

Newlyn Tide Gauge

Latitude: 50° 06' 10.8" N
Longitude: 05° 32' 33.9" W
Grid Reference: SW 4676 2856

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SW 4677 2856	Brass bolt in the floor of the recorder hut.
Aux1	SW 4673 2851	Flush Bracket 1565 on wall S pier NW face 17.8m SW
Aux2	SW 4659 2841	F Bracket 1520 wall SE side of S Pier Rd NW face

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.05m below Ordnance Datum Newlyn (ODN)
TGZ = 7.801m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Ordnance Datum Newlyn (ODN) is based on mean sea level at Newlyn between 1915 and 1921 (inclusive).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site:		
	Day 212	On site to reset data logger and install new software for float gauge. Calibration of float gauge and general maintenance.
	Day 311	On site to survey for tsunami gauge. Flow rate adjusted and Channel 2 now OK. New compressor fitted.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
94	15 minutes	129,192-212	217-311

Statistics:

Surge maxima	Value	Day	Time
January	0.353	17	01:15:00
February	0.541	7	23:15:00
March	0.515	5	22:45:00
April	0.236	24	20:30:00
May	0.363	30	01:30:00
June	0.382	18	04:30:00
July	0.299	1	01:45:00
August	0.157	5	07:15:00
September			
October			
November	0.208	21	12:15:00
December	0.324	8	08:45:00

Surge minima	Value	Day	Time
January	-0.318	2	12:30:00
February	-0.197	1	19:45:00
March	-0.399	19	18:15:00
April	-0.181	11	00:30:00
May	-0.156	23	15:00:00
June	-0.074	4	10:30:00
July	-0.103	10	00:30:00
August	-0.074	3	08:30:00
September			
October			
November	-0.303	8	19:00:00
December	-0.361	10	08:00:00

Extreme maxima	Value	Day	Time
January	5.762	22	06:45:00
February	6.192	20	06:15:00
March	5.894	21	06:00:00
April	5.823	18	04:45:00
May	5.604	17	17:00:00
June	5.726	17	18:15:00
July	5.624	31	17:45:00
August	5.676	1	18:15:00
September			
October			
November	5.691	26	05:15:00
December	5.799	25	05:00:00

Extreme minima	Value	Day	Time
January	0.68	23	14:15:00
February	0.583	20	13:15:00
March	0.002	20	12:00:00
April	0.302	17	23:15:00
May	0.608	17	23:45:00
June	1.07	17	00:15:00
July	0.956	31	23:45:00
August	0.742	3	01:45:00
September			
October			
November	0.647	25	11:15:00
December	0.779	26	12:45:00

Mean sea level	No days	MSL
January	31	3.194
February	28	3.307
March	31	3.144
April	30	3.114
May	31	3.204
June	30	3.286
July	9	3.214
August	4	3.173
September		
October		
November	22	3.235
December	31	3.227
	Sum	Avg
	247	3.21

Newhaven (Sussex) Tide Gauge

Latitude: 50° 46' 54.6" N
Longitude: 00° 03' 25.3" E
Grid Reference: TQ 4511 0004

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TQ 4510 0003	Bolt concrete 7.4M SW of SW angle of tower
Aux1	TQ 4495 0001	OSBM bolt concrete sea wall 154.3M SW of tower
Aux2	TQ 4503 0008	Steel ball Gun mount

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.52m below Ordnance Datum Newlyn (ODN)
TGZ = 8.783m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site:		
	Day 045	TGI on site to investigate power failure. Rats had gnawed through battery cable, cable replaced
	Day 072	On site to check OTT gauge for port control. Whilst there, a software problem was encountered with the DR2 gauge resulting in loss of data in memory store.
	Day 206	On site, replaced compressor and carried out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	038-044	None

Statistics:

Surge maxima	Value	Day	Time
January	0.913	18	08:15:00
February	0.516	28	19:30:00
March	0.662	6	23:30:00
April	0.259	19	23:15:00
May	0.407	11	02:30:00
June	0.417	26	15:45:00
July	0.391	26	15:30:00
August	0.361	15	11:15:00
September	0.441	24	07:00:00
October	0.241	16	23:45:00
November	0.774	9	04:30:00
December	0.611	9	14:00:00

Surge minima	Value	Day	Time
January	-0.563	23	04:15:00
February	-0.396	3	17:00:00
March	-0.429	6	13:00:00
April	-0.306	1	08:30:00
May	-0.21	23	22:45:00
June	-0.144	2	15:15:00
July	-0.229	15	05:45:00
August	-0.261	26	00:30:00
September	-0.264	12	04:15:00
October	-0.313	31	09:15:00
November	-0.426	7	04:15:00
December	-0.446	18	02:00:00

Extreme maxima	Value	Day	Time
January	7.057	21	00:45:00
February	7.224	20	00:45:00
March	7.386	18	22:45:00
April	7.222	20	00:30:00
May	6.933	16	22:45:00
June	6.767	15	23:15:00
July	6.621	16	00:00:00
August	6.954	31	13:00:00
September	7.299	28	12:00:00
October	7.152	27	11:30:00
November	7.324	25	11:15:00
December	6.881	24	23:30:00

Extreme minima	Value	Day	Time
January	0.53	22	20:00:00
February	0.394	20	19:30:00
March	0.217	21	19:00:00
April	0.213	18	18:00:00
May	0.49	18	06:00:00
June	0.908	17	06:30:00
July	0.729	15	05:45:00
August	0.419	30	06:30:00
September	0.484	28	06:00:00
October	0.454	27	18:00:00
November	0.461	24	16:45:00
December	0.612	25	18:15:00

Mean sea level	No days	MSL
January	31	3.702
February	19	3.679
March	31	3.616
April	30	3.512
May	31	3.638
June	30	3.687
July	31	3.687
August	31	3.648
September	30	3.65
October	31	3.641
November	30	3.666
December	31	3.658
	Sum	Avg
	356	3.649

Newport (Wales) Tide Gauge

Latitude: 51° 33' 00.0" N
Longitude: 02° 59' 14.6" W
Grid Reference: ST 3163 8392

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	ST 3163 8392	Brass bolt adjacent to TG building
Aux1	ST 3160 8414	Pin in quay west side of South Lock
Aux2	ST 3160 8426	Pin in quay east side of South Lock
Aux3	ST 3147 8427	Pin in quay south west corner of South Dock

TGZ = Admiralty Chart Datum (ACD)
TGZ = 5.81m below Ordnance Datum Newlyn (ODN)
TGZ = 14.525m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: Geodetic levelling of temporary gauge performed on day 025 and 078.
Geodetic levelling of permanent gauge performed on day 106.

T.G.I. visits to site:

Day 025	On site to find that the wooden fendering had collapsed destroying the pressure points in the process. Temporary pressure point set up in the stilling well. This is in the Channel 1 slot so no statistics will be available for this temporary gauge. It has been levelled to within a couple of mms but TGI will return (on a spring tide) in order to accurately level in gauge from bench marks. Compressor also changed.
Day 078	On site to level in gauge from benchmark. It had been reading 19mm high since 25/01(025), this was rectified. TGI also encountered the same DR2 software fault as found at Newhaven resulting in all data in store being lost. This is now being investigated generally.
Day 106	On site to reinstall permanent gauge plus mid-tide sensor. All levelling as before.
Day 344	On site to fit new modem.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
92	15 minutes	001-025,045-050,106	025-045,050-106,344-365

Statistics:

Surge maxima	Value	Day	Time
January			
February			
March			
April	0.625	18	14:15:00
May	1.121	9	18:00:00
June	0.923	29	01:15:00
July	1.068	5	17:45:00
August	0.956	14	18:45:00
September	0.898	20	06:15:00
October	0.805	15	16:30:00
November	0.763	30	19:15:00
December	1.416	8	13:45:00

Surge minima	Value	Day	Time
January			
February			
March			
April	-0.737	18	15:15:00
May	-0.653	14	11:45:00
June	-0.487	13	11:45:00
July	-0.398	19	16:30:00
August	-0.591	21	15:45:00
September	-0.865	28	03:30:00
October	-0.856	28	15:45:00
November	-0.841	23	12:30:00
December	-0.489	10	03:45:00

Extreme maxima	Value	Day	Time
January			
February			
March			
April	13.046	18	07:30:00
May	12.57	17	07:00:00
June	12.141	15	19:00:00
July	12.142	31	20:15:00
August	12.939	30	20:30:00
September	13.306	28	20:15:00
October	13.109	27	19:45:00
November	12.598	25	19:30:00
December	11.504	9	06:45:00

Extreme minima	Value	Day	Time
January			
February			
March			
April	0.142	18	02:45:00
May	0.305	17	14:15:00
June	0.788	17	02:45:00
July	0.865	15	02:00:00
August	0.309	31	16:15:00
September	0.205	28	03:15:00
October	0.207	26	01:45:00
November	0.323	26	02:45:00
December	1.308	10	01:45:00

Mean sea level	No days	MSL
January		
February		
March		
April	13	6.091
May	31	6.17
June	30	6.216
July	31	6.243
August	31	6.169
September	30	6.168
October	31	6.179
November	30	6.157
December	8	6.459
	Sum	Avg
	235	6.206

North Shields (Tyne and Wear) Tide Gauge

Latitude: 55° 00' 26.7" N
Longitude: 01° 26' 23.4" W
Grid Reference: NZ 3593 6824

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NZ 3592 6823	Bolt adjacent to tide gauge building
Aux1	NZ 3626 6842	PA Bolt low lighthouse W face SW angle
Aux2	NZ 3630 6895	PA Bolt butt N side railway

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.60m below Ordnance Datum Newlyn (ODN)
TGZ = 6.754m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: There were no visits to site in 2007.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	None

Statistics:

Surge maxima	Value	Day	Time
January	0.95	11	23:15:00
February	0.544	17	00:45:00
March	0.87	18	18:15:00
April	0.402	19	13:45:00
May	0.458	6	19:45:00
June	0.358	26	19:30:00
July	0.308	1	16:30:00
August	0.403	15	13:30:00
September	0.52	14	14:30:00
October	0.337	16	02:30:00
November	1.15	8	19:00:00
December	0.566	6	09:15:00

Surge minima	Value	Day	Time
January	-0.785	11	05:00:00
February	-0.291	27	20:15:00
March	-0.413	4	23:15:00
April	-0.333	1	11:00:00
May	-0.175	5	21:45:00
June	-0.184	2	10:30:00
July	-0.116	31	12:45:00
August	-0.266	25	16:15:00
September	-0.286	4	15:45:00
October	-0.241	31	03:00:00
November	-0.566	24	06:30:00
December	-0.41	4	15:30:00

Extreme maxima	Value	Day	Time
January	5.532	4	15:45:00
February	5.693	20	17:15:00
March	5.849	18	14:30:00
April	5.723	19	16:30:00
May	5.342	18	16:15:00
June	5.231	15	15:30:00
July	5.177	16	04:15:00
August	5.524	31	04:45:00
September	5.627	29	04:30:00
October	5.675	27	03:15:00
November	5.864	25	03:00:00
December	5.449	27	17:45:00

Extreme minima	Value	Day	Time
January	0.469	23	00:15:00
February	0.199	18	22:30:00
March	0	20	23:00:00
April	0.052	18	22:30:00
May	0.456	15	20:30:00
June	0.741	18	12:00:00
July	0.543	31	10:30:00
August	0.264	29	10:15:00
September	0.145	28	10:15:00
October	0.242	26	09:15:00
November	0.272	24	08:45:00
December	0.519	26	23:30:00

Mean sea level	No days	MSL
January	31	3.095
February	28	2.981
March	31	2.955
April	30	2.825
May	31	2.937
June	30	2.979
July	31	3.023
August	31	2.961
September	30	2.998
October	31	2.987
November	30	3.014
December	31	3.025
	Sum	Avg
	365	2.982

Portpatrick (Scotland) Tide Gauge

Latitude: 54° 50' 33.0" N
Longitude: 05° 07' 12.1" W
Grid Reference: NW 9976 5421

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NW 9976 5421	Bolt Harbour wall 13.84M NE angle of building
Aux1	NW 9977 5411	Rivet E side of Jetty wall 16.6M SE angle Lifeboat HQ
Aux2	NW 9995 5412	Rivet S angle No 53 Main St
Aux3	NX 0006 5423	Church hall SE side of Rd W angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.80m below Ordnance Datum Newlyn (ODN)
TGZ = 6.827m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 253 On site to replace compressor and carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	192-193,282	022,078-080,106-108,270-271

Statistics:

Surge maxima	Value	Day	Time
January	1.153	11	08:45:00
February	0.987	15	16:30:00
March	1.107	6	01:45:00
April	0.32	25	06:15:00
May	0.558	19	03:30:00
June	0.414	20	13:00:00
July	0.477	26	04:30:00
August	0.414	14	23:15:00
September	0.341	23	03:15:00
October	0.364	28	02:45:00
November	0.305	30	18:00:00
December	0.629	5	01:30:00

Surge minima	Value	Day	Time
January	-0.504	2	19:45:00
February	-0.412	2	19:15:00
March	-0.65	20	11:15:00
April	-0.292	1	16:15:00
May	-0.307	28	06:45:00
June	-0.193	25	19:30:00
July	-0.118	10	06:15:00
August	-0.356	21	08:45:00
September	-0.366	26	21:30:00
October	-0.209	30	10:15:00
November	-0.48	8	23:30:00
December	-0.697	9	22:30:00

Extreme maxima	Value	Day	Time
January	4.651	18	10:45:00
February	4.553	20	13:15:00
March	4.542	6	01:00:00
April	4.056	19	12:45:00
May	4.381	19	00:45:00
June	4.148	18	01:15:00
July	4.157	17	01:00:00
August	4.289	15	00:30:00
September	4.201	30	01:15:00
October	4.485	28	00:15:00
November	4.198	28	14:00:00
December	4.493	28	14:30:00

Extreme minima	Value	Day	Time
January	-0.154	22	20:00:00
February	0.15	18	18:15:00
March	-0.559	19	17:45:00
April	-0.135	17	17:30:00
May	0.199	15	16:15:00
June	0.485	16	06:00:00
July	0.37	31	06:15:00
August	0.035	30	06:30:00
September	-0.08	28	06:00:00
October	0.182	27	05:30:00
November	0.152	23	03:45:00
December	0.33	10	18:00:00

Mean sea level	No days	MSL
January	31	2.32
February	28	2.289
March	31	2.125
April	30	2.024
May	31	2.165
June	30	2.193
July	27	2.233
August	31	2.135
September	30	2.123
October	31	2.221
November	30	2.155
December	31	2.273
	Sum	Avg
	361	2.188

Portrush (Northern Ireland) Tide Gauge

Latitude: 55° 12' 24.4" N
Longitude: 06° 39' 24.6" W
Grid Reference: NW 0416 9952

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	Sheet 6 C 8556 4079	Pin RNLI slipway
Aux1	Sheet 6 C 8567 4070	Cut mark wall Kerr St
Aux2	Sheet 6 C 8580 4055	Cut mark wall Kerr St

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.24m below Ordnance Datum Belfast (ODB)
TGZ = 2.844m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 339 On site to carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	None

Statistics:

Surge maxima	Value	Day	Time
January	0.995	11	09:30:00
February	0.627	27	22:00:00
March	0.981	5	04:00:00
April	0.293	23	23:15:00
May	0.611	19	01:45:00
June	0.278	30	18:30:00
July	0.333	26	03:45:00
August	0.326	4	00:30:00
September	0.297	24	09:30:00
October	0.273	28	02:15:00
November	0.23	30	15:30:00
December	0.538	8	17:30:00

Surge minima	Value	Day	Time
January	-0.532	22	15:00:00
February	-0.511	2	18:00:00
March	-0.605	20	10:30:00
April	-0.33	1	05:00:00
May	-0.257	28	05:15:00
June	-0.168	4	13:45:00
July	-0.136	10	15:30:00
August	-0.374	21	06:45:00
September	-0.35	26	06:45:00
October	-0.265	30	08:15:00
November	-0.456	19	14:45:00
December	-0.693	10	07:30:00

Extreme maxima	Value	Day	Time
January	2.914	20	07:15:00
February	2.955	20	08:00:00
March	2.759	5	07:00:00
April	2.295	19	07:30:00
May	2.558	18	19:30:00
June	2.27	30	18:45:00
July	2.428	31	19:30:00
August	2.439	3	21:30:00
September	2.431	28	19:15:00
October	2.67	27	19:00:00
November	2.459	24	18:00:00
December	2.555	27	08:30:00

Extreme minima	Value	Day	Time
January	0.072	22	15:00:00
February	0.131	3	00:45:00
March	-0.444	20	00:30:00
April	-0.105	18	00:15:00
May	0.239	15	23:15:00
June	0.488	14	11:45:00
July	0.381	30	13:00:00
August	0.046	30	13:30:00
September	-0.042	27	12:15:00
October	0.29	25	11:00:00
November	0.246	23	10:45:00
December	0.234	10	00:30:00

Mean sea level	No days	MSL
January	31	1.399
February	28	1.359
March	31	1.225
April	30	1.11
May	31	1.252
June	30	1.259
July	31	1.3
August	31	1.226
September	30	1.218
October	31	1.307
November	30	1.243
December	31	1.354
	Sum	Avg
	365	1.271

Portsmouth (Hampshire) Tide Gauge

Latitude: 50° 48' 08.1" N
Longitude: 01° 06' 40.5" W
Grid Reference: SU 6273 0067

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SU 6269 0053	Bolt in concrete jetty TG building S angle
Aux1	SU 6330 9996	GP N side entrance to HMS Vernon
Aux2	SU 6274 0039	Building SW face 0.6M S angle
Aux3	SU 6283 0050	Building SW side of Main Rd NE face N angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.73m below Ordnance Datum Newlyn (ODN)
TGZ = 6.007m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 207 On site for software upgrade and general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	207	None

Statistics:

Surge maxima	Value	Day	Time
January	0.79	18	09:45:00
February	0.866	12	10:30:00
March	0.788	6	04:45:00
April	0.307	20	02:45:00
May	0.364	10	23:15:00
June	0.392	26	15:45:00
July	0.411	26	15:15:00
August	0.424	14	12:30:00
September	0.319	24	04:45:00
October	0.29	16	23:15:00
November	0.674	9	06:30:00
December	0.583	2	10:45:00

Surge minima	Value	Day	Time
January	-0.653	23	06:30:00
February	-0.369	3	18:00:00
March	-0.373	6	14:00:00
April	-0.327	4	05:00:00
May	-0.223	10	05:15:00
June	-0.157	2	17:00:00
July	-0.127	11	04:15:00
August	-0.283	26	03:00:00
September	-0.28	18	22:15:00
October	-0.292	31	07:15:00
November	-0.541	7	03:15:00
December	-0.388	17	21:00:00

Extreme maxima	Value	Day	Time
January	5.147	21	00:45:00
February	5.189	20	01:00:00
March	5.295	18	23:00:00
April	5.077	20	01:00:00
May	4.934	16	23:00:00
June	4.93	15	23:30:00
July	4.757	16	00:15:00
August	4.94	14	12:15:00
September	5.102	29	12:45:00
October	5.053	27	11:45:00
November	5.213	25	11:15:00
December	5.017	24	23:45:00

Extreme minima	Value	Day	Time
January	0.316	23	07:15:00
February	0.41	20	18:45:00
March	0.101	21	18:15:00
April	0.201	18	17:15:00
May	0.516	18	05:15:00
June	0.91	17	05:45:00
July	0.761	31	05:15:00
August	0.318	30	05:30:00
September	0.315	28	05:15:00
October	0.473	27	04:45:00
November	0.531	24	16:00:00
December	0.636	25	17:30:00

Mean sea level	No days	MSL
January	31	2.919
February	28	2.965
March	31	2.839
April	30	2.75
May	31	2.874
June	30	2.933
July	31	2.924
August	31	2.882
September	30	2.874
October	31	2.883
November	30	2.887
December	31	2.892
	Sum	Avg
	365	2.885

Sheerness (Kent) Tide Gauge

Latitude: 51° 26' 44.3" N
Longitude: 00° 44' 36.1" E
Grid Reference: TQ 9074 7542

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TQ 9080 7549	Flush bracket 11859, Garrison Fort, S angle, SW building.
Aux1	TQ 9133 7532	Flush bracket G.4790, on house, NW angle, N face
Aux2	TQ 9115 7533	Wall on SW side of road, NE angle.
Aux3	TQ 9147 7516	Bolt Ch. Dis, SW side of road, E face, NE angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.90m below Ordnance Datum Newlyn (ODN)
TGZ = 7.532m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site:		
	Day 205	On site to clear the blockage on Channel 2. Purged system. Replaced compressor and carried out general maintenance.
	Day 297	On site to investigate radio interference fault. New earth straps fitted.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
94	15 minutes	199-205,282-297	183-199,299-365

Statistics:

Surge maxima	Value	Day	Time
January	1.68	12	02:45:00
February	0.627	17	08:30:00
March	1.232	18	21:45:00
April	0.775	19	21:30:00
May	0.546	11	04:15:00
June	0.862	26	18:15:00
July	0.554	30	08:30:00
August	0.721	22	13:00:00
September	1.093	10	21:00:00
October	0.356	30	11:00:00
November	2.369	9	07:45:00
December	0.549	1	16:15:00

Surge minima	Value	Day	Time
January	-2.128	11	13:45:00
February	-0.887	27	17:45:00
March	-1.178	6	10:15:00
April	-0.427	21	10:45:00
May	-0.395	6	06:30:00
June	-0.356	29	02:45:00
July	-0.464	26	17:45:00
August	-0.469	14	21:30:00
September	-0.517	20	06:45:00
October	-0.644	28	10:45:00
November	-0.628	19	15:30:00
December	-0.117	1	04:45:00

Extreme maxima	Value	Day	Time
January	6.547	22	15:00:00
February	6.167	21	02:45:00
March	6.564	20	13:30:00
April	6.356	20	02:00:00
May	6.013	17	12:45:00
June	5.991	16	00:45:00
July	5.932	31	01:15:00
August	6.058	31	14:30:00
September	6.44	28	13:15:00
October	6.241	29	14:15:00
November	6.636	25	12:30:00
December	5.423	1	17:15:00

Extreme minima	Value	Day	Time
January	-0.286	11	12:30:00
February	0.281	20	08:45:00
March	0.003	18	06:15:00
April	0.09	19	07:45:00
May	0.209	18	19:45:00
June	0.606	16	19:45:00
July	0.445	31	20:00:00
August	0.315	3	22:00:00
September	0.333	28	19:45:00
October	0.53	25	18:00:00
November	0.967	5	16:15:00
December	3.649	1	15:00:00

Mean sea level	No days	MSL
January	31	3.053
February	28	3.027
March	31	3.045
April	30	2.988
May	31	3.045
June	30	3.091
July	8	3.108
August	31	3.106
September	30	3.159
October	7	3.125
November		
December		
	Sum	Avg
	257	3.075

St. Mary's (Isles of Scilly) Tide Gauge

Latitude: 49° 55' 04.2" N
Longitude: 06° 19' 01.7" W
Grid Reference: SV 9021 1090

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	N/A	Bolt by VTS
Aux1	N/A	Bolt by VTS 2
Aux2	N/A	Bolt by top of steps
Aux3	N/A	Bolt by top of steps
Aux4	SV 9028 1097	Point above pressure points
Aux5	SV 9014 1071	Cut Mark east angle Mermaid Inn
Aux6	SV 9007 1065	Cut Mark Guard House top of Garrison Hill
VTS	SV 9023 1091	Tide staff 7.210 metre mark
VTS2	N/A	Tide staff 7.245 metre mark

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.91m below Ordnance Datum Local (ODL)
TGZ = 7.425m below TGBM
TGZ = 7.399m below Aux 1
TGZ = 6.776m below Aux 2

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 213 On site for software upgrade, system purge and carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	213	001-004,041,043,343,360-363

Statistics:

Surge maxima	Value	Day	Time
January	0.309	18	02:00:00
February	0.436	12	04:30:00
March	0.421	4	09:00:00
April	0.162	24	22:15:00
May	0.327	30	02:00:00
June	0.326	20	04:45:00
July	0.324	22	21:30:00
August	0.319	14	15:15:00
September	0.127	24	00:15:00
October	0.08	16	15:45:00
November	0.195	21	12:30:00
December	0.251	2	07:00:00

Surge minima	Value	Day	Time
January	-0.268	28	12:30:00
February	-0.256	1	21:45:00
March	-0.329	19	22:15:00
April	-0.226	17	18:45:00
May	-0.164	6	11:45:00
June	-0.105	4	11:00:00
July	-0.074	9	12:15:00
August	-0.222	21	11:15:00
September	-0.241	7	19:45:00
October	-0.227	31	03:00:00
November	-0.324	8	20:45:00
December	-0.32	10	07:30:00

Extreme maxima	Value	Day	Time
January	5.879	22	06:45:00
February	6.38	20	06:30:00
March	6.045	21	06:15:00
April	5.963	18	05:00:00
May	5.747	18	17:45:00
June	5.804	17	18:15:00
July	5.739	16	18:00:00
August	5.959	30	18:00:00
September	6.205	28	17:30:00
October	6.052	26	16:30:00
November	5.778	26	05:15:00
December	5.845	25	05:15:00

Extreme minima	Value	Day	Time
January	0.574	22	13:15:00
February	0.438	18	11:30:00
March	-0.113	20	11:45:00
April	0.159	18	11:15:00
May	0.524	17	23:15:00
June	0.988	17	00:15:00
July	0.777	31	23:45:00
August	0.306	31	00:30:00
September	0.229	27	23:30:00
October	0.387	26	23:00:00
November	0.519	25	11:00:00
December	0.708	26	12:45:00

Mean sea level	No days	MSL
January	27	3.188
February	27	3.273
March	31	3.113
April	30	3.076
May	31	3.17
June	30	3.246
July	30	3.22
August	30	3.144
September	30	3.125
October	31	3.188
November	30	3.149
December	23	3.183
	Sum	Avg
	350	3.173

Stornoway (Hebrides) Tide Gauge

Latitude: 58° 12' 28.0" N
Longitude: 06° 23' 20.0" W
Grid Reference: NB 4229 3273

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NB 4228 3264	OSBM bolt E side of No 2 wharf
Aux1	NB 4215 3271	OSBM bolt STS NE angle King Edwards Wharf
Aux2	NB 4212 3275	Amity House E side of Espl Rd N face NW angle
Aux3	NB 4223 3280	BK S side Worth Beach NW angle N face

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.71m below Ordnance Datum Local (ODL)
TGZ = 6.368m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 253 TGI on site to replace compressor and carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	353-357	210-235,253-256

Statistics:

Surge maxima	Value	Day	Time
January	0.804	11	13:30:00
February	0.563	16	13:00:00
March	0.792	5	09:30:00
April	0.309	23	21:00:00
May	0.657	19	03:30:00
June	0.269	2	20:00:00
July	0.31	26	04:00:00
August	0.059	31	00:15:00
September	0.424	23	01:15:00
October	0.357	15	13:30:00
November	0.41	8	09:30:00
December	0.524	5	12:45:00

Surge minima	Value	Day	Time
January	-0.497	22	23:00:00
February	-0.275	3	11:30:00
March	-0.665	20	03:00:00
April	-0.328	1	01:45:00
May	-0.165	28	06:00:00
June	-0.15	5	05:15:00
July	-0.123	19	01:00:00
August	-0.188	23	21:30:00
September	-0.377	26	07:30:00
October	-0.195	18	02:00:00
November	-0.411	19	03:45:00
December	-0.482	10	08:30:00

Extreme maxima	Value	Day	Time
January	5.289	20	07:45:00
February	5.747	20	08:30:00
March	5.419	5	07:45:00
April	5.18	18	06:45:00
May	5.234	18	20:00:00
June	4.829	16	19:45:00
July	4.873	2	20:15:00
August	5.332	30	19:45:00
September	5.332	28	19:30:00
October	5.491	27	19:15:00
November	5.216	24	18:00:00
December	5.201	27	08:30:00

Extreme minima	Value	Day	Time
January	0.168	22	15:30:00
February	0.35	18	13:30:00
March	-0.192	20	13:30:00
April	0.034	17	12:45:00
May	0.587	16	12:30:00
June	0.849	16	01:45:00
July	0.752	16	02:15:00
August	0.275	31	02:45:00
September	0.003	28	01:30:00
October	0.431	27	01:00:00
November	0.527	26	01:30:00
December	0.996	25	14:00:00

Mean sea level	No days	MSL
January	31	3.047
February	28	2.995
March	31	2.883
April	30	2.751
May	31	2.881
June	30	2.855
July	28	2.915
August	8	2.804
September	25	2.904
October	31	2.986
November	30	2.9
December	24	3.074
	Sum	Avg
	327	2.916

Tobermory (Mull) Tide Gauge

Latitude: 56° 37' 23.2"
N Longitude: 06° 03' 51.2" W
Grid Reference: NM 5079 5531

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NM 5069 5530	F bracket G5186 on SW angle of Royal bldg
Aux2	NM 5077 5529	NBM rivet in sea wall of Mishnish Pier

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.39m below Ordnance Datum Newlyn (ODN)
TGZ = Chart Datum = 6.856m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 026 TGI on site to replace compressor and carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
95	15 minutes	011-015,192-202,300-301,338-340	None

Statistics:

Surge maxima	Value	Day	Time
January	1.104	11	10:45:00
February	0.762	27	22:00:00
March	1.076	5	02:15:00
April	0.34	23	22:45:00
May	0.653	19	02:15:00
June	0.252	30	20:00:00
July	0.351	26	02:30:00
August	0.401	3	23:15:00
September	0.384	23	01:45:00
October	0.266	15	10:15:00
November	0.273	24	02:15:00
December	0.583	27	03:30:00

Surge minima	Value	Day	Time
January	-0.485	22	16:00:00
February	-0.403	3	01:30:00
March	-0.677	19	18:30:00
April	-0.326	1	00:30:00
May	-0.28	28	05:45:00
June	-0.22	25	21:00:00
July	-0.132	10	23:00:00
August	-0.39	21	05:30:00
September	-0.378	25	23:15:00
October	-0.234	30	08:00:00
November	-0.439	9	06:00:00
December	-0.689	10	07:30:00

Extreme maxima	Value	Day	Time
January	5.191	20	07:00:00
February	5.53	20	07:45:00
March	5.395	5	06:15:00
April	4.892	19	06:45:00
May	5.097	18	19:00:00
June	4.553	17	19:15:00
July	4.818	31	19:00:00
August	4.929	30	19:15:00
September	5.011	28	18:45:00
October	5.088	26	17:45:00
November	4.881	24	17:15:00
December	4.987	27	07:45:00

Extreme minima	Value	Day	Time
January	0.346	22	14:30:00
February	0.482	21	02:30:00
March	-0.361	20	00:30:00
April	0.113	18	00:15:00
May	0.625	15	23:00:00
June	0.89	16	12:45:00
July	0.846	31	13:00:00
August	0.306	30	13:15:00
September	0.174	28	00:30:00
October	0.525	27	00:00:00
November	0.549	25	12:15:00
December	0.822	10	00:00:00

Mean sea level	No days	MSL
January	25	2.82
February	28	2.83
March	31	2.693
April	30	2.574
May	31	2.709
June	30	2.702
July	18	2.78
August	31	2.677
September	30	2.676
October	27	2.765
November	30	2.692
December	28	2.805
	Sum	Avg
	339	2.727

Ullapool (Scotland) Tide Gauge

Latitude: 57° 53' 42.9" N
Longitude: 05° 09' 28.8" W
Grid Reference: NH 1292 9391

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NH 1288 9391	OSBM Pier NW Para 8.2M NE steps
Aux1	NH 1303 9425	PA bolt Church SW side of road NE face N angle
Aux2	NH 1288 9398	No 8 Shore Street SE face 0.3M S angle
Aux3	NH 1253 9376	Rivet Fnd No 21 West Shore Street S angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.75m below Ordnance Datum Newlyn (ODN)
TGZ = 7.155m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 226 TGI on site to replace compressor and fit new potentiometer to the float gauge. Software modified to prevent system from crashing and as a result there is no mid tide.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	192-195,226,311	None

Statistics:

Surge maxima	Value	Day	Time
January	1.129	11	14:00:00
February	0.621	28	06:30:00
March	0.884	5	03:30:00
April	0.368	23	20:45:00
May	0.719	19	03:45:00
June	0.257	2	20:00:00
July	0.292	1	15:15:00
August	0.408	3	23:30:00
September	0.429	23	02:45:00
October	0.328	28	03:00:00
November	0.493	8	09:15:00
December	0.595	5	05:00:00

Surge minima	Value	Day	Time
January	-0.577	22	22:30:00
February	-0.366	3	01:45:00
March	-0.715	19	21:00:00
April	-0.355	1	01:15:00
May	-0.242	28	06:15:00
June	-0.194	25	22:00:00
July	-0.194	19	01:30:00
August	-0.418	21	06:30:00
September	-0.452	26	08:00:00
October	-0.24	17	17:00:00
November	-0.527	19	03:45:00
December	-0.655	10	08:15:00

Extreme maxima	Value	Day	Time
January	5.664	20	08:00:00
February	6.116	20	08:30:00
March	5.89	5	07:45:00
April	5.533	18	07:00:00
May	5.601	18	20:15:00
June	5.054	16	20:00:00
July	5.436	31	20:00:00
August	5.64	30	20:15:00
September	5.622	28	19:45:00
October	5.855	27	19:15:00
November	5.547	24	18:15:00
December	5.577	27	08:45:00

Extreme minima	Value	Day	Time
January	0.181	22	15:30:00
February	0.344	18	13:45:00
March	-0.442	20	14:00:00
April	0.076	17	13:00:00
May	0.608	16	12:15:00
June	0.811	16	01:30:00
July	0.775	16	02:30:00
August	0.278	31	02:45:00
September	-0.035	28	01:30:00
October	0.414	27	01:15:00
November	0.51	26	01:30:00
December	0.973	25	14:15:00

Mean sea level	No days	MSL
January	31	3.256
February	28	3.173
March	31	3.067
April	30	2.937
May	31	3.06
June	30	3.011
July	25	3.078
August	28	3.023
September	30	3.052
October	31	3.143
November	30	3.069
December	31	3.214
	Sum	Avg
	356	3.09

Weymouth (Dorset) Tide Gauge

Latitude: 50° 36' 30.6" N
Longitude: 02° 26' 52.6" W
Grid Reference: SY 6840 7885
.
Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SY 6826 7882	Bolt corner of quay wall NW side N angle
Aux1	SY 6822 7886	Bolt sea wall 5.5M W steps
Aux2	SY 6813 7888	Right base NW pillar NE entrance Alexandra gardens
Aux3	SY 6810 7893	Bolt sea wall 10.1M NW shelter
Aux4	SY 6806 7908	Bolt N base STS aquarium E side of esplanade
REFBM	SY 6837 7884	Bolt concrete SW corner of building adjacent to Tide Gauge Hut

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.02m below Ordnance Datum Newlyn (ODN)
TGZ = 4.334m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 214 On site for software upgrade and general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	192,214,339	049-051,118-119,152-156,160-164,249-251,275,297-339,339-365

Statistics:

Surge maxima	Value	Day	Time
January	0.605	18	09:45:00
February	0.723	12	06:45:00
March	0.803	6	03:15:00
April	0.21	20	01:45:00
May	0.408	27	09:45:00
June	0.35	20	07:00:00
July	0.345	26	13:45:00
August	0.41	15	04:30:00
September	0.282	24	05:00:00
October	0.233	16	18:00:00
November			
December	-0.065	11	15:00:00

Surge minima	Value	Day	Time
January	-0.536	23	06:15:00
February	-0.295	3	12:30:00
March	-0.29	19	21:45:00
April	-0.296	1	11:00:00
May	-0.181	23	14:30:00
June	-0.105	7	08:30:00
July	-0.116	14	23:30:00
August	-0.249	26	02:30:00
September	-0.262	27	03:00:00
October	-0.228	18	22:15:00
November			
December	-0.273	13	05:00:00

Extreme maxima	Value	Day	Time
January	2.591	21	08:15:00
February	2.76	20	09:00:00
March	2.592	19	06:30:00
April	2.383	18	07:15:00
May	2.355	16	18:30:00
June	2.463	15	19:00:00
July	2.428	15	19:45:00
August	2.574	14	20:00:00
September	2.654	28	20:00:00
October	2.221	1	09:30:00
November			
December	2.002	12	08:00:00

Extreme minima	Value	Day	Time
January	-0.119	23	02:15:00
February	0.001	20	16:45:00
March	-0.322	20	15:45:00
April	-0.165	18	15:30:00
May	0.122	18	03:30:00
June	0.402	17	04:00:00
July	0.273	31	03:30:00
August	-0.115	30	03:45:00
September	-0.14	27	02:45:00
October	0.247	10	23:15:00
November			
December	0.411	12	00:30:00

Mean sea level	No days	MSL
January	31	1.192
February	25	1.265
March	31	1.118
April	30	1.047
May	30	1.165
June	18	1.276
July	31	1.215
August	30	1.172
September	26	1.163
October	22	1.189
November		
December		
	Sum	Avg
	274	1.18

Whitby (Yorkshire) Tide Gauge

Latitude: 54° 29' 24.0" N
Longitude: 00° 36' 52.9" W
Grid Reference: NZ 8986 1140

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NZ 8986 1141	E side of Pier Rd
Aux1	NZ 8992 1105	Bolt butt of Whitby Bridge
Aux2	NZ 8985 1134	Rivet quayside SE side of Pier Rd
Aux3	NZ 8983 1142	Rivet wall angle S side of road angle of lifeboat museum

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.00m below Ordnance Datum Newlyn (ODN)
TGZ = 9.105m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 289 TGI on site to replace compressor and carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	168-171,213-220,227-269,276-299,305,326,328-329,339-341,347-360

Statistics:

Surge maxima	Value	Day	Time
January	1.12	11	23:00:00
February	0.667	17	00:00:00
March	1.034	18	21:30:00
April	0.581	19	13:15:00
May	0.567	6	20:45:00
June	0.656	26	06:45:00
July	0.52	30	09:15:00
August	0.344	14	17:30:00
September	0.596	26	10:00:00
October	0.372	29	10:30:00
November	1.504	8	19:30:00
December	0.723	9	21:30:00

Surge minima	Value	Day	Time
January	-0.778	11	05:00:00
February	-0.201	27	21:15:00
March	-0.351	5	01:30:00
April	-0.23	1	11:45:00
May	-0.057	5	22:45:00
June	-0.064	2	07:30:00
July	0.025	31	12:45:00
August	0.052	13	20:45:00
September	0.061	30	23:45:00
October	-0.096	31	03:30:00
November	-0.466	24	06:00:00
December	-0.349	4	16:45:00

Extreme maxima	Value	Day	Time
January	6.137	4	16:30:00
February	6.256	20	17:45:00
March	6.482	18	15:15:00
April	6.303	19	17:00:00
May	5.892	18	17:00:00
June	5.776	15	16:00:00
July	5.751	18	06:15:00
August	5.814	14	04:30:00
September	6.285	29	05:00:00
October	6.251	27	04:00:00
November	6.347	9	03:15:00
December	6.062	27	18:15:00

Extreme minima	Value	Day	Time
January	0.956	23	00:45:00
February	0.575	18	23:00:00
March	0.451	21	23:45:00
April	0.4	18	22:45:00
May	0.806	17	22:30:00
June	1.108	17	11:30:00
July	0.99	31	11:00:00
August	1.07	14	11:00:00
September	0.599	28	10:45:00
October	0.679	27	10:30:00
November	0.894	26	23:30:00
December	0.929	26	23:45:00

Mean sea level	No days	MSL
January	31	3.583
February	28	3.475
March	31	3.465
April	30	3.34
May	31	3.452
June	26	3.489
July	30	3.566
August	5	3.522
September	4	3.538
October	6	3.563
November	23	3.531
December	11	3.58
	Sum	Avg
	256	3.509

Wick (Scotland) Tide Gauge

Latitude: 58° 26' 27.5" N
Longitude: 03° 05' 11.0" W
Grid Reference: ND 3668 5081

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	ND 3667 5081	New OSBM bolt quay E angle tide gauge building
Aux1	ND 3670 5084	Rivet base of wall 15.5M NE angle of building
Aux2	ND 3670 5083	NBM rivet base SE end of wall NE side of N pier
Aux3	ND 3705 5055	Wall base of steps SE side of pier

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.71m below Ordnance Datum (ODN)
TGZ = 5.084m below TGBM

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: There were no site visits in 2007.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	None

Statistics:

Surge maxima	Value	Day	Time
January	0.875	11	14:30:00
February	0.543	28	12:30:00
March	0.741	5	21:30:00
April	0.287	24	04:45:00
May	0.59	19	07:45:00
June	0.218	29	09:00:00
July	0.316	26	07:00:00
August	0.371	4	09:30:00
September	0.357	23	17:30:00
October	0.358	15	22:15:00
November	0.414	8	14:30:00
December	0.503	5	05:45:00

Surge minima	Value	Day	Time
January	-0.427	23	04:00:00
February	-0.265	3	17:45:00
March	-0.498	20	01:00:00
April	-0.377	1	03:00:00
May	-0.152	29	01:00:00
June	-0.155	5	04:45:00
July	-0.175	20	06:00:00
August	-0.381	21	08:45:00
September	-0.322	26	11:45:00
October	-0.23	18	17:30:00
November	-0.438	19	08:00:00
December	-0.451	10	12:15:00

Extreme maxima	Value	Day	Time
January	3.845	20	12:00:00
February	4.071	20	13:00:00
March	4.101	18	10:30:00
April	3.759	19	12:30:00
May	3.847	19	12:45:00
June	3.513	17	00:15:00
July	3.648	31	23:45:00
August	3.809	31	00:45:00
September	3.759	30	01:00:00
October	4.049	27	23:45:00
November	3.868	24	23:00:00
December	3.947	27	13:30:00

Extreme minima	Value	Day	Time
January	0.14	22	19:30:00
February	0.237	18	17:45:00
March	-0.297	20	18:00:00
April	0.077	17	17:00:00
May	0.405	15	15:45:00
June	0.53	16	05:30:00
July	0.451	16	06:15:00
August	0.197	29	05:45:00
September	-0.02	28	05:30:00
October	0.432	25	03:45:00
November	0.333	26	18:30:00
December	0.636	10	17:45:00

Mean sea level	No days	MSL
January	31	2.227
February	28	2.121
March	31	2.046
April	30	1.913
May	31	2.032
June	30	1.984
July	31	2.055
August	31	2.021
September	30	2.053
October	31	2.113
November	30	2.058
December	31	2.167
	Sum	Avg
	365	2.066

Workington (Cumbria) Tide Gauge

Latitude: 54° 39' 02.6" N
Longitude: 03° 34' 01.8"W
Grid Reference: NX 9898 2953

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
Aux1	NX 9917 2928	Building SW face 3.7M from S angle Workington Dock
Aux2	NX 9948 2967	NBM works building S side Rd N face NE angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 4.20m below Ordnance Datum Newlyn (ODN)
TGZ = 11.59m below Aux1

Datum information: All data are to Admiralty Chart Datum (ACD).

Levelling information: No levelling was carried out in 2007.

T.G.I. visits to site: Day 248 TGI on site to replace compressor and carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	078-079,248,347-348

Statistics:

Surge maxima	Value	Day	Time
January	1.313	11	08:30:00
February	0.844	15	18:30:00
March	1.291	6	04:15:00
April	0.309	25	11:30:00
May	0.558	19	06:00:00
June	0.608	28	18:45:00
July	0.577	5	23:45:00
August	0.456	14	22:15:00
September	0.488	24	15:15:00
October	0.595	28	04:30:00
November	0.411	18	01:15:00
December	0.738	8	19:15:00

Surge minima	Value	Day	Time
January	-0.801	22	16:45:00
February	-0.674	2	17:45:00
March	-0.836	20	03:15:00
April	-0.479	1	04:00:00
May	-0.488	27	17:15:00
June	-0.384	25	11:30:00
July	-0.217	30	03:00:00
August	-0.464	21	08:45:00
September	-0.498	26	12:30:00
October	-0.329	30	11:15:00
November	-0.724	9	02:30:00
December	-0.827	9	21:15:00

Extreme maxima	Value	Day	Time
January	8.819	20	12:15:00
February	9.321	20	13:15:00
March	8.906	21	12:45:00
April	8.857	19	12:30:00
May	8.807	19	00:30:00
June	8.368	17	00:30:00
July	8.371	17	00:45:00
August	8.832	31	00:45:00
September	8.932	29	00:15:00
October	9.233	28	00:00:00
November	8.574	24	10:30:00
December	8.601	27	13:30:00

Extreme minima	Value	Day	Time
January	0.302	22	20:15:00
February	0.342	20	20:00:00
March	0	21	07:00:00
April	0.068	17	17:45:00
May	0.649	17	18:00:00
June	0.961	15	05:30:00
July	0.94	31	06:30:00
August	0.371	30	06:45:00
September	0.07	28	06:15:00
October	0.379	27	05:45:00
November	0.616	25	18:00:00
December	0.874	24	18:00:00

Mean sea level	No days	MSL
January	31	4.654
February	28	4.577
March	31	4.426
April	30	4.308
May	31	4.467
June	30	4.488
July	31	4.537
August	31	4.445
September	30	4.435
October	31	4.528
November	30	4.479
December	31	4.608
	Sum	Avg
	365	4.496

Monitoring Vertical Land Movements at Tide Gauges

Dr Richard Bingley,

Institute of Engineering, Surveying and Space Geodesy,
University of Nottingham

Monitoring Vertical Land Movements at Tide Gauges

Global sea level has risen by 10 to 20 cm during the 20th century. Much of the evidence for this rise came from mean sea level (MSL) measurements obtained at tide gauges, which measure MSL with respect to a local tide gauge bench mark (TGBM). However, it is impossible to distinguish between any 'true sea level variations' and any changes in the level of the land at a tide gauge using these measurements alone. Around Britain sea levels have risen by different amounts over the last century, from a 7cm rise at Aberdeen to a 21cm rise at Sheerness. This is because different parts of the British Isles are rising and subsiding at different rates, due mainly to the removal of ice from the land at the end of the last ice age – so called, glacial isostatic adjustment (GIA). Therefore, to measure the climate related component of changes in sea level using a tide gauge, the rate of any vertical land movements at the specific tide gauge must be determined.

In recent years, modern geodetic techniques have developed to the stage where they can be used to measure such vertical land movements, which are typically of the order of 1 to 2 mm/yr for the British Isles. The two most suitable techniques for this purpose are measurements using the Global Positioning System (GPS) and measurements of absolute gravity (AG).

With funding from Defra and the Environment Agency, POL, together with the Institute of Engineering Surveying and Space Geodesy (IESSG) at the University of Nottingham, have been carrying out research on these geodetic techniques since 1990. By 2004, this had resulted in the establishment of a network of continuous GPS (CGPS) stations at, or close to, the tide gauges of Aberdeen, Liverpool, Lowestoft, Newlyn, North Shields, Portsmouth and Sheerness, and a network of AG stations close to the tide gauges of Aberdeen, Lerwick and Newlyn, some of which have been operational since 1996. During 2005, three new CGPS stations were established at, or close to, the tide gauges of Dover, Lerwick and Stornoway.

The data from the ten CGPS stations at, or close to, tide gauges are archived as part of the British Isles GPS archive Facility (BIGF), which is also operated by the IESSG at the University of Nottingham. By the end of 2007, BIGF contained data for a total of 155 CGPS stations, some of which are also used to help to understand vertical land movements at non-coastal locations in the British Isles.

Data from four of the CGPS stations at, or close to, tide gauges (namely Aberdeen, Newlyn, North Shields and Sheerness) are contributed to European initiatives, notably the European Sea Level Service (ESEAS), and international initiatives, notably the International GPS Service (IGS) Tide Gauge Pilot Project (TIGA); and data from Newlyn are also contributed to the EUREF Permanent Network (EPN).

This report includes copies of the log files for the ten CGPS stations at, or close to, tide gauges along with plots summarising their daily data availability and quality, based on the TEQC program available through the IGS. These plots show the time window length (taken as the period between the first and last epoch of data recorded on a single day), the number of observations (along with the maximum number of satellites available for a particular day), the multipath characteristics for the dual-frequency pseudo-range observables (given as MP1 and MP2 values), and the number of cycle slips on the carrier phase observables (given as slips per thousand observations).

The data from the AG stations are processed and analysed by POL. The data from the CGPS stations are combined with data from other CGPS stations on a global scale that form part of the IGS network and processed by the IESSG. The resultant time series are then analysed by POL and IESSG.

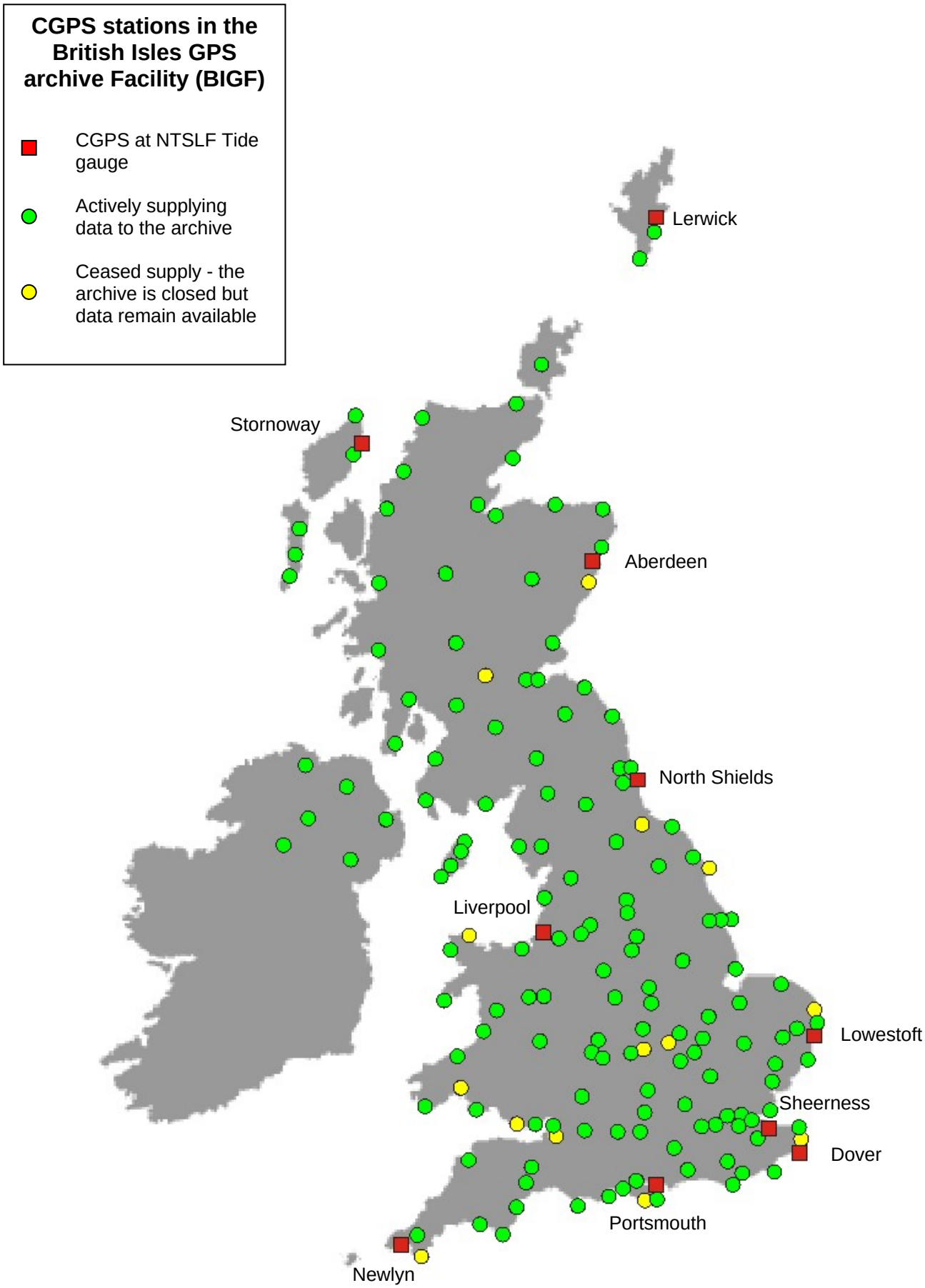
In 2007, results from the research carried out were published as R&D Technical Report FD2319/TR (Bingley et. al., 2007) and may be downloaded from the Defra/EA Joint R&D FCERM Programme website. The conclusions of the report state that the results demonstrate how:

- the combined CGPS and AG estimates of changes in land level
    - correlate with long term geological and geophysical evidence for the 'tilt' of Great Britain, which have Scotland rising by 1 to 2mm/yr and the South of England subsiding by up to 1.2mm/yr.
    - are in general agreement with long term geological and geophysical evidence, in terms of whether there is subsidence or uplift at individual stations, although in some cases there are differences which are of the same order as the changes in land level themselves and are, therefore, significant in relation to any assumptions made regarding future changes in land level.
- when the combined AG and CGPS results are considered along with tide gauge estimates of changes in sea level, our 'best' current estimate for the average change in sea level (decoupled from changes in land level) around the coast of Great Britain over the past few decades/past century suggests that sea level has risen by 0.9 to 1.2mm/yr.
- the direct estimates of changes in land level at specific tide gauges can be combined with predictions of future changes in sea level to provide an assessment of future changes in sea level around the coast of Great Britain.

These results should still be considered preliminary; as more reliable estimates of vertical land movements will be obtained after an extended monitoring period. These will lead to improved estimates for the changes in sea level (decoupled from changes in land level) around the coast of Great Britain over the past few decades/past century but, perhaps more importantly, will establish the selected tide gauges as devices with increasingly concurrent sea level and land level data from where estimates for any accelerations in changes sea level can be obtained. This will enable the validation of climate change model predictions of sea level rise around Great Britain, particularly as we move into the period of increasing variance between the different IPCC scenario predictions, which will lead to a better assessment of risk and more informed decisions on planning and managing flood risk at the coast and in our estuaries.

References

Bingley, R. M., Teferle, F. N., Orliac, E. J., Dodson, A. H., Williams, S. D. P., Blackman, D. L., Baker, T. F., Riedmann, M., Haynes, M., Aldiss, D. T., Burke, H. C., Chacksfield, B. C. and Tragheim, D., 2007. Absolute fixing of tide gauge benchmarks and land levels: measuring changes in land and sea levels around the coast of Great Britain and along the Thames Estuary using GPS, absolute gravimetry, persistent scatterer interferometry and tide gauges. Defra/Environment Agency Joint R&D FCERM Programme R&D Technical Report FD2319/TR, PB Number 12643, April 2007, available via http://www.defra.gov.uk/environ/fcd/research/ from 2 July 2007.


CGPS stations in the British Isles GPS archive Facility (BIGF)
CGPS at NTSLF Tide gauge
Actively supplying data to the archive
Ceased supply - the archive is closed but data remain available
Lerwick
Stornoway
Aberdeen
North Shields
Liverpool
Lowestoft
Sheerness
Dover
Portsmouth
Newlyn

Aberdeen

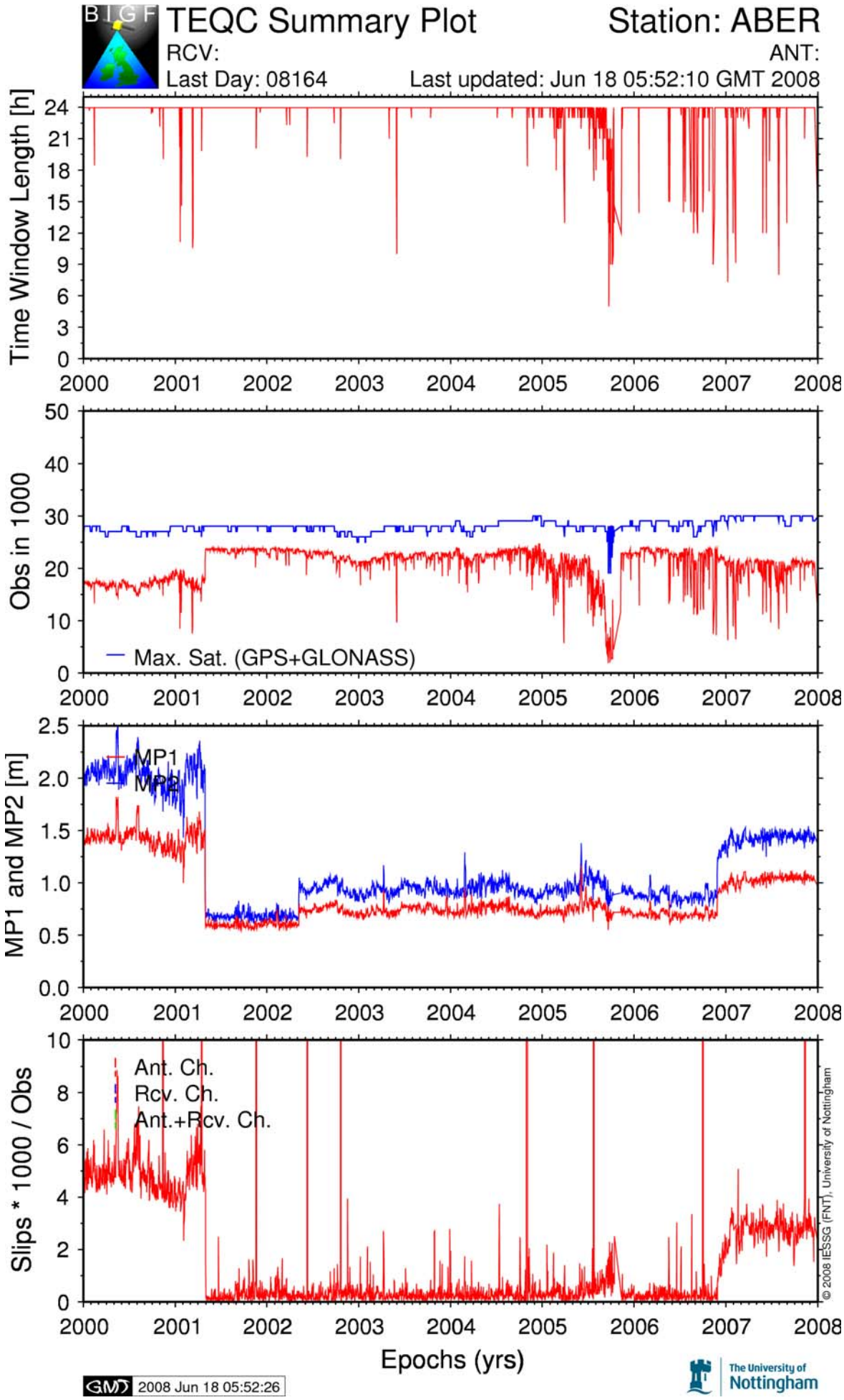
```
     ABER Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Richard Bingley
     Date Prepared            : 2001-12-12
     Report Type              : NEW
     If Update:
      Previous Site Log       :
      Modified/Added Sections :


1.   Site Identification of the GNSS Monument

     Site Name                : Aberdeen Tide Gauge
     Four Character ID        : ABER
     Monument Inscription     :
     IERS DOMES Number        : 13231M001
     CDP Number               : (A4)
     Monument Description     : STEEL PLATE AND CARBON FIBRE PIPE
       Height of the Monument : 4.0m
       Monument Foundation    : QUAY
       Foundation Depth       : (m)
     Marker Description       : TOP OF 40mm DIA THREAD ON STEEL PLATE
     Date Installed           : 1998-09-17T12:00Z
     Geologic Characteristic  : GLACIAL SAND AND GRAVEL
       Bedrock Type           : METAMORPHIC (QUARTZ-MICA-SCHIST)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : The monument is mounted adjacent to the
                              : tide gauge building, which is located on a
                              : concrete quay, with piled foundations.
                              : The GPS antenna is located on the monument
                              : which consists of a 4m carbon fibre pipe mounted
                              : on a steel plate, which is fixed to the concrete
                              : quay.
                              : The GPS antenna is attached to the carbon fibre
                              : pipe using a 5/8" thread.
                              : The carbon fibre pipe is attached to the steel
                              : plate using a 40 mm diameter thread.
                              : The male part of the 40mm diameter thread is on
                              : the steel plate and has a domed head, which
                              : serves as the survey marker.


2.   Site Location Information

     City or Town             : Aberdeen
     State or Province        :
     Country                  : Scotland
     Tectonic Plate           : EURASIAN
     Approximate Position
       X coordinate (m)       : 3466272.4
       Y coordinate (m)       : -125904.3
       Z coordinate (m)       : 5334662.3
       Latitude (N is +)      : +570838.42
       Longitude (E is +)     : -0020448.80
       Elevation (m,ellips.)  : 53.4
     Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 03140
     Firmware Version         : 1F50
     Elevation Cutoff Setting : 5
     Date Installed           : 1998-09-18T00:00Z
     Date Removed             : 1999-08-15T23:59Z
```

```
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 03140.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRS1F50 and
                              : CGHOSE v5.4.00 CGRS1F50.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.2  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 03140
     Firmware Version         : CD00
     Elevation Cutoff Setting : 5
     Date Installed           : 1999-08-17T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 03140.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRSCD00 and
                              : CGHOSE v6.0.00 CGRSCD00.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.x  Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
     Satellite System         : (GPS/GLONASS/GPS+GLONASS)
     Serial Number            : (A5)
     Firmware Version         : (A11)
     Elevation Cutoff Setting : (deg)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : (none or tolerance in degrees C)
     Additional Information   : (multiple lines)


4.   GNSS Antenna Information

4.1  Antenna Type             : ASH700936F_C    SNOW
     Serial Number            : 14767
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   3.9650
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 1998-09-17T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is CR 14767.

4.x  Antenna Type             : (A20 from rcvr_ant.tab; see instructions)
     Serial Number            : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


5.   Surveyed Local Ties

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : (m)
       dy (m)                 : (m)
       dz (m)                 : (m)
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
```

```
     Additional Information   : (multiple lines)


6.   Frequency Standard

6.1  Standard Type            : INTERNAL
       Input Frequency        : (if external)
       Effective Dates        : 1998-09-17/CCYY-MM-DD
       Notes                  : (multiple lines)

6.x  Standard Type            : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
       Input Frequency        : (if external)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


7.   Collocation Information

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.1 Humidity Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.1.x Humidity Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.1 Pressure Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.x Pressure Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.1 Temp. Sensor Model      : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.x Temp. Sensor Model      :
```

```
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.1 Water Vapor Radiometer  : NONE
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer  :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.1 Radio Interferences     : ANTENNA
       Observed Degradations  : SN RATIO/DATA GAPS
       Effective Dates        : 1998-09-17/2001-05-01
       Additional Information : Harbour antenna transmitting DGPS corrections.
                              : Fault on antenna repaired on 2001-05-01.

9.1.x Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degradations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.2.x Multipath Sources       : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.3.x Signal Obstructions     : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)


10.  Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)


11.  On-Site, Point of Contact Agency Information

     Agency                   : Aberdeen Harbour Board
     Preferred Abbreviation   : (A10)
     Mailing Address          : 16 Regents Quay
                              : Aberdeen AB511SS
                              : UK
     Primary Contact
       Contact Name           : Port Surveyor
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           :
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
```

```
       E-mail                  :
     Additional Information    : (multiple lines)


12.  Responsible Agency (if different from 11.)

     Agency                    : IESSG
     Preferred Abbreviation    : IESSG
     Mailing Address           : University of Nottingham
                               : University Park
                               : Nottingham NG72RD
                               : UK
     Primary Contact
       Contact Name            : Richard Bingley
       Telephone (primary)     : +44 (0)115 9513932
       Telephone (secondary)   : +44 (0)115 9513880
       Fax                     : +44 (0)115 9513881
       E-mail                  : richard.bingley@nottingham.ac.uk
     Secondary Contact
       Contact Name            : IESSG Experimental Officers
       Telephone (primary)     : +44 (0)115 9513921
       Telephone (secondary)   : +44 (0)115 9513880
       Fax                     : +44 (0)115 9513881
       E-mail                  : iessg@nottingham.ac.uk
     Additional Information    : ABER is operated by the IESSG for the
                               : Proudman Oceanographic Laboratory and
                               : the UK Department for Environment, Food
                               : and Rural Affairs (DEFRA)


13.  More Information

     Primary Data Center       :
     Secondary Data Center     :
     URL for More Information  : http://www.bigf.ac.uk
     Hardcopy on File
       Site Map                : Y
       Site Diagram            : Y
       Horizon Mask            : Y
       Monument Description    : Y
       Site Pictures           : Y
     Additional Information    : (multiple lines)
     Antenna Graphics with Dimensions

ASH700936F_C


                      +---------+
                     /     +     \                      <--  0.1280 L2
                    |      +      |                     <--  0.1100 L1
    +-----------------+------------+------------------+    <--  0.1008 TCR
    |                                                  |
    |                                                  |
    |                                                  |
    |                                                  |
  +-+--------------------------------------------------+-+  <--  0.0378
  +------------------+------------+--------------------+  <--  0.0348 BCR
                     |            |
                     |            |
                     +------x-----+                      <--  0.0000 BPA=ARP

  <--                     0.3794                     -->


   ARP: Antenna Reference Point
   L1 : L1 Phase Center                 L2 : L2 Phase Center
   TCR: Top of Chokering                BCR: Bottom of Chokering
```


TEQC Summary Plot
Station: ABER
RCV:
ANT:
Last Day: 08164
Last updated: Jun 18 05:52:10 GMT 2008
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS+GLONASS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
Epochs (yrs)
GMT 2008 Jun 18 05:52:26
The University of Nottingham
© 2008 IESSG (FNT), University of Nottingham

Dover

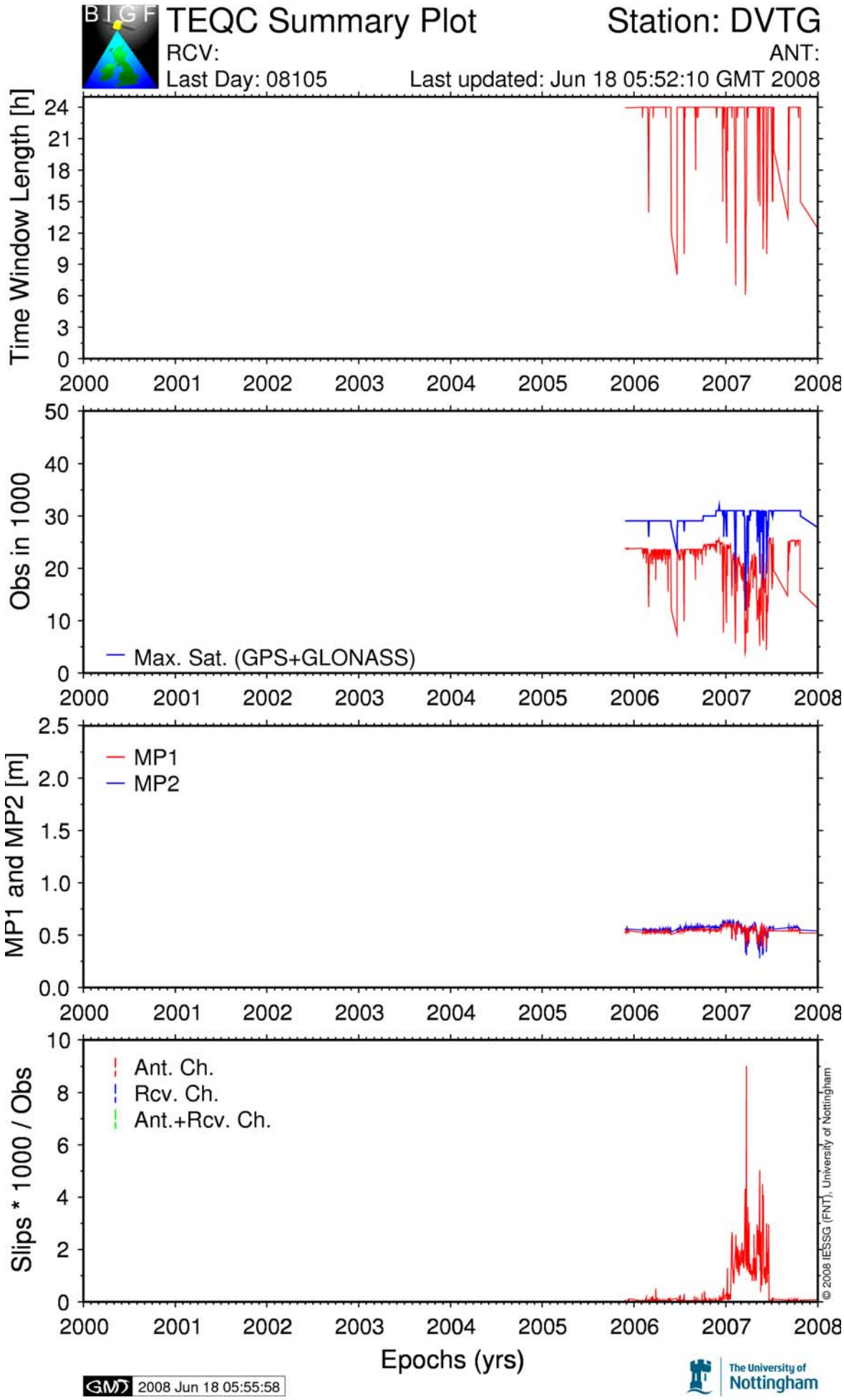
```
     DVTG Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Richard Bingley
     Date Prepared            : 2008-01-24
     Report Type              : UPDATE
     If Update:
      Previous Site Log       : dvtg_20070620.log
      Modified/Added Sections : 4.1, 4.2


1.   Site Identification of the GNSS Monument

     Site Name                : Dover Tide Gauge
     Four Character ID        : DVTG
     Monument Inscription     :
     IERS DOMES Number        : (A9)
     CDP Number               : (A4)
     Monument Description     : STEEL PLATE AND CARBON FIBRE PIPE
       Height of the Monument : 2.0m
       Monument Foundation    : PIER
       Foundation Depth       : (m)
     Marker Description       : TOP OF 40mm DIA THREAD ON STEEL PLATE
     Date Installed           : 2005-11-24T15:00Z
     Geologic Characteristic  : BEDROCK
       Bedrock Type           : SEDIMENTARY (CHALK)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : The monument is mounted about 15m from the tide gauge
                              : building, and located on the Prince of Wales Pier.
                              : The GPS antenna is located on the monument
                              : which consists of a 2m carbon fibre pipe mounted
                              : on a steel plate, which is fixed to the stone wall
                              : of the pier.
                              : The GPS antenna is attached to the carbon fibre
                              : pipe using a 5/8" thread.
                              : The carbon fibre pipe is attached to the steel
                              : plate using a 40 mm diameter thread.
                              : The male part of the 40mm diameter thread is on
                              : the steel plate and has a domed head, which
                              : serves as the survey marker.

2.   Site Location Information

     City or Town             : Dover
     State or Province        : Kent
     Country                  : England
     Tectonic Plate           : EURASIAN
     Approximate Position
       X coordinate (m)       :
       Y coordinate (m)       :
       Z coordinate (m)       :
       Latitude (N is +)      :
       Longitude (E is +)     :
       Elevation (m,ellips.)  :
     Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type            : ASHTECH UZ-12
     Satellite System         : GPS
     Serial Number            : 10207
     Firmware Version         : CJ00
     Elevation Cutoff Setting : 5
     Date Installed           : 2005-11-24T15:00Z
     Date Removed             : 2007-06-19T23:59Z
     Temperature Stabiliz.    : NONE
     Additional Information   : Receiver is an Ashtech Micro-Z.
                              : Full receiver serial number is ZR 2001 0207.
```

```
                              : Operation using a direct modem connection.
                              : Download using MicroManager Pro v1.1.00 (2001).
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.2  Receiver Type            : ASHTECH UZ-12
     Satellite System         : GPS
     Serial Number            : 26007
     Firmware Version         : CQ00
     Elevation Cutoff Setting : 5
     Date Installed           : 2007-06-22T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Temperature Stabiliz.    : NONE
     Additional Information   : Receiver is an Ashtech Micro-Z.
                              : Full receiver serial number is UC1 2003 26007.
                              : Operation using a direct modem connection.
                              : Download using MicroManager Pro v1.1.00 (2001).
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.x  Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
     Satellite System         : (GPS/GLONASS/GPS+GLONASS)
     Serial Number            : (A5)
     Firmware Version         : (A11)
     Elevation Cutoff Setting : (deg)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : (none or tolerance in degrees C)
     Additional Information   : (multiple lines)


4.   GNSS Antenna Information

4.1  Antenna Type             : ASH701945C_M    SNOW
     Serial Number            : 10215
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   2.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 2005-11-24T15:00Z
     Date Removed             : 2007-10-24T23:59Z
     Additional Information   : Full antenna serial number is CR5 2001 0215.
                                The monument was damaged in a storm some time
                                shortly after 2007-10-24.

4.2  Antenna Type             : ASH701945C_M    SNOW
     Serial Number            : 10215
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   2.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 2008-01-24T12:30Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is CR5 2001 0215.
                                The monument was re-installed with the original
                                carbon fibre pipe but using a new steel plate.
                                The original antenna was put back in place but
                                with a new 30m antenna cable.  All attempts were
                                made to put the new steel plate in the same
                                place as the original steel plate but local
                                levelling suggests that the new survey marker
                                may be 2 to 3mm lower than before.

4.x  Antenna Type             : (A20 from rcvr_ant.tab; see instructions)
     Serial Number            : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
```

```
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


5.   Surveyed Local Ties

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : (m)
       dy (m)                 : (m)
       dz (m)                 : (m)
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


6.   Frequency Standard

6.1  Standard Type            : INTERNAL
       Input Frequency        : (if external)
       Effective Dates        : 2005-11-24/CCYY-MM-DD
       Notes                  : (multiple lines)

6.x  Standard Type            : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
       Input Frequency        : (if external)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


7.   Collocation Information

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.1 Humidity Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.1.x Humidity Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.1 Pressure Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.x Pressure Sensor Model   :
```

```
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.1 Temp. Sensor Model      : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.x Temp. Sensor Model      :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.1 Water Vapor Radiometer  : NONE
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer  :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.x Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degradations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.2.x Multipath Sources       : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.3.x Signal Obstructions     : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)


10.  Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)


11.  On-Site, Point of Contact Agency Information

     Agency                   : Port of Dover
     Preferred Abbreviation   :
```

```
     Mailing Address          : Harbour House
                              : Dover
                              : Kent CT17 9BU
                              : UK
     Primary Contact
       Contact Name           : Marine Services Manager
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           :
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Additional Information   : (multiple lines)


12.  Responsible Agency (if different from 11.)

     Agency                   : IESSG
     Preferred Abbreviation   : IESSG
     Mailing Address          : University of Nottingham
                              : University Park
                              : Nottingham NG72RD
                              : UK
     Primary Contact
       Contact Name           : Richard Bingley
       Telephone (primary)    : +44 (0)115 9513932
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : richard.bingley@nottingham.ac.uk
     Secondary Contact
       Contact Name           : IESSG Experimental Officers
       Telephone (primary)    : +44 (0)115 9513921
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : iessg@nottingham.ac.uk
     Additional Information   : DVTG is operated by the IESSG for the
                              : Proudman Oceanographic Laboratory and
                              : the UK Department for Environment, Food
                              : and Rural Affairs (DEFRA)


13.  More Information

     Primary Data Center      :
     Secondary Data Center    :
     URL for More Information : http://www.bigf.ac.uk
     Hardcopy on File
       Site Map               : Y
       Site Diagram           : Y
       Horizon Mask           : Y
       Monument Description   : Y
       Site Pictures          : Y
     Additional Information   : (multiple lines)
     Antenna Graphics with Dimensions

ASH701945C_M

                      -----
                    /     +     \                      <--  0.128  L2
                   |      +      |                     <--  0.110  L1
   +-----------------------------------------------+    <--  0.102  TCR
   |                                               |
   |                                               |
   |                                               |
   |                                               |
+-+-----------------------------------------------+-+  <--  0.038
+-------------------+-------------+-----------------+  <--  0.035  BCR
                    |             |
                   =|             |
                    +------x------+                     <--  0.000  BPA=ARP

<--                      0.381                      -->


   ARP: Antenna Reference Point
   L1 : L1 Phase Center                 L2 : L2 Phase Center
   TCR: Top of Chokering                BCR: Bottom of Chokering
```


TEQC Summary Plot
Station: DVTG
RCV:
ANT:
Last Day: 08105
Last updated: Jun 18 05:52:10 GMT 2008
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS+GLONASS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
Epochs (yrs)
GMT 2008 Jun 18 05:55:58
The University of Nottingham
© 2008 IESSG (FNT), University of Nottingham

Liverpool

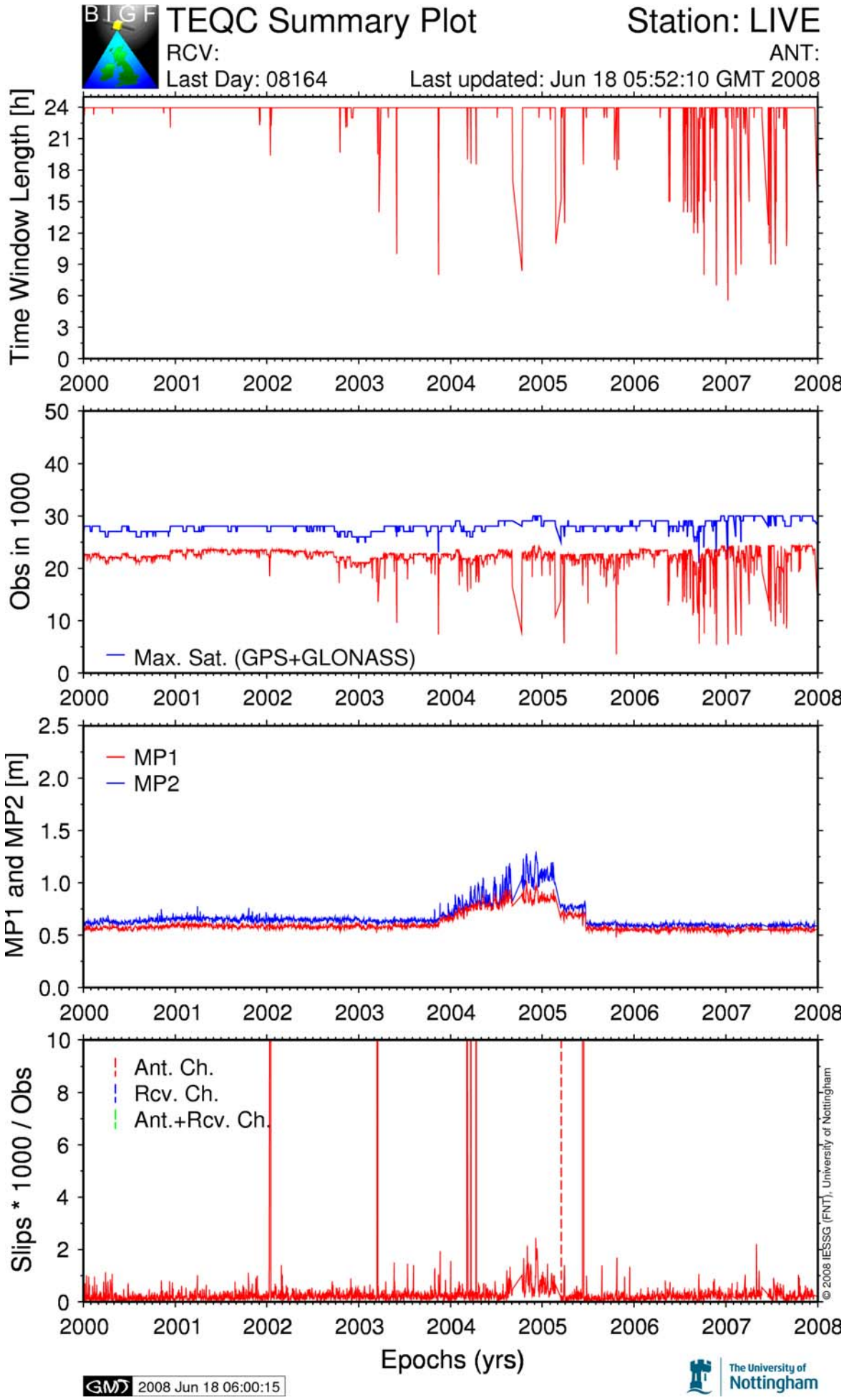
```
     LIVE Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Richard Bingley
     Date Prepared            : 2005-03-15
     Report Type              : UPDATE
     If Update:
      Previous Site Log       : live_20011212.log
      Modified/Added Sections : 4.2


1.   Site Identification of the GNSS Monument

     Site Name                : Liverpool Tide Gauge
     Four Character ID        : LIVE
     Monument Inscription     :
     IERS DOMES Number        : 13233M001
     CDP Number               : (A4)
     Monument Description     : STEEL PLATE AND STEEL PIPE
       Height of the Monument : 0.07m
       Monument Foundation    : CONCRETE PILLAR
       Foundation Depth       : (m)
     Marker Description       : TOP OF 40mm DIA THREAD ON STEEL PLATE
     Date Installed           : 1999-02-03T12:00Z
     Geologic Characteristic  : ALLUVIUM
       Bedrock Type           : SEDIMENTARY (SANDSTONE)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : The monument is mounted on a 5m high
                              : concrete pillar which forms part of a
                              : wind-break and is about 5m from the
                              : tide gauge building, which is located
                              : on a stone pier, with piled foundations.
                              : The GPS antenna is located on the monument
                              : which consists of a 0.07m steel pipe mounted on
                              : a steel plate.
                              : The GPS antenna is attached to the steel pipe
                              : using a 5/8" thread.
                              : The steel pipe is attached to the steel plate
                              : using a 40 mm diameter thread.
                              : The male part of the 40mm diameter thread is on
                              : the steel plate and has a domed head, which
                              : serves as the survey marker.


2.   Site Location Information

     City or Town             : Liverpool
     State or Province        : Merseyside
     Country                  : England
     Tectonic Plate           : EURASIAN
     Approximate Position
       X coordinate (m)       : 3801351.8
       Y coordinate (m)       : -200433.1
       Z coordinate (m)       : 5100558.2
       Latitude (N is +)      : +532658.90
       Longitude (E is +)     : -0030105.62
       Elevation (m,ellips.)  : 66.0
     Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 03145
     Firmware Version         : 1F50
     Elevation Cutoff Setting : 5
     Date Installed           : 1999-02-04T00:00Z
     Date Removed             : 1999-08-15T23:59Z
```

```
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 03145.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRS1F50 and
                              : CGHOSE v5.4.00 CGRS1F50.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.2  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 03145
     Firmware Version         : CD00
     Elevation Cutoff Setting : 5
     Date Installed           : 1999-08-17T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 03145.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRSCD00 and
                              : CGHOSE v6.0.00 CGRSCD00
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0)

3.x  Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
     Satellite System         : (GPS/GLONASS/GPS+GLONASS)
     Serial Number            : (A5)
     Firmware Version         : (A11)
     Elevation Cutoff Setting : (deg)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : (none or tolerance in degrees C)
     Additional Information   : (multiple lines)


4.   GNSS Antenna Information

4.1  Antenna Type             : ASH700936F_C    SNOW
     Serial Number            : 14774
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0310
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 1999-02-04T00:00Z
     Date Removed             : 2005-02-22T12:00Z
     Additional Information   : Full antenna serial number is CR 14774.

4.2  Antenna Type             : ASH700936D_M    SNOW
     Serial Number            : 13141
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0310
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 2005-03-15T09:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is CR 13141.
                                The antenna cable was not replaced.

4.x  Antenna Type             : (A20 from rcvr_ant.tab; see instructions)
     Serial Number            : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
```

```
     Additional Information   : (multiple lines)


5.   Surveyed Local Ties

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : (m)
       dy (m)                 : (m)
       dz (m)                 : (m)
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


6.   Frequency Standard

6.1  Standard Type            : INTERNAL
       Input Frequency        : (if external)
       Effective Dates        : 1999-02-04/CCYY-MM-DD
       Notes                  : (multiple lines)

6.x  Standard Type            : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
       Input Frequency        : (if external)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


7.   Collocation Information

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.1 Humidity Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.1.x Humidity Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.1 Pressure Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.x Pressure Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
```

```
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.1 Temp. Sensor Model      : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.x Temp. Sensor Model      :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.1 Water Vapor Radiometer  : NONE
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer  :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.x Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degradations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.2.1 Multipath Sources       : SALT WATER CORROSION OF ANTENNA
       Effective Dates        : 2003-09-15/2005-02-22
       Additional Information : Apparent increase in MP1/2 values observed
                                and physical movement of antenna caused
                                by corrosion causing the pre-amp to detach
                                from the monument

9.2.x Multipath Sources       : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.3.x Signal Obstructions     : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)


10.  Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)


11.  On-Site, Point of Contact Agency Information

     Agency                   : Mersey Docks and Harbour Company
     Preferred Abbreviation   : (A10)
```

```
     Mailing Address          : Maritime Centre
                              : Port of Liverpool
                              : Merseyside L21 1LA
                              : UK
     Primary Contact
       Contact Name           : Marine Operations Manager
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           :
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Additional Information   : (multiple lines)


12.  Responsible Agency (if different from 11.)

     Agency                   : IESSG
     Preferred Abbreviation   : IESSG
     Mailing Address          : University of Nottingham
                              : University Park
                              : Nottingham NG72RD
                              : UK
     Primary Contact
       Contact Name           : Richard Bingley
       Telephone (primary)    : +44 (0)115 9513932
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : richard.bingley@nottingham.ac.uk
     Secondary Contact
       Contact Name           : IESSG Experimental Officers
       Telephone (primary)    : +44 (0)115 9513921
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : iessg@nottingham.ac.uk
     Additional Information   : LIVE is operated by the IESSG for the
                              : Proudman Oceanographic Laboratory and
                              : the UK Department for Environment, Food
                              : and Rural Affairs (DEFRA)


13.  More Information

     Primary Data Center      :
     Secondary Data Center    :
     URL for More Information : http://www.bigf.ac.uk
     Hardcopy on File
       Site Map               : Y
       Site Diagram           : Y
       Horizon Mask           : Y
       Monument Description   : Y
       Site Pictures          : Y
     Additional Information   : (multiple lines)
     Antenna Graphics with Dimensions

ASH700936F_C

                      +---------+
                     /     +     \                      <--  0.1280 L2
                    |      +      |                     <--  0.1100 L1
    +-----------------+------------+------------------+  <--  0.1008 TCR
    |                                                 |
    |                                                 |
    |                                                 |
    |                                                 |
  +-+-------------------------------------------------+-+  <--  0.0378
  +-------------------+------------+--------------------+  <--  0.0348 BCR
                      |            |
                      |            |
                      +------x-----+                      <--  0.0000 BPA=ARP

  <--                      0.3794                      -->

   ARP: Antenna Reference Point
   L1 : L1 Phase Center                  L2 : L2 Phase Center
   TCR: Top of Chokering                 BCR: Bottom of Chokering
```


TEQC Summary Plot
Station: LIVE
RCV:
ANT:
Last Day: 08164
Last updated: Jun 18 05:52:10 GMT 2008
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS+GLONASS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
Epochs (yrs)
GMT 2008 Jun 18 06:00:15
The University of Nottingham
© 2008 IESSG (FNT), University of Nottingham

Lowestoft

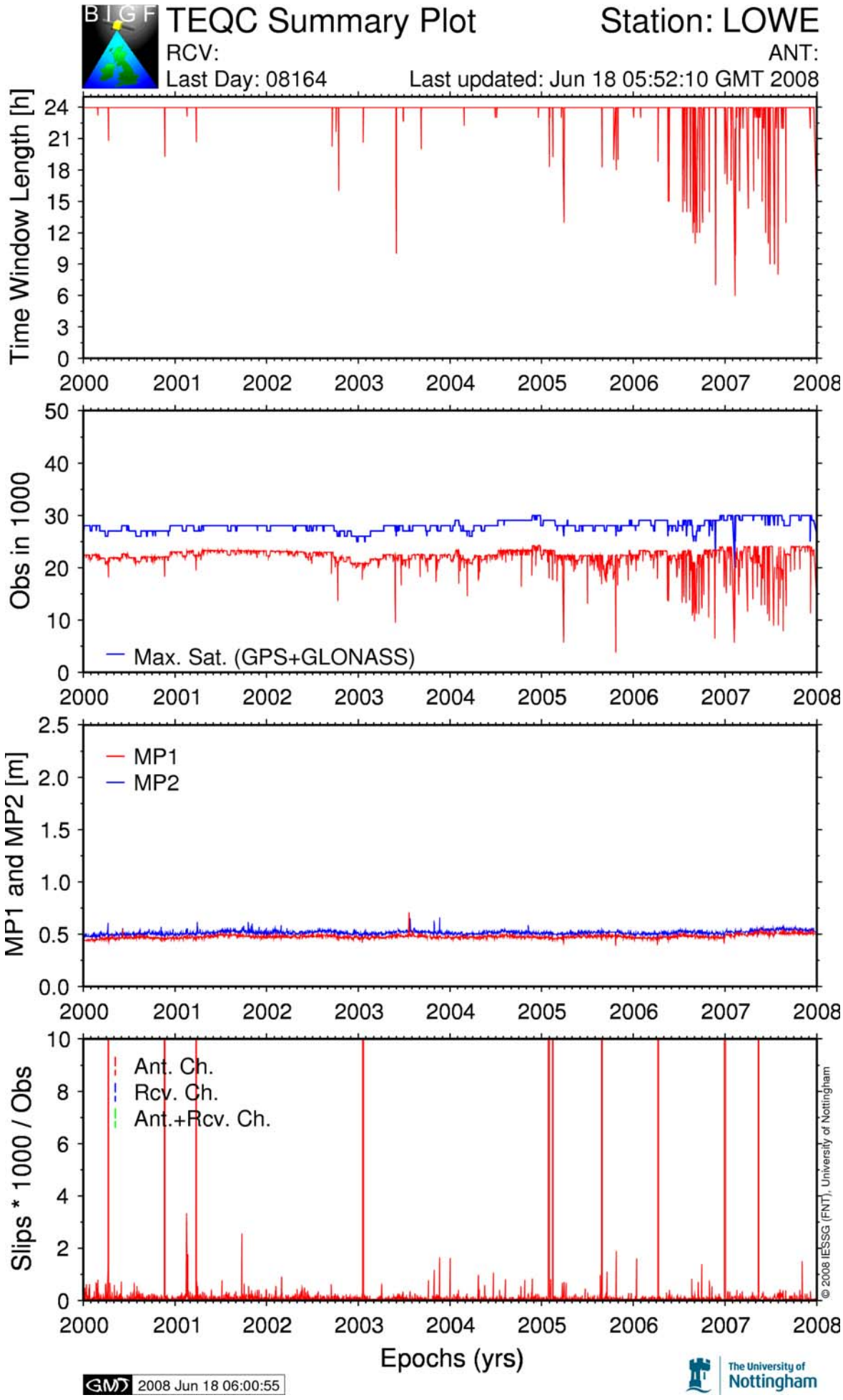
```
     LOWE Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Richard Bingley
     Date Prepared            : 2001-12-12
     Report Type              : NEW
     If Update:
      Previous Site Log       :
      Modified/Added Sections :


1.   Site Identification of the GNSS Monument

     Site Name                : Lowestoft Tide Gauge
     Four Character ID        : LOWE
     Monument Inscription     :
     IERS DOMES Number        : 13232M001
     CDP Number               : (A4)
     Monument Description     : STEEL BRACKET AND CARBON FIBRE PIPE
       Height of the Monument : 0.80m
       Monument Foundation    : BUILDING
       Foundation Depth       : (m)
     Marker Description       : TOP OF 40mm DIA THREAD ON STEEL BRACKET
     Date Installed           : 1999-02-12T12:00Z
     Geologic Characteristic  : ALLUVIUM
       Bedrock Type           : SEDIMENTARY (CRAG)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : The monument is mounted on the side
                              : wall of a two storey brick office
                              : building, adjacent to the tide gauge
                              : building, so that the antenna is raised
                              : above the roof
                              : The GPS antenna is located on the monument
                              : which consists of a 0.8m carbon fibre pipe
                              : mounted on a steel bracket.
                              : The GPS antenna is attached to the carbon fibre
                              : pipe using a 5/8" thread.
                              : The carbon fibre pipe is attached to the steel
                              : bracket using a 40 mm diameter thread.
                              : The male part of the 40mm diameter thread is on
                              : the steel bracket and has a domed head, which
                              : serves as the survey marker.


2.   Site Location Information

     City or Town             : Lowestoft
     State or Province        : Suffolk
     Country                  : England
     Tectonic Plate           : EURASIAN
     Approximate Position
       X coordinate (m)       : 3891549.7
       Y coordinate (m)       : 118910.8
       Z coordinate (m)       : 5035092.8
       Latitude (N is +)      : +522823.60
       Longitude (E is +)     : +0014500.70
       Elevation (m,ellips.)  : 53.8
     Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 03141
     Firmware Version         : 1F50
     Elevation Cutoff Setting : 5
     Date Installed           : 1999-02-13T00:00Z
```

```
     Date Removed             : 1999-08-15T23:59Z
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 03141.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRS1F50 and
                              : CGHOSE v5.4.00 CGRS1F50.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.2  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 03141
     Firmware Version         : CD00
     Elevation Cutoff Setting : 5
     Date Installed           : 1999-08-17T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Temperature Stabiliz.    : NONE
     Additional Information   : The full receiver serial number is LP 03141.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRSCD00 and
                              : CGHOSE v6.0.00 CGRSCD00.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.x  Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
     Satellite System         : (GPS/GLONASS/GPS+GLONASS)
     Serial Number            : (A5)
     Firmware Version         : (A11)
     Elevation Cutoff Setting : (deg)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : (none or tolerance in degrees C)
     Additional Information   : (multiple lines)


4.   GNSS Antenna Information

4.1  Antenna Type             : ASH700936F_C    SNOW
     Serial Number            : 14769
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.7620
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 1999-02-13T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is CR 14769.

4.x  Antenna Type             : (A20 from rcvr_ant.tab; see instructions)
     Serial Number            : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


5.   Surveyed Local Ties

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : (m)
       dy (m)                 : (m)
       dz (m)                 : (m)
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
```

```
     Date Measured            : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


6.   Frequency Standard

6.1  Standard Type            : INTERNAL
       Input Frequency        : (if external)
       Effective Dates        : 1999-02-13/CCYY-MM-DD
       Notes                  : (multiple lines)

6.x  Standard Type            : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
       Input Frequency        : (if external)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


7.   Collocation Information

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.1 Humidity Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.1.x Humidity Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.1 Pressure Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.x Pressure Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.1 Temp. Sensor Model      : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)
```

```
8.3.x Temp. Sensor Model      :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.1 Water Vapor Radiometer  : NONE
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer  :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.x Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degradations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.2.x Multipath Sources       : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.3.x Signal Obstructions     : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)


10.  Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)


11.  On-Site, Point of Contact Agency Information

     Agency                   : Associated British Ports
     Preferred Abbreviation   : (A10)
     Mailing Address          : Port House
                              : Lowestoft
                              : Suffolk NR32 1BG
                              : UK
     Primary Contact
       Contact Name           : Harbour Master
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           :
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Additional Information   : (multiple lines)
```

```
12.  Responsible Agency (if different from 11.)

     Agency                  : IESSG
     Preferred Abbreviation  : IESSG
     Mailing Address         : University of Nottingham
                             : University Park
                             : Nottingham NG72RD
                             : UK
     Primary Contact
       Contact Name          : Richard Bingley
       Telephone (primary)   : +44 (0)115 9513932
       Telephone (secondary) : +44 (0)115 9513880
       Fax                   : +44 (0)115 9513881
       E-mail                : richard.bingley@nottingham.ac.uk
     Secondary Contact
       Contact Name          : IESSG Experimental Officers
       Telephone (primary)   : +44 (0)115 9513921
       Telephone (secondary) : +44 (0)115 9513880
       Fax                   : +44 (0)115 9513881
       E-mail                : iessg@nottingham.ac.uk
     Additional Information  : LOWE is operated by the IESSG for the
                             : Proudman Oceanographic Laboratory and
                             : the UK Department for Environment, Food
                             : and Rural Affairs (DEFRA)


13.  More Information

     Primary Data Center     :
     Secondary Data Center   :
     URL for More Information : http://www.bigf.ac.uk
     Hardcopy on File
       Site Map              : Y
       Site Diagram          : Y
       Horizon Mask          : Y
       Monument Description  : Y
       Site Pictures         : Y
     Additional Information  : (multiple lines)
     Antenna Graphics with Dimensions

ASH700936F_C


                      +---------+
                     /     +     \                      <--  0.1280 L2
                    |      +      |                     <--  0.1100 L1
    +-----------------+-------------+------------------+    <--  0.1008 TCR
    |                                                   |
    |                                                   |
    |                                                   |
    |                                                   |
  +-+---------------------------------------------------+-+  <--  0.0378
  +-------------------+-------------+--------------------+  <--  0.0348 BCR
                      |             |
                      |             |
                      +------x------+                     <--  0.0000 BPA=ARP

  <--                      0.3794                      -->


   ARP: Antenna Reference Point
   L1 : L1 Phase Center                 L2 : L2 Phase Center
   TCR: Top of Chokering                BCR: Bottom of Chokering
```


TEQC Summary Plot
Station: LOWE
RCV:
ANT:
Last Day: 08164
Last updated: Jun 18 05:52:10 GMT 2008
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS+GLONASS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
Epochs (yrs)
GMT 2008 Jun 18 06:00:55
© 2008 IESSG (FNT), University of Nottingham
The University of Nottingham

Lerwick

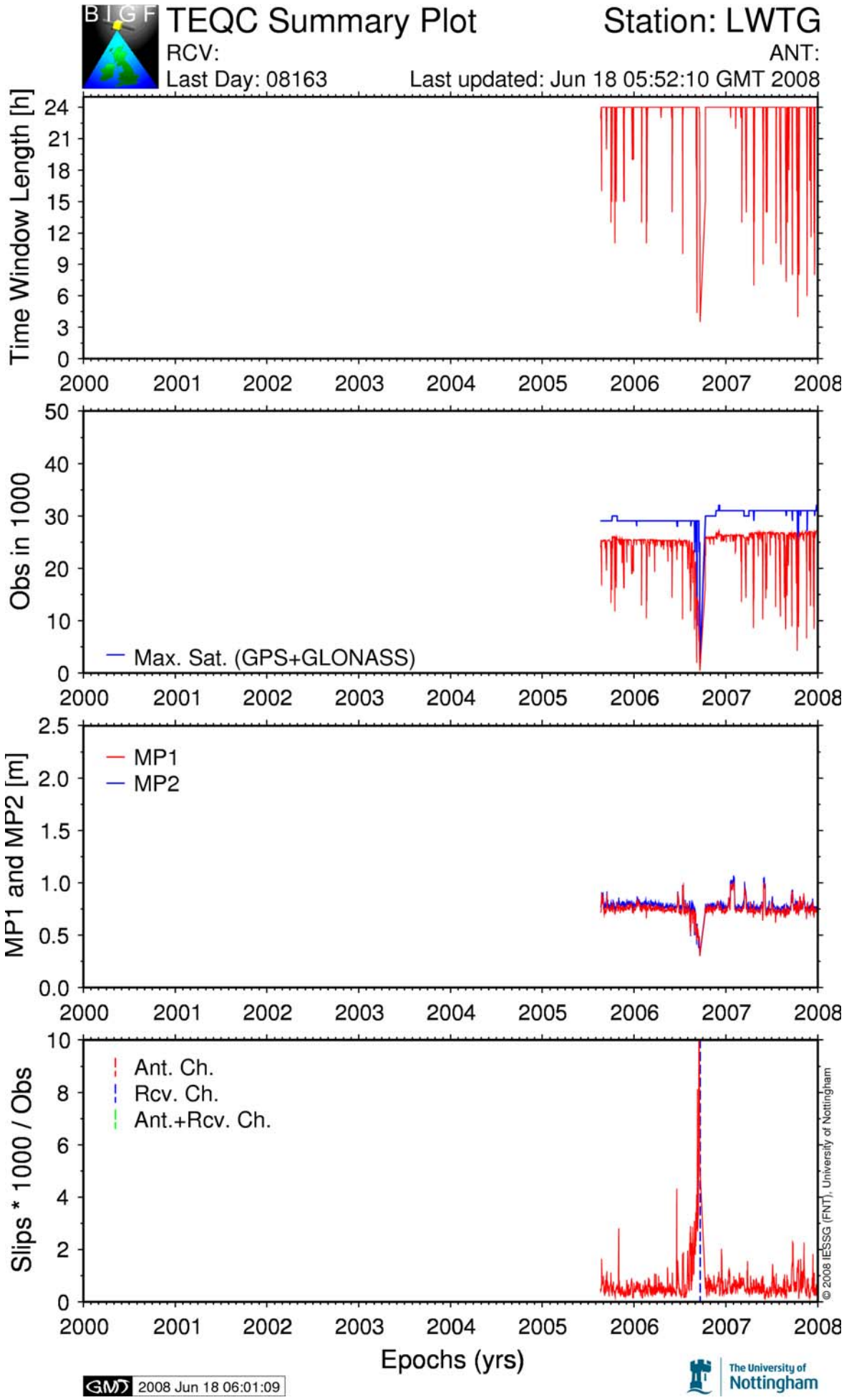
```
     LWTG Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Richard Bingley
     Date Prepared            : 2006-10-10
     Report Type              : UPDATE
     If Update:
      Previous Site Log       : lwtg_20050819
      Modified/Added Sections : 3.1, 3.2


1.   Site Identification of the GNSS Monument

     Site Name                : Lerwick Tide Gauge
     Four Character ID        : LWTG
     Monument Inscription     :
     IERS DOMES Number        : (A9)
     CDP Number               : (A4)
     Monument Description     : STEEL PLATE AND CARBON FIBRE PIPE
       Height of the Monument : 3.0m
       Monument Foundation    : PIER/BREAKWATER
       Foundation Depth       : (m)
     Marker Description       : TOP OF 40mm DIA THREAD ON STEEL PLATE
     Date Installed           : 2005-08-17T15:00Z
     Geologic Characteristic  : BEDROCK
       Bedrock Type           : SEDIMENTARY (SANDSTONE)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : The monument is mounted adjacent to the
                              : tide gauge building, which is located on a
                              : stone pier/breakwater, built in 1913.
                              : The GPS antenna is located on the monument
                              : which consists of a 3m carbon fibre pipe mounted
                              : on a steel plate, which is fixed to a concrete
                              : plinth on top of the pier/breakwater stone wall.
                              : The GPS antenna is attached to the carbon fibre
                              : pipe using a 5/8" thread.
                              : The carbon fibre pipe is attached to the steel
                              : plate using a 40 mm diameter thread.
                              : The male part of the 40mm diameter thread is on
                              : the steel plate and has a domed head, which
                              : serves as the survey marker.


2.   Site Location Information

     City or Town             : Lerwick
     State or Province        : Shetland
     Country                  : Scotland
     Tectonic Plate           : EURASIAN
     Approximate Position
       X coordinate (m)       :
       Y coordinate (m)       :
       Z coordinate (m)       :
       Latitude (N is +)      :
       Longitude (E is +)     :
       Elevation (m,ellips.)  :
     Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type            : ASHTECH UZ-12
     Satellite System         : GPS
     Serial Number            : 13838
     Firmware Version         : CJ00
     Elevation Cutoff Setting : 5
     Date Installed           : 2005-08-19T00:00Z
     Date Removed             : 2006-09-19T23:59Z
```

```
     Temperature Stabiliz.    : NONE
     Additional Information   : Receiver is an Ashtech Micro-Z.
                              : Full receiver serial number is ZR2 2001 3838.
                              : Operation using a direct modem connection.
                              : Download using MicroManager Pro v1.1.00 (2001).
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.2  Receiver Type            : ASHTECH UZ-12
     Satellite System         : GPS
     Serial Number            : 13833
     Firmware Version         : CK00
     Elevation Cutoff Setting : 5
     Date Installed           : 2006-10-10T11:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Temperature Stabiliz.    : NONE
     Additional Information   : Receiver is an Ashtech Micro-Z.
                              : Full receiver serial number is ZR2 2001 3833.
                              : Operation using a direct modem connection.
                              : Download using MicroManager Pro v1.1.00 (2001).
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.x  Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
     Satellite System         : (GPS/GLONASS/GPS+GLONASS)
     Serial Number            : (A5)
     Firmware Version         : (A11)
     Elevation Cutoff Setting : (deg)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : (none or tolerance in degrees C)
     Additional Information   : (multiple lines)


4.   GNSS Antenna Information

4.1  Antenna Type             : ASH701945C_M    SNOW
     Serial Number            : 14803
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   3.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 2005-08-19T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is CR5 2001 4803.

4.x  Antenna Type             : (A20 from rcvr_ant.tab; see instructions)
     Serial Number            : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


5.   Surveyed Local Ties

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : (m)
       dy (m)                 : (m)
       dz (m)                 : (m)
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
```

```
     Additional Information   : (multiple lines)


6.   Frequency Standard

6.1  Standard Type            : INTERNAL
       Input Frequency        : (if external)
       Effective Dates        : 2005-08-19/CCYY-MM-DD
       Notes                  : (multiple lines)

6.x  Standard Type            : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
       Input Frequency        : (if external)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


7.   Collocation Information

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.1 Humidity Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.1.x Humidity Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.1 Pressure Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.x Pressure Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.1 Temp. Sensor Model      : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.x Temp. Sensor Model      :
```

```
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.1 Water Vapor Radiometer  : NONE
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer  :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.x Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degradations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.2.x Multipath Sources       : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.3.x Signal Obstructions     : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)


10.  Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)


11.  On-Site, Point of Contact Agency Information

     Agency                   : Lerwick Port Authority
     Preferred Abbreviation   :
     Mailing Address          : Albert Building
                              : Lerwick
                              : Shetland ZE1 0LL
                              : UK
     Primary Contact
       Contact Name           : Harbour Master
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           :
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Additional Information   : (multiple lines)


12.  Responsible Agency (if different from 11.)
```

```
     Agency                    : IESSG
     Preferred Abbreviation    : IESSG
     Mailing Address           : University of Nottingham
                               : University Park
                               : Nottingham NG72RD
                               : UK
     Primary Contact
       Contact Name            : Richard Bingley
       Telephone (primary)     : +44 (0)115 9513932
       Telephone (secondary)   : +44 (0)115 9513880
       Fax                     : +44 (0)115 9513881
       E-mail                  : richard.bingley@nottingham.ac.uk
     Secondary Contact
       Contact Name            : IESSG Experimental Officers
       Telephone (primary)     : +44 (0)115 9513921
       Telephone (secondary)   : +44 (0)115 9513880
       Fax                     : +44 (0)115 9513881
       E-mail                  : iessg@nottingham.ac.uk
     Additional Information    : LWTG is operated by the IESSG for the
                               : Proudman Oceanographic Laboratory and
                               : the UK Department for Environment, Food
                               : and Rural Affairs (DEFRA)


13.  More Information

     Primary Data Center       :
     Secondary Data Center     :
     URL for More Information  : http://www.bigf.ac.uk
     Hardcopy on File
       Site Map                : Y
       Site Diagram            : Y
       Horizon Mask            : Y
       Monument Description    : Y
       Site Pictures           : Y
     Additional Information    : (multiple lines)
     Antenna Graphics with Dimensions

ASH701945C_M

                      -----
                    /     +     \                       <--  0.128  L2
                   |      +      |                      <--  0.110  L1
  +------------------------------------------------+    <--  0.102  TCR
  |                                                |
  |                                                |
  |                                                |
  |                                                |
+-+------------------------------------------------+-+  <--  0.038
+-------------------+-------------+-------------------+  <--  0.035  BCR
                    |             |
                   =|             |
                    +------x------+                      <--  0.000  BPA=ARP

<--                      0.381                       -->


   ARP: Antenna Reference Point
   L1 : L1 Phase Center                  L2 : L2 Phase Center
   TCR: Top of Chokering                 BCR: Bottom of Chokering
```


TEQC Summary Plot
Station: LWTG
RCV:
ANT:
Last Day: 08163
Last updated: Jun 18 05:52:10 GMT 2008
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS+GLONASS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
© 2008 IESSG (FNT), University of Nottingham
Epochs (yrs)
GMT 2008 Jun 18 06:01:09
The University of Nottingham

Newlyn

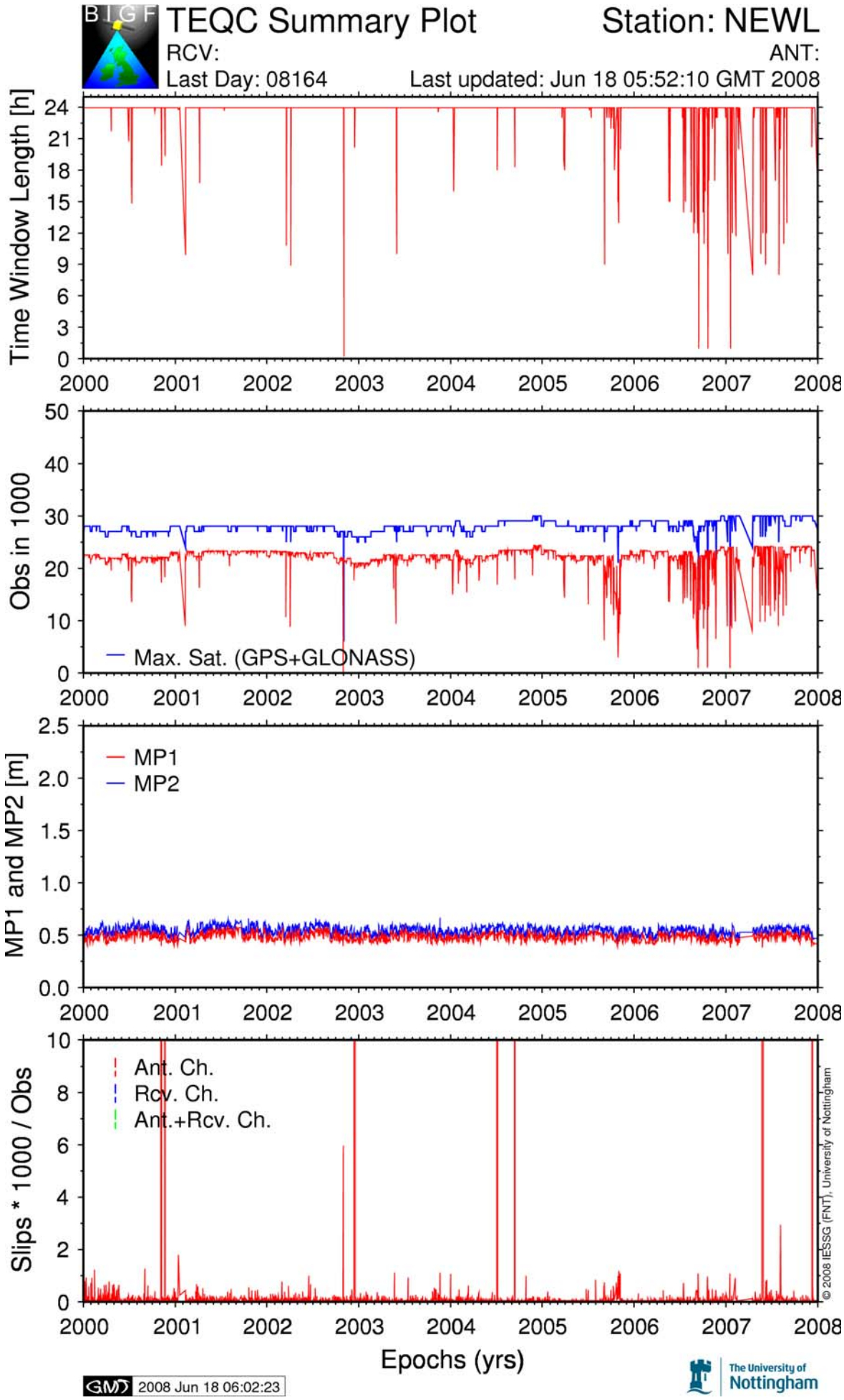
```
     NEWL Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Richard Bingley
     Date Prepared            : 2003-12-12
     Report Type              : NEW
     If Update:
      Previous Site Log       :
      Modified/Added Sections :


1.   Site Identification of the GNSS Monument

     Site Name                : Newlyn Tide Gauge
     Four Character ID        : NEWL
     Monument Inscription     :
     IERS DOMES Number        : 13273M103
     CDP Number               : (A4)
     Monument Description     : STEEL PLATE AND CARBON FIBRE PIPE
       Height of the Monument : 3.0m
       Monument Foundation    : LIGHTHOUSE
       Foundation Depth       : (m)
     Marker Description       : TOP OF 40mm DIA THREAD ON STEEL PLATE
     Date Installed           : 1998-09-29T12:00Z
     Geologic Characteristic  : BEDROCK
       Bedrock Type           : SEDIMENTARY (SANDSTONE)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : The monument is mounted on the
                              : observation platform of a steel
                              : lighthouse adjacent to the tide gauge
                              : building, which is located at the end
                              : of a stone pier, which is founded
                              : on the Sandstone bedrock
                              : The GPS antenna is located on the monument
                              : which consists of a 3m carbon fibre pipe mounted
                              : on a steel plate, which is fixed to the
                              : observation platform.
                              : The GPS antenna is attached to the carbon fibre
                              : pipe using a 5/8" thread.
                              : The carbon fibre pipe is attached to the steel
                              : plate using a 40 mm diameter thread.
                              : The male part of the 40mm diameter thread is on
                              : the steel plate and has a domed head, which
                              : serves as the survey marker.


2.   Site Location Information

     City or Town             : Newlyn
     State or Province        : Cornwall
     Country                  : England
     Tectonic Plate           : EURASIAN
     Approximate Position
       X coordinate (m)       : 4079954.1
       Y coordinate (m)       : -395930.4
       Z coordinate (m)       : 4870196.8
       Latitude (N is +)      : +500610.90
       Longitude (E is +)     : -0053234.04
       Elevation (m,ellips.)  : 64.5
     Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 02964
     Firmware Version         : 1F50
     Elevation Cutoff Setting : 5
```

```
     Date Installed           : 1998-09-30T00:00Z
     Date Removed             : 1999-08-15T23:59Z
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 02964.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRS1F50 and
                              : CGHOSE v5.4.00 CGRS1F50
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0)

3.2  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 02964
     Firmware Version         : CD00
     Elevation Cutoff Setting : 5
     Date Installed           : 1999-08-17T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 02964.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRSCD00 and
                              : CGHOSE v6.0.00 CGRSCD00.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.x  Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
     Satellite System         : (GPS/GLONASS/GPS+GLONASS)
     Serial Number            : (A5)
     Firmware Version         : (A11)
     Elevation Cutoff Setting : (deg)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : (none or tolerance in degrees C)
     Additional Information   : (multiple lines)


4.   GNSS Antenna Information

4.1  Antenna Type             : ASH700936D_M    SNOW
     Serial Number            : 15402
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   2.9650
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 1998-09-30T00:00Z
     Date Removed             : 2001-01-17T23:59Z
     Additional Information   : Full antenna serial number is CR 15042.
                              : Antenna cable damaged in 2001-01

4.2  Antenna Type             : ASH700936D_M    SNOW
     Serial Number            : 15402
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   2.9650
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 2001-02-09T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is CR 15042.
                              : New antenna cable installed

4.x  Antenna Type             : (A20 from rcvr_ant.tab; see instructions)
     Serial Number            : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
```

```
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


5.   Surveyed Local Ties

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : (m)
       dy (m)                 : (m)
       dz (m)                 : (m)
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


6.   Frequency Standard

6.1  Standard Type            : INTERNAL
       Input Frequency        : (if external)
       Effective Dates        : 1998-09-30/CCYY-MM-DD
       Notes                  : (multiple lines)

6.x  Standard Type            : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
       Input Frequency        : (if external)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


7.   Collocation Information

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.1 Humidity Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.1.x Humidity Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.1 Pressure Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.x Pressure Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
```

```
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.1 Temp. Sensor Model      : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.x Temp. Sensor Model      :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.1 Water Vapor Radiometer  : NONE
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer  :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.x Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degradations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.2.x Multipath Sources       : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.3.x Signal Obstructions     : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)


10.  Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)


11.  On-Site, Point of Contact Agency Information

     Agency                   : Newlyn Pier and Harbour Commissioners
     Preferred Abbreviation   : NPHC
     Mailing Address          : Newlyn
                              : Penzance
                              : Cornwall
```

```
                              : UK

     Primary Contact
       Contact Name           : Andrew Munson (Harbour Master)
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           : Richard Turner (Tide Gauge)
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Additional Information   : (multiple lines)


12.  Responsible Agency (if different from 11.)

     Agency                   : IESSG
     Preferred Abbreviation   : IESSG
     Mailing Address          : University of Nottingham
                              : University Park
                              : Nottingham NG72RD
                              : UK
     Primary Contact
       Contact Name           : Richard Bingley
       Telephone (primary)    : +44 (0)115 9513932
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : richard.bingley@nottingham.ac.uk
     Secondary Contact
       Contact Name           : IESSG Experimental Officers
       Telephone (primary)    : +44 (0)115 9513921
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : iessg@nottingham.ac.uk
     Additional Information   : NEWL is operated by the IESSG for the
                              : Proudman Oceanographic Laboratory and
                              : the UK Department for Environment, Food
                              : and Rural Affairs (DEFRA)


13.  More Information

     Primary Data Center      : BKGE
     Secondary Data Center    :
     URL for More Information : http://www.bigf.ac.uk
     Hardcopy on File
       Site Map               : Y
       Site Diagram           : Y
       Horizon Mask           : Y
       Monument Description   : Y
       Site Pictures          : Y
     Additional Information   : (multiple lines)
     Antenna Graphics with Dimensions

ASH700936D_M

                      -----
                    /     +     \                      <--  0.128  L2
                   |      +      |                     <--  0.110  L1
  +------------------------------------------------+    <--  0.102  TCR
  |                                                |
  |                                                |
  |                                                |
  |                                                |
+-+------------------------------------------------+-+  <--  0.038
+------------------+-------------+-------------------+  <--  0.035  BCR
                   |             |
                  =|             |
                   +------x------+                     <--  0.000  BPA=ARP

<--                     0.381                      -->

   ARP: Antenna Reference Point
   L1 : L1 Phase Center                 L2 : L2 Phase Center
   TCR: Top of Chokering                BCR: Bottom of Chokering
```


TEQC Summary Plot
Station: NEWL
RCV:
ANT:
Last Day: 08164
Last updated: Jun 18 05:52:10 GMT 2008
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS+GLONASS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
Epochs (yrs)
GMT 2008 Jun 18 06:02:23
The University of Nottingham
© 2008 IESSG (FNT), University of Nottingham

North Shields

```
     NSTG Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Richard Bingley
     Date Prepared            : 2003-11-??
     Report Type              : UPDATE
     If Update:
      Previous Site Log       : nstg_20031021.log
      Modified/Added Sections : 4.10


1.   Site Identification of the GNSS Monument

     Site Name                : North Shields Tide Gauge
     Four Character ID        : NSTG
     Monument Inscription     :
     IERS DOMES Number        : 13216M001
     CDP Number               : (A4)
     Monument Description     : ALUMINIUM POLE
       Height of the Monument : 4.00m
       Monument Foundation    : QUAY
       Foundation Depth       : 2.4m
     Marker Description       : BOTTOM OF 5/8" THREAD ON 4m ALUMINIUM POLE
     Date Installed           : 1998-03-07T12:00Z
     Geologic Characteristic  : BOULDER CLAY
       Bedrock Type           : SEDIMENTARY (WESTPHALIAN)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : The monument is mounted in the
                              : tide gauge building, which is located
                              : on a concrete quay, with piled
                              : foundations
                              : The GPS antenna is located on the monument
                              : which consists of a 4m aluminium pole, which is
                              : fixed to the concrete quay, in the tide gauge
                              : building.
                              : The GPS antenna is attached to the aluminium
                              : pole using a 5/8" thread.
                              : The male part of the 5/8" thread is on the
                              : aluminium pole and the bottom of the thread
                              : serves as the survey marker.


2.   Site Location Information

     City or Town             : North Shields
     State or Province        : Northumbria
     Country                  : England
     Tectonic Plate           : EURASIAN
     Approximate Position
       X coordinate (m)       : 3664792.2
       Y coordinate (m)       : -92117.3
       Z coordinate (m)       : 5201903.7
       Latitude (N is +)      : +550026.70
       Longitude (E is +)     : -0012623.53
       Elevation (m,ellips.)  : 56.9
     Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : ??????
     Firmware Version         : 1I00
     Elevation Cutoff Setting : 5
     Date Installed           : 1998-03-15T00:00Z
     Date Removed             : 1998-08-23T23:59Z
     Temperature Stabiliz.    : NONE
```

```
     Additional Information   : Full receiver serial number not known.
                              : Not continuous operation.
                              : Download using HOSE?
                              : Conversion to RINEX using ASHTORIN
                              : (with codephase smoothing).

3.2  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 982
     Firmware Version         : 1I00
     Elevation Cutoff Setting : 5
     Date Installed           : 1999-08-10T00:00Z
     Date Removed             : 1999-08-13T23:59Z
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number not known.
                              : Not continuous operation.
                              : Download using HOSE?
                              : Conversion to RINEX using ASHTORIN
                              : (with codephase smoothing).

3.3  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : ??????
     Firmware Version         : 1L00
     Elevation Cutoff Setting : 5
     Date Installed           : 1999-12-03T00:00Z
     Date Removed             : 1999-12-09T23:59Z
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number not known.
                              : Not continuous operation.
                              : Download using HOSE?
                              : Conversion to RINEX using ASHTORIN
                              : (with codephase smoothing).

3.4  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 00111
     Firmware Version         : 1L00
     Elevation Cutoff Setting : 5
     Date Installed           : 2000-02-12T00:00Z
     Date Removed             : 2000-10-15T23:59Z
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 00111.

3.5  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 00111
     Firmware Version         : CD00
     Elevation Cutoff Setting : 5
     Date Installed           : 2001-05-15T00:00Z
     Date Removed             : 2002-04-03T23:59Z
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 00111.
                              : Operation using a direct modem connection
                              : Download using CGREMOTE v5.4.00 CGRSCD00 and
                              : CGHOSE v6.0.00 CGRSCD00.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.6  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 01845
     Firmware Version         : CD00
     Elevation Cutoff Setting : 5
     Date Installed           : 2002-04-05T00:00Z
     Date Removed             : 2002-05-16T23:59Z
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 01845.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRSCD00 and
                              : CGHOSE v6.0.00 CGRSCD00.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.7  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 00111
     Firmware Version         : CD00
     Elevation Cutoff Setting : 5
     Date Installed           : 2002-05-18T00:00Z
```

```
     Date Removed             : CCYY-MM-DDThh:mmZ
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 00111.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRSCD00 and
                              : CGHOSE v6.0.00 CGRSCD00.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.x  Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
     Satellite System         : (GPS/GLONASS/GPS+GLONASS)
     Serial Number            : (A5)
     Firmware Version         : (A11)
     Elevation Cutoff Setting : (deg)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : (none or tolerance in degrees C)
     Additional Information   : (multiple lines)


4.   GNSS Antenna Information

4.1  Antenna Type             : ASH700936B_M
     Serial Number            : ?????
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : NONE
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     :
     Date Installed           : 1998-03-15T00:00Z
     Date Removed             : 1998-08-23T23:59Z
     Additional Information   : Full antenna serial number is not known.

4.2  Antenna Type             : ASH700936B_M    SNOW
     Serial Number            : 146
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     :
     Date Installed           : 1999-08-10T00:00Z
     Date Removed             : 1999-08-13T23:59Z
     Additional Information   : Full antenna serial number is not known.

4.3  Antenna Type             : ASH700936B_M    SNOW
     Serial Number            : ?????
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     :
     Date Installed           : 1999-12-03T00:00Z
     Date Removed             : 1999-12-09T23:59Z
     Additional Information   : Full antenna serial number is not known.

4.4  Antenna Type             : ASH700936B_M    SNOW
     Serial Number            : 13570
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     :
     Date Installed           : 2000-02-12T00:00Z
     Date Removed             : 2000-10-15T23:59Z
```

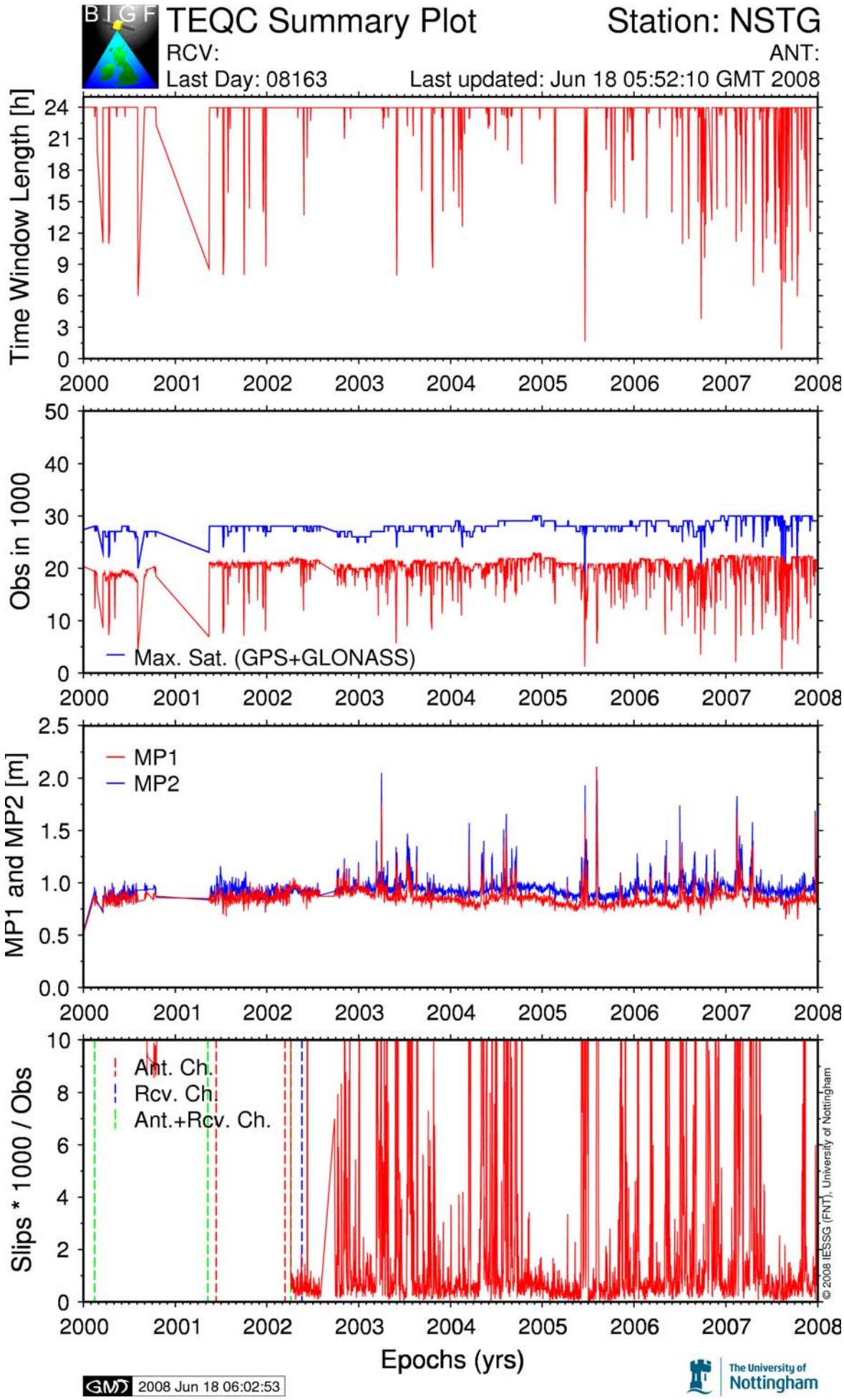
```
     Additional Information   : Full antenna serial number is CR 13570.

4.5  Antenna Type             : ASH700936B_M    SNOW
     Serial Number            : 13570
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     : 10m
     Date Installed           : 2001-05-15T00:00Z
     Date Removed             : 2001-06-12T12:59Z
     Additional Information   : Full antenna serial number is CR 13570.

4.6  Antenna Type             : ASH700936B_M    SNOW
     Serial Number            : 13570
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     : 30m
     Date Installed           : 2001-06-12T13:00Z
     Date Removed             : 2002-03-11T23:59Z
     Additional Information   : Full antenna serial number is CR 13570.

4.7  Antenna Type             : ASH701945C_M    SNOW
     Serial Number            : 10213
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     : 30m
     Date Installed           : 2002-03-13T00:00Z
     Date Removed             : 2002-04-03T23:59Z
     Additional Information   : Full antenna serial number is CR5 2001 0213.

4.8  Antenna Type             : ASH700936B_M    SNOW
     Serial Number            : 13570
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     : 30m
     Date Installed           : 2002-04-05T00:00Z
     Date Removed             : 2003-10-20T15:59Z
     Additional Information   : Full antenna serial number is CR 13570.

4.9  Antenna Type             : ASH700936B_M    SNOW
     Serial Number            : 13570
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     : 30m
     Date Installed           : 2003-10-20T16:00Z
     Date Removed             : 2003-11-18T10:00Z
     Additional Information   : Full antenna serial number is CR 13570.
                              : Antenna cable replaced.

4.10 Antenna Type             : ASH700936B_M    SNOW
     Serial Number            : 13570
```

```
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       :
     Antenna Cable Length     : 30m
     Date Installed           : 2003-11-18T11:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is CR 13570.
                              : Antenna cable replaced.

4.x  Antenna Type             : (A20 from rcvr_ant.tab; see instructions)
     Serial Number            : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


5.   Surveyed Local Ties

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : (m)
       dy (m)                 : (m)
       dz (m)                 : (m)
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


6.   Frequency Standard

6.1  Standard Type            : INTERNAL
       Input Frequency        : (if external)
       Effective Dates        : 1998-03-22/CCYY-MM-DD
       Notes                  : (multiple lines)

6.x  Standard Type            : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
       Input Frequency        : (if external)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


7.   Collocation Information

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.1 Humidity Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)
```

```
8.1.x Humidity Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.1 Pressure Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.x Pressure Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.1 Temp. Sensor Model      : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.x Temp. Sensor Model      :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.1 Water Vapor Radiometer  : NONE
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer  :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.x Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degradations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)
```

```
9.2.x Multipath Sources       : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.3.x Signal Obstructions     : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)


10.  Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)


11.  On-Site, Point of Contact Agency Information

     Agency                   : Port of Tyne Authority
     Preferred Abbreviation   :
     Mailing Address          : Neville House
                              : Bell Street
                              : North Shields NE30 1LJ
                              : UK
     Primary Contact
       Contact Name           : Port Control
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           : Martin Robertson
       Telephone (primary)    : +44 (0)191 2227834
       Telephone (secondary)  : +44 (0)191 2226445
       Fax                    : +44 (0)191 2228691
       E-mail                 : Martin.Robertson@newcastle.ac.uk
     Additional Information   : (multiple lines)


12.  Responsible Agency (if different from 11.)

     Agency                   : IESSG
     Preferred Abbreviation   : IESSG
     Mailing Address          : University of Nottingham
                              : University Park
                              : Nottingham NG72RD
                              : UK
     Primary Contact
       Contact Name           : Richard Bingley
       Telephone (primary)    : +44 (0)115 9513932
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : richard.bingley@nottingham.ac.uk
     Secondary Contact
       Contact Name           : IESSG Experimental Officers
       Telephone (primary)    : +44 (0)115 9513921
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : iessg@nottingham.ac.uk
     Additional Information   : NSTG is operated jointly by the
                              : University of Newcastle-upon-Tyne and
                              : the IESSG for the
                              : Proudman Oceanographic Laboratory and
                              : the UK Department for Environment, Food
                              : and Rural Affairs (DEFRA)

13.  More Information

     Primary Data Center      :
     Secondary Data Center    :
     URL for More Information : http://www.bigf.ac.uk
     Hardcopy on File
       Site Map               : Y
       Site Diagram           : Y
       Horizon Mask           : Y
       Monument Description   : Y
       Site Pictures          : Y
```

```
     Additional Information   : (multiple lines)
     Antenna Graphics with Dimensions

ASH700936B_M

                      -----
                    /     +     \                       <--  0.128  L2
                   |      +      |                      <--  0.110  L1
  +------------------------------------------------+    <--  0.102  TCR
  |                                                |
  |                                                |
  |                                                |
  |                                                |
+-+------------------------------------------------+-+  <--  0.038
+-------------------+-------------+--------------------+  <--  0.035  BCR
                    |             |
                   =|             |
                    +------x------+                      <--  0.000  BPA=ARP

<--                      0.381                       -->


   ARP: Antenna Reference Point
   L1 : L1 Phase Center                  L2 : L2 Phase Center
   TCR: Top of Chokering                 BCR: Bottom of Chokering
```


TEQC Summary Plot
Station: NSTG
RCV:
ANT:
Last Day: 08163
Last updated: Jun 18 05:52:10 GMT 2008
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS+GLONASS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
Epochs (yrs)
2008 Jun 18 06:02:53
The University of Nottingham
© 2008 IESSG (FNT), University of Nottingham

Portsmouth

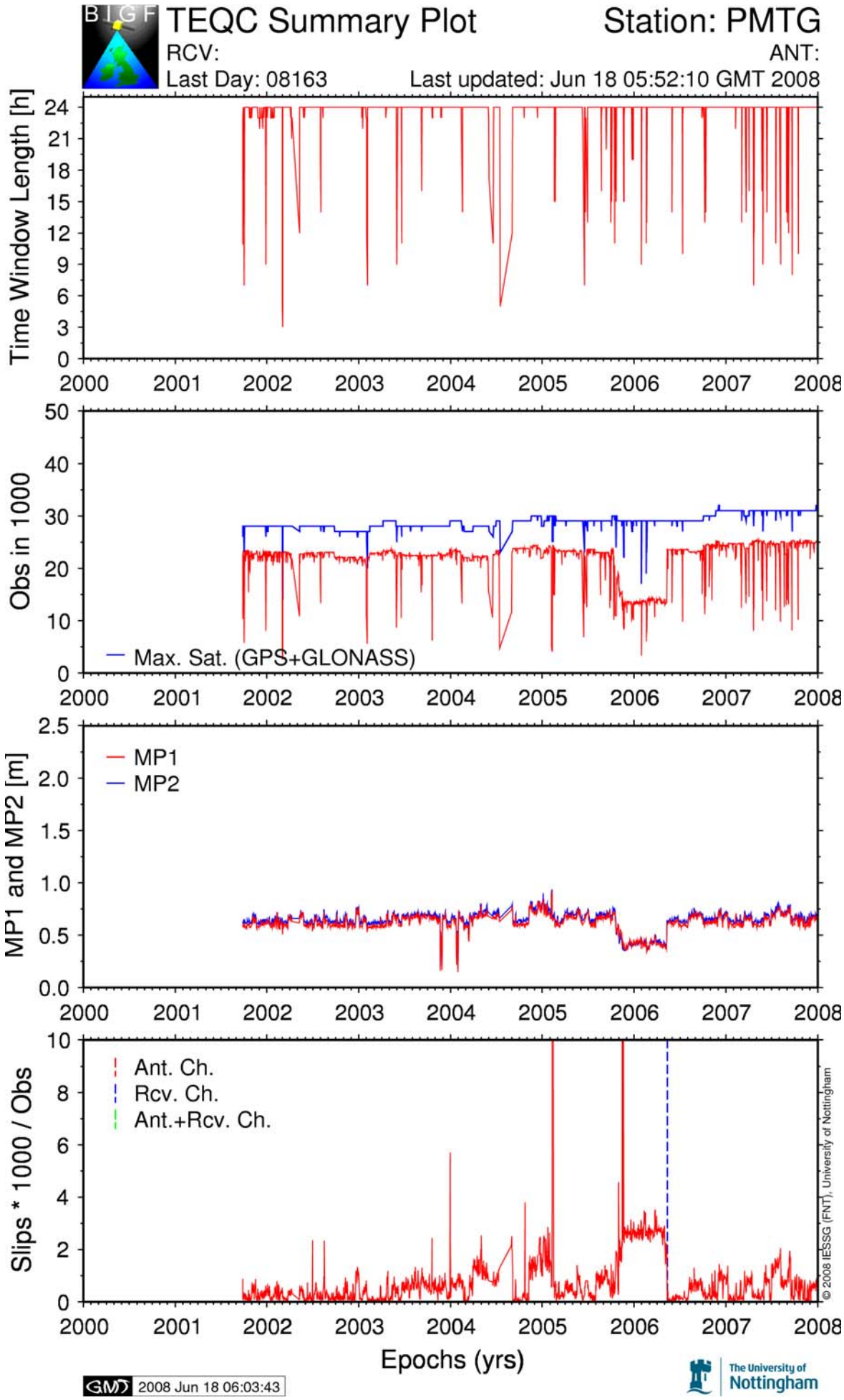
```
     PMTG Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Richard Bingley
     Date Prepared            : 2001-09-25
     Report Type              : UPDATE
     If Update:
      Previous Site Log       : pmtg_20011212.log
      Modified/Added Sections : 3.1, 3.2


1.   Site Identification of the GNSS Monument

     Site Name                : Portsmouth Tide Gauge
     Four Character ID        : PMTG
     Monument Inscription     :
     IERS DOMES Number        : 13289M003
     CDP Number               : (A4)
     Monument Description     : STEEL BRACKET
       Height of the Monument : 1.5m
       Monument Foundation    : BUILDING
       Foundation Depth       : (m)
     Marker Description       : TOP OF 5/8" THREAD ON 1.5m STEEL POLE/BRACKET
     Date Installed           : 2001-09-25T12:00Z
     Geologic Characteristic  : ALLUVIUM
       Bedrock Type           : SEDIMENTARY (BAGSHOT BEDS)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : The monument is mounted on the North end
                              : wall of a single storey brick building,
                              : which houses the tide gauge equipment,
                              : so that the antenna is raised above the
                              : roof apex.
                              : The GPS antenna is located on the monument
                              : which consists of a steel bracket with a 1.5m
                              : pole.
                              : The GPS antenna is attached to the steel pole
                              : using a 5/8" thread.
                              : The antenna height is taken as 0.000m (ie the
                              : survey marker is on the pole and is coincident
                              : with the GPS ARP).


2.   Site Location Information

     City or Town             : Portsmouth
     State or Province        : Hampshire
     Country                  : England
     Tectonic Plate           : EURASIAN
     Approximate Position
       X coordinate (m)       : 4038372.3
       Y coordinate (m)       : -78330.6
       Z coordinate (m)       : 4919718.8
       Latitude (N is +)      : +504808.36
       Longitude (E is +)     : -0010640.33
       Elevation (m,ellips.)  : 55.4
     Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type            : ASHTECH UZ-12
     Satellite System         : GPS
     Serial Number            : 10206
     Firmware Version         : CJ00
     Elevation Cutoff Setting : 5
     Date Installed           : 2001-09-25T00:00Z
     Date Removed             : 2006-05-11T11:00Z
     Temperature Stabiliz.    : NONE
```

```
     Additional Information   : Receiver is an Ashtech Micro-Z.
                              : Full receiver serial number is ZR 2001 0206.
                              : Operation using a direct modem connection.
                              : Download using MicroManager Pro v1.1.00 (2001).
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.2  Receiver Type            : ASHTECH UZ-12
     Satellite System         : GPS
     Serial Number            : 39007
     Firmware Version         : CQ00
     Elevation Cutoff Setting : 5
     Date Installed           : 2006-05-11T12:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Temperature Stabiliz.    : NONE
     Additional Information   : Receiver is an Ashtech Micro-Z.
                              : Full receiver serial number is UC1 2003 39007.
                              : Operation using a direct modem connection.
                              : Download using MicroManager Pro v1.2.00 (2002).
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.x  Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
     Satellite System         : (GPS/GLONASS/GPS+GLONASS)
     Serial Number            : (A5)
     Firmware Version         : (A11)
     Elevation Cutoff Setting : (deg)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : (none or tolerance in degrees C)
     Additional Information   : (multiple lines)


4.   GNSS Antenna Information

4.1  Antenna Type             : ASH701945C_M    SNOW
     Serial Number            : 10214
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   0.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 2001-09-25T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is CR5 2001 0214.
                              : The antenna radome is painted black.

4.x  Antenna Type             : (A20 from rcvr_ant.tab; see instructions)
     Serial Number            : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


5.   Surveyed Local Ties

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : (m)
       dy (m)                 : (m)
       dz (m)                 : (m)
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
```

```
     Additional Information   : (multiple lines)


6.   Frequency Standard

6.1  Standard Type            : INTERNAL
       Input Frequency        : (if external)
       Effective Dates        : 2001-09-26/CCYY-MM-DD
       Notes                  : (multiple lines)

6.x  Standard Type            : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
       Input Frequency        : (if external)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


7.   Collocation Information

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.1 Humidity Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.1.x Humidity Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.1 Pressure Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.x Pressure Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.1 Temp. Sensor Model      : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.x Temp. Sensor Model      :
```

```
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.1 Water Vapor Radiometer  : NONE
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer  :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.x Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degradations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.2.x Multipath Sources       : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.3.x Signal Obstructions     : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)


10.  Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)


11.  On-Site, Point of Contact Agency Information

     Agency                   : Queen's Harbour Master
     Preferred Abbreviation   :
     Mailing Address          : HM Naval Base
                              : Portsmouth
                              : Hampshire
                              : UK
     Primary Contact
       Contact Name           : CPO Surveyor for Queen's Harbour Master
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           :
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Additional Information   : (multiple lines)


12.  Responsible Agency (if different from 11.)
```

```
     Agency                    : IESSG
     Preferred Abbreviation    : IESSG
     Mailing Address           : University of Nottingham
                               : University Park
                               : Nottingham NG72RD
                               : UK
     Primary Contact
       Contact Name            : Richard Bingley
       Telephone (primary)     : +44 (0)115 9513932
       Telephone (secondary)   : +44 (0)115 9513880
       Fax                     : +44 (0)115 9513881
       E-mail                  : richard.bingley@nottingham.ac.uk
     Secondary Contact
       Contact Name            : IESSG Experimental Officers
       Telephone (primary)     : +44 (0)115 9513921
       Telephone (secondary)   : +44 (0)115 9513880
       Fax                     : +44 (0)115 9513881
       E-mail                  : iessg@nottingham.ac.uk
     Additional Information    : PMTG is operated by the IESSG for the
                               : Proudman Oceanographic Laboratory and
                               : the UK Department for Environment, Food
                               : and Rural Affairs (DEFRA)


13.  More Information

     Primary Data Center       :
     Secondary Data Center     :
     URL for More Information  : http://www.bigf.ac.uk
     Hardcopy on File
       Site Map                : Y
       Site Diagram            : Y
       Horizon Mask            : Y
       Monument Description    : Y
       Site Pictures           : Y
     Additional Information    : (multiple lines)
     Antenna Graphics with Dimensions

ASH701945C_M

                      -----
                    /     +     \                      <--  0.128  L2
                   |      +      |                     <--  0.110  L1
  +------------------------------------------------+    <--  0.102  TCR
  |                                                |
  |                                                |
  |                                                |
  |                                                |
+-+------------------------------------------------+-+  <--  0.038
+-------------------+-------------+-------------------+  <--  0.035  BCR
                    |             |
                   =|             |
                    +------x------+                     <--  0.000  BPA=ARP

<--                      0.381                      -->


   ARP: Antenna Reference Point
   L1 : L1 Phase Center                  L2 : L2 Phase Center
   TCR: Top of Chokering                 BCR: Bottom of Chokering
```


TEQC Summary Plot
Station: PMTG
RCV:
ANT:
Last Day: 08163
Last updated: Jun 18 05:52:10 GMT 2008
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS+GLONASS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
© 2008 IESSG (FNT), University of Nottingham
Epochs (yrs)
GMT 2008 Jun 18 06:03:43
The University of Nottingham

Sheerness

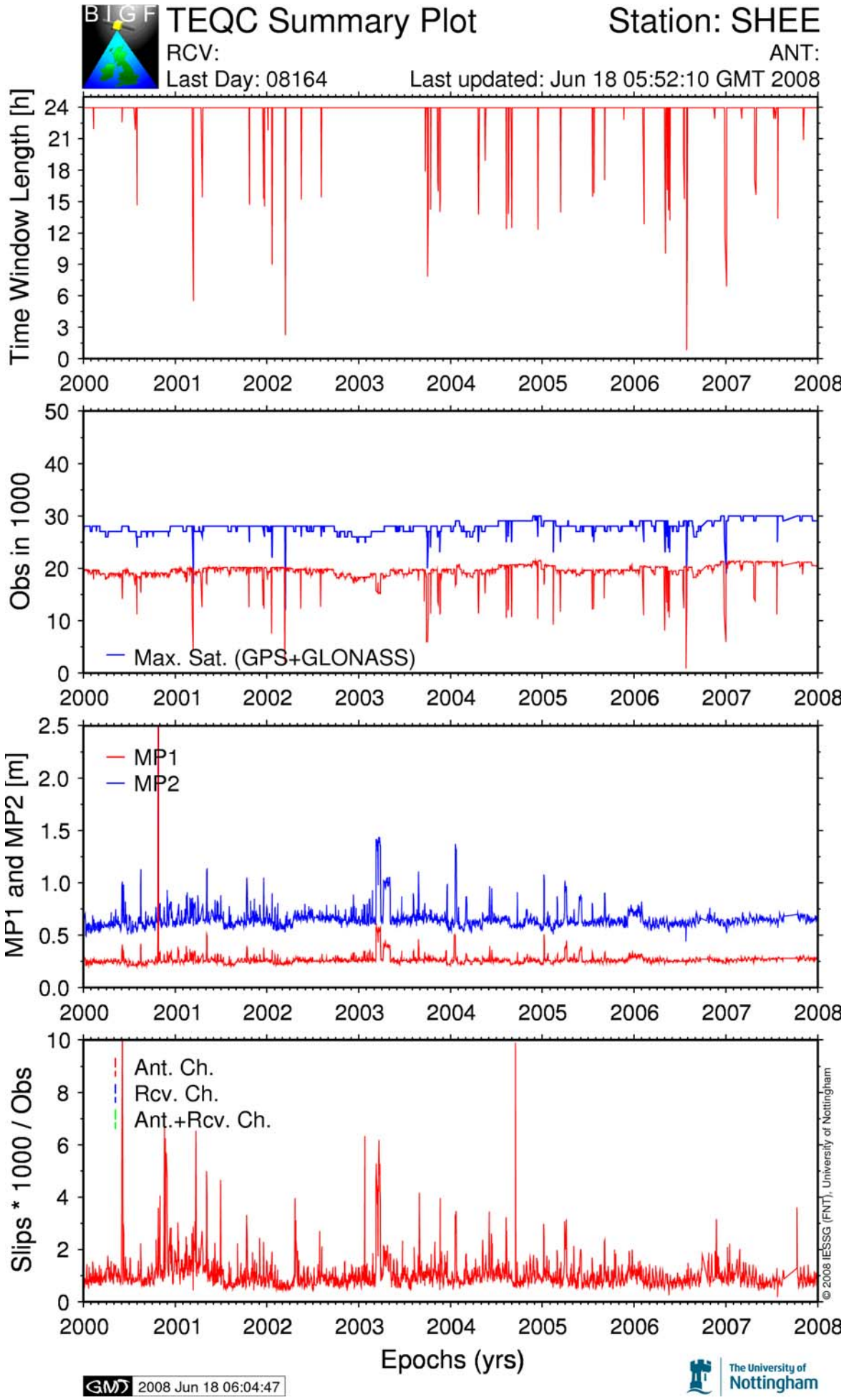
```
     SHEE Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Richard Bingley
     Date Prepared            : 2001-06-01
     Report Type              : NEW
     If Update:
      Previous Site Log       :
      Modified/Added Sections :


1.   Site Identification of the GNSS Monument

     Site Name                : Sheerness Tide Gauge
     Four Character ID        : SHEE
     Monument Inscription     :
     IERS DOMES Number        : 13236M001
     CDP Number               : (A4)
     Monument Description     : STEEL BRACKET
       Height of the Monument : 0.16m
       Monument Foundation    : ROOF
       Foundation Depth       : (m)
     Marker Description       : TOP OF 5/8" THREAD ON STEEL BRACKET
     Date Installed           : 1997-03-05T12:00Z
     Geologic Characteristic  : ALLUVIUM (CLAY, SILT, PEAT)
       Bedrock Type           : SEDIMENTARY (CHALK)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : The monument is mounted on the concrete
                              : slab roof of the tide gauge building,
                              : which is a single storey brick building
                              : located on a jetty with piled foundations.
                              : The GPS antenna is located on the monument
                              : which consists of a 0.16m high steel bracket
                              : fixed to the concrete roof of the tide gauge
                              : building.
                              : The GPS antenna is attached to the steel bracket
                              : using a 5/8" thread.
                              : The male part of the 5/8" thread is on the steel
                              : bracket and has a domed top, which serves as the
                              : survey marker.


2.   Site Location Information

     City or Town             : Sheerness
     State or Province        : Isle of Sheppey
     Country                  : England
     Tectonic Plate           : EURASIAN
     Approximate Position (ITRF)
       X coordinate (m)       : 3983074.5
       Y coordinate (m)       : 51683.0
       Z coordinate (m)       : 4964639.6
       Latitude (N is +)      : +512644.44
       Longitude (E is +)     : +0004436.27
       Elevation (m,ellips.)  : 53.3
     Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type            : TRIMBLE 4000SSI
     Satellite System         : GPS
     Serial Number            : 16407
     Firmware Version         : 7.21
     Elevation Cutoff Setting : 15
     Date Installed           : 1997-03-27T00:00Z
     Date Removed             : 1999-08-19T23:59Z
     Temperature Stabiliz.    : NONE
```

```
     Additional Information   : Full receiver serial number is 3628A16407.
                              : Operation using a direct modem connection.
                              : Download using RFILE v2.31 [21-MAR-97 TEST].
                              : Conversion to RINEX using DAT2RIN v2.20b.

3.2  Receiver Type            : TRIMBLE 4000SSI
     Satellite System         : GPS
     Serial Number            : 16407
     Firmware Version         : 7.29
     Elevation Cutoff Setting : 15
     Date Installed           : 1999-08-21T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is 3628A16407.
                              : Operation using a direct modem connection.
                              : Download using RFILE v2.35 (20 DEC 99).
                              : Conversion to RINEX using DAT2RIN v2.35a.

3.x  Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
     Satellite System         : (GPS/GLONASS/GPS+GLONASS)
     Serial Number            : (A5)
     Firmware Version         : (A11)
     Elevation Cutoff Setting : (deg)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : (none or tolerance in degrees C)
     Additional Information   : (multiple lines)


4.   GNSS Antenna Information

4.1  Antenna Type             : TRM29659.00     NONE
     Serial Number            : 66923
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :  -0.0070
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : NONE
     Radome Serial Number     :
     Antenna Cable Type       : TRIMBLE 14553-00
     Antenna Cable Length     : 10m
     Date Installed           : 1997-03-27T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is 0220066923.

4.x  Antenna Type             : (A20 from rcvr_ant.tab; see instructions)
     Serial Number            : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


5.   Surveyed Local Ties

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : (m)
       dy (m)                 : (m)
       dz (m)                 : (m)
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


6.   Frequency Standard
```

```
6.1  Standard Type            : INTERNAL
       Input Frequency        : (if external)
       Effective Dates        : 2001-03-27/CCYY-MM-DD
       Notes                  : (multiple lines)

6.x  Standard Type            : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
       Input Frequency        : (if external)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


7.   Collocation Information

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.1 Humidity Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.1.x Humidity Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.1 Pressure Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.x Pressure Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.1 Temp. Sensor Model      : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.x Temp. Sensor Model      :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
```

```
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.1 Water Vapor Radiometer  : NONE
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer  :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.x Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degradations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.2.x Multipath Sources       : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.3.x Signal Obstructions     : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)


10.  Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)


11.  On-Site, Point of Contact Agency Information

     Agency                   : Medway Ports
     Preferred Abbreviation   : (A10)
     Mailing Address          : Sheerness Docks
                              : Sheerness
                              : Kent ME121RX
                              : UK
     Primary Contact
       Contact Name           : Mike Hillier
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           : Phillip Woodgate
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Additional Information   : (multiple lines)


12.  Responsible Agency (if different from 11.)

     Agency                   : IESSG
     Preferred Abbreviation   : IESSG
     Mailing Address          : University of Nottingham
                              : University Park
```

```
                              : Nottingham NG72RD
                              : UK
     Primary Contact
       Contact Name           : Richard Bingley
       Telephone (primary)    : +44 (0)115 9513932
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : richard.bingley@nottingham.ac.uk
     Secondary Contact
       Contact Name           : IESSG Experimental Officers
       Telephone (primary)    : +44 (0)115 9513921
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : iessg@nottingham.ac.uk
     Additional Information   : SHEE is operated by the IESSG for the
                              : Environment Agency of England and Wales


13.  More Information

     Primary Data Center      :
     Secondary Data Center    :
     URL for More Information : http://www.bigf.ac.uk
     Hardcopy on File
       Site Map               : Y
       Site Diagram           : Y
       Horizon Mask           : Y
       Monument Description   : Y
       Site Pictures          : Y
     Additional Information   : (multiple lines)
     Antenna Graphics with Dimensions

TRM29659.00

                        -----
                      /     +     \                       <--  0.128  L2
                     |      +      |                      <--  0.110  L1
   +-------------------------------------------------+    <--  0.102  TCR
   |                                                 |
   |                                                 |
   |                                                 |
   |                                                 |
+-+-------------------------------------------------+-+  <--  0.038
+-------------------+-------------+-------------------+  <--  0.035  BCR
                     |             |
                    =|             |
                     +------x------+                      <--  0.000  BPA=ARP

<--                       0.381                       -->


   ARP: Antenna Reference Point
   L1 : L1 Phase Center                  L2 : L2 Phase Center
   TCR: Top of Chokering                 BCR: Bottom of Chokering
```


TEQC Summary Plot
Station: SHEE
RCV:
ANT:
Last Day: 08164
Last updated: Jun 18 05:52:10 GMT 2008
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS+GLONASS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
© 2008 IESSG (FNT), University of Nottingham
Epochs (yrs)
GMT 2008 Jun 18 06:04:47
The University of Nottingham

Stornoway

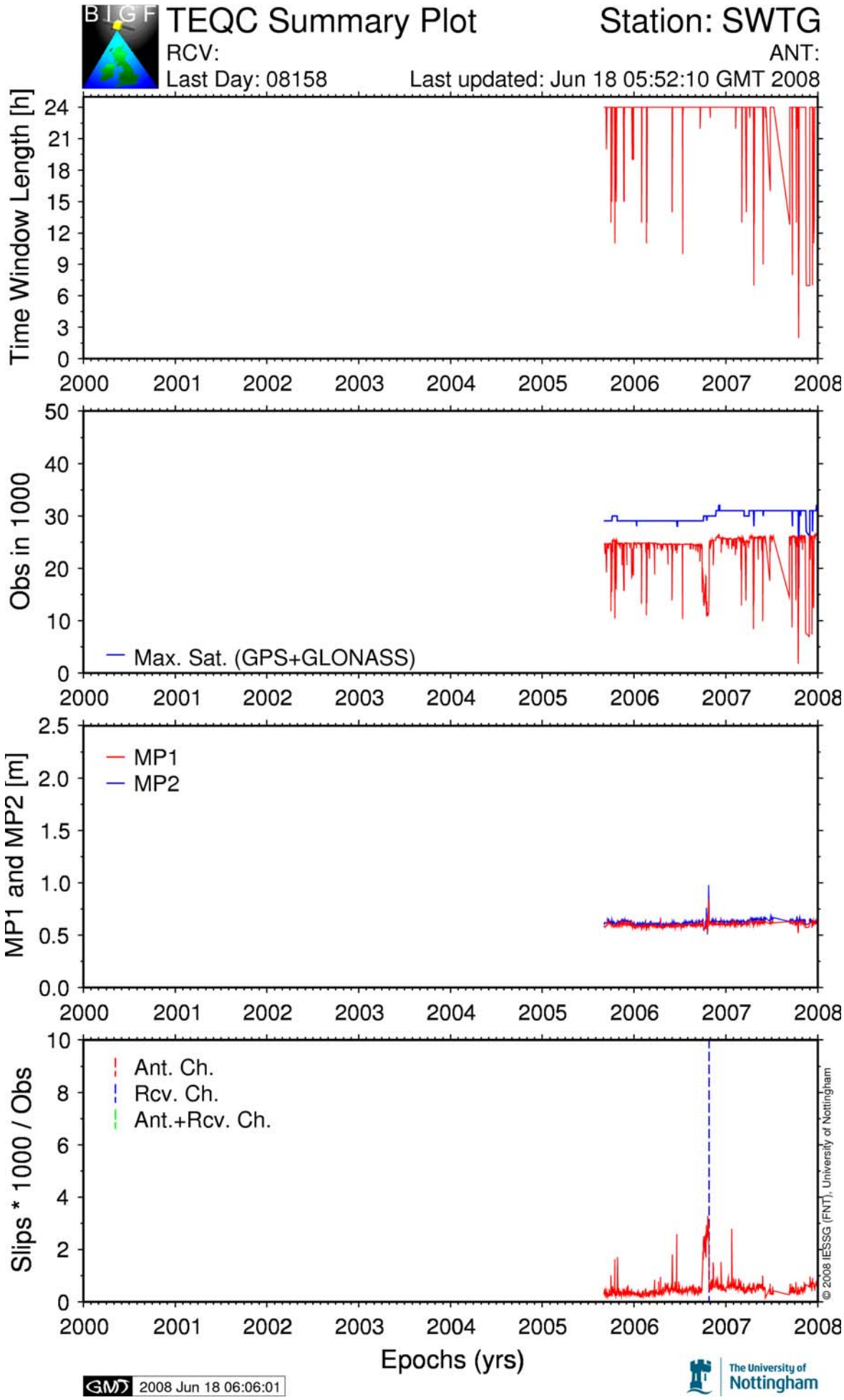
```
     SWTG Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Richard Bingley
     Date Prepared            : 2005-09-02
     Report Type              : UPDATE
     If Update:
      Previous Site Log       : swtg_20060902
      Modified/Added Sections : 3.1, 3.2


1.   Site Identification of the GNSS Monument

     Site Name                : Stornoway Tide Gauge
     Four Character ID        : SWTG
     Monument Inscription     :
     IERS DOMES Number        : (A9)
     CDP Number               : (A4)
     Monument Description     : STEEL PLATE AND CARBON FIBRE PIPE
       Height of the Monument : 2.0m
       Monument Foundation    : WHARF
       Foundation Depth       : (m)
     Marker Description       : TOP OF 40mm DIA THREAD ON STEEL PLATE
     Date Installed           : 2005-09-01T15:00Z
     Geologic Characteristic  : BEDROCK
       Bedrock Type           : SEDIMENTARY (SANDSTONE)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : The monument is mounted about 20m from the
                              : tide gauge building, and located on No 2 Wharf.
                              : The GPS antenna is located on the monument
                              : which consists of a 2m carbon fibre pipe mounted
                              : on a steel plate, which is fixed to the concrete
                              : of the Wharf.
                              : The GPS antenna is attached to the carbon fibre
                              : pipe using a 5/8" thread.
                              : The carbon fibre pipe is attached to the steel
                              : plate using a 40 mm diameter thread.
                              : The male part of the 40mm diameter thread is on
                              : the steel plate and has a domed head, which
                              : serves as the survey marker.

2.   Site Location Information

     City or Town             : Stornoway
     State or Province        : Isle of Lewis
     Country                  : Scotland
     Tectonic Plate           : EURASIAN
     Approximate Position
       X coordinate (m)       :
       Y coordinate (m)       :
       Z coordinate (m)       :
       Latitude (N is +)      :
       Longitude (E is +)     :
       Elevation (m,ellips.)  :
     Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type            : ASHTECH UZ-12
     Satellite System         : GPS
     Serial Number            : 13830
     Firmware Version         : CJ00
     Elevation Cutoff Setting : 5
     Date Installed           : 2005-09-02T00:00Z
     Date Removed             : 2006-10-25T23:59Z
     Temperature Stabiliz.    : NONE
     Additional Information   : Receiver is an Ashtech Micro-Z.
```

```
                              : Full receiver serial number is ZR2 2001 3830.
                              : Operation using a direct modem connection.
                              : Download using MicroManager Pro v1.1.00 (2001).
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.2  Receiver Type            : ASHTECH UZ-12
     Satellite System         : GPS
     Serial Number            : 08002
     Firmware Version         : CN00
     Elevation Cutoff Setting : 5
     Date Installed           : 2006-10-27T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Temperature Stabiliz.    : NONE
     Additional Information   : Receiver is an Ashtech Micro-Z.
                              : Full receiver serial number is UC1 2004 08002.
                              : Operation using a direct modem connection.
                              : Download using MicroManager Pro v1.1.00 (2001).
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

3.x  Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
     Satellite System         : (GPS/GLONASS/GPS+GLONASS)
     Serial Number            : (A5)
     Firmware Version         : (A11)
     Elevation Cutoff Setting : (deg)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : (none or tolerance in degrees C)
     Additional Information   : (multiple lines)


4.   GNSS Antenna Information

4.1  Antenna Type             : ASH701945C_M    SNOW
     Serial Number            : 14802
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   2.0000
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 2005-09-02T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is CR5 2001 4802.

4.x  Antenna Type             : (A20 from rcvr_ant.tab; see instructions)
     Serial Number            : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


5.   Surveyed Local Ties

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 : (m)
       dy (m)                 : (m)
       dz (m)                 : (m)
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)
```

```
6.   Frequency Standard

6.1  Standard Type            : INTERNAL
       Input Frequency        : (if external)
       Effective Dates        : 2005-09-02/CCYY-MM-DD
       Notes                  : (multiple lines)

6.x  Standard Type            : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
       Input Frequency        : (if external)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


7.   Collocation Information

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.1 Humidity Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.1.x Humidity Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.1 Pressure Sensor Model   : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.x Pressure Sensor Model   :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.1 Temp. Sensor Model      : NONE
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.x Temp. Sensor Model      :
       Manufacturer           :
       Serial Number          :
```

```
       Data Sampling Interval : (sec)
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.1 Water Vapor Radiometer  : NONE
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer  :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.x Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degradations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.2.x Multipath Sources       : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.3.x Signal Obstructions     : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)


10.  Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                     : (CCYY-MM-DDThh:mmZ)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)


11.  On-Site, Point of Contact Agency Information

     Agency                   : Stornoway Port Authority
     Preferred Abbreviation   :
     Mailing Address          : Amity House, Esplanade Quay
                              : Stornoway
                              : Isle of Lewis HS1 2XS
                              : UK
     Primary Contact
       Contact Name           : Deputy Harbour Master
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           :
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Additional Information   : (multiple lines)


12.  Responsible Agency (if different from 11.)

     Agency                   : IESSG
```

```
     Preferred Abbreviation   : IESSG
     Mailing Address          : University of Nottingham
                              : University Park
                              : Nottingham NG72RD
                              : UK
     Primary Contact
       Contact Name           : Richard Bingley
       Telephone (primary)    : +44 (0)115 9513932
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : richard.bingley@nottingham.ac.uk
     Secondary Contact
       Contact Name           : IESSG Experimental Officers
       Telephone (primary)    : +44 (0)115 9513921
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : iessg@nottingham.ac.uk
     Additional Information   : LWTG is operated by the IESSG for the
                              : Proudman Oceanographic Laboratory and
                              : the UK Department for Environment, Food
                              : and Rural Affairs (DEFRA)


13.  More Information

     Primary Data Center      :
     Secondary Data Center    :
     URL for More Information : http://www.bigf.ac.uk
     Hardcopy on File
       Site Map               : Y
       Site Diagram           : Y
       Horizon Mask           : Y
       Monument Description   : Y
       Site Pictures          : Y
     Additional Information   : (multiple lines)
     Antenna Graphics with Dimensions

ASH701945C_M

                       -----
                     /     +     \                      <--  0.128  L2
                    |      +      |                     <--  0.110  L1
   +-------------------------------------------------+   <--  0.102  TCR
   |                                                 |
   |                                                 |
   |                                                 |
   |                                                 |
+-+-------------------------------------------------+-+  <--  0.038
+-------------------+-------------+-------------------+  <--  0.035  BCR
                    |             |
                   =|             |
                    +------x------+                      <--  0.000  BPA=ARP

<--                      0.381                       -->


   ARP: Antenna Reference Point
   L1 : L1 Phase Center                 L2 : L2 Phase Center
   TCR: Top of Chokering                BCR: Bottom of Chokering
```


TEQC Summary Plot
Station: SWTG
RCV:
ANT:
Last Day: 08158
Last updated: Jun 18 05:52:10 GMT 2008
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS+GLONASS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
© 2008 IESSG (FNT), University of Nottingham
Epochs (yrs)
GMT 2008 Jun 18 06:06:01
The University of Nottingham

Report on gauges in the South Atlantic

Gauges in the South Atlantic

In 2007, the Oceans 2025 funding programme, Theme 10 Sustained Observations, replaced what was formerly known as the ACCLAIM (Antarctic Circumpolar Current Levels by Altimetry and Island Measurements) programme in the South Atlantic and Southern Oceans under Work Package 7: The UK contribution to GLOSS. The project consists of measurements from coastal tide gauges and bottom pressure stations.

Historical background to the ACCLAIM project

Phase 1 of ACCLAIM Coastal Gauges

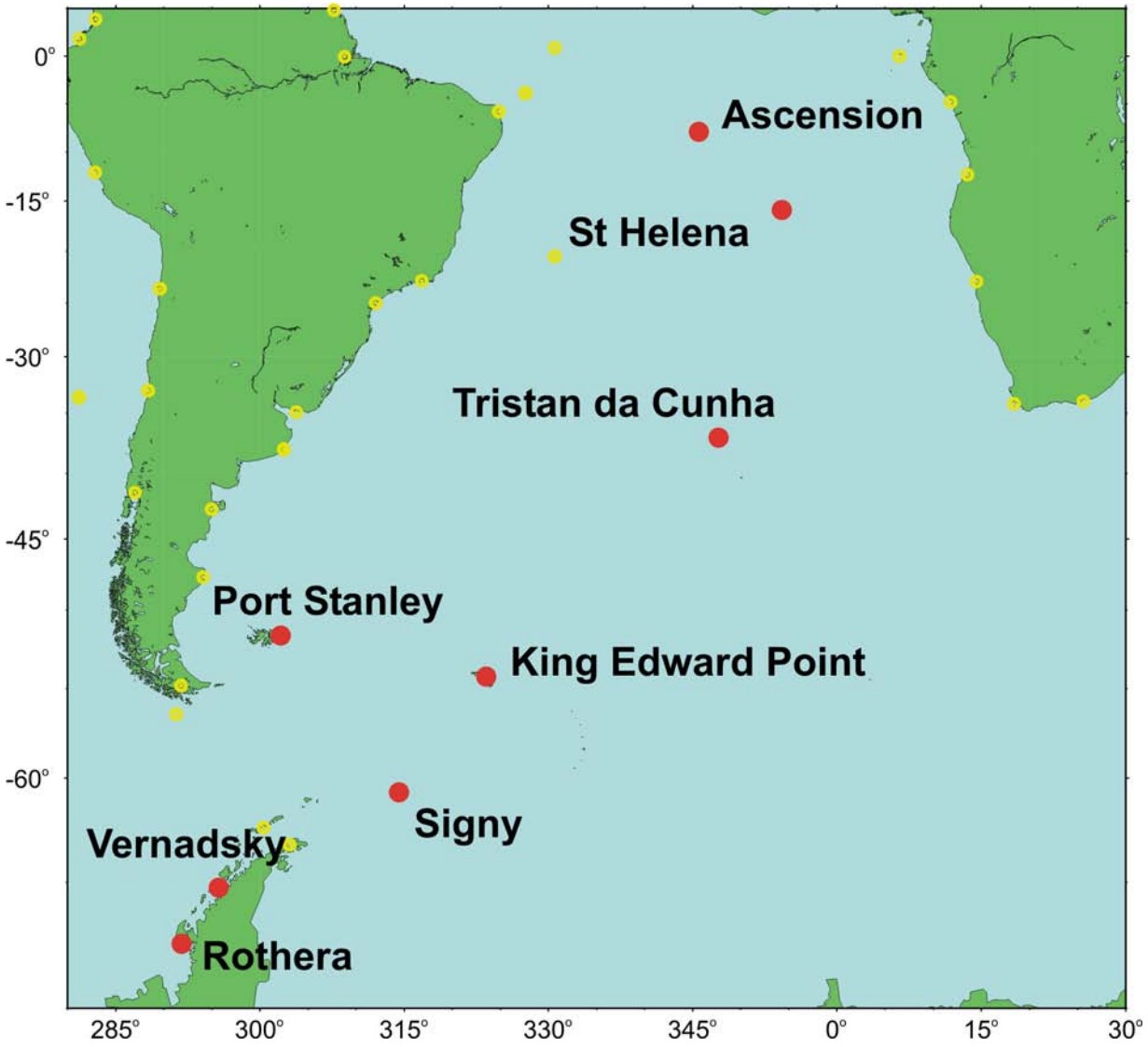
Phase 1 of ACCLAIM began in 1983, and measurements at coastal tide gauge sites took the form of sub-surface pressure (SSP) measurements (units of pressure e.g. mbar) rather than sea level (units of length e.g. centimetres). SSP is here defined as the total, measured pressure recorded by a sub-surface pressure transducer, a measurement which includes the pressure load from the atmosphere as well as from the water column. It is absolutely essential that any user of ACCLAIM data realises which data type (either SSP or sea level) is being analysed.

The Phase 1 coastal SSP data were acquired in different ways (e.g. with a diver-replaced Aanderaa pressure gauge at Ascension, or with a Digiquartz in the sea sensor at St. Helena, see Spencer et al. 1993 for details) and with different pressure integration periods (e.g. quarter hour, half hour, one hour). For some data sets, the original data have been filtered to give one hour sampling. However, common to all records is an uncertainty connected with potential offset biases and drifts in the pressure sensors. At some sites (e.g. St. Helena) extensive tide pole data are also available and biases and long term drifts in the sensor data may eventually be rectified. However, the drifts in general mean that in most cases the records should not be used for the study of timescales seasonal or longer, without further careful attention in particular studies.

Phase 2 of ACCLAIM Coastal Gauges

From around early 1993, the gauges at several sites were replaced by 'B gauges' which record SSP, air pressure and sea level. These gauges have precise datum control and are used to provide long term sea level change data to the PSMSL.

Some Phase 1 and all Phase 2 coastal data will contain ancillary information on air pressures and sea temperatures from ACCLAIM sensors. Several of these records contain large gaps. However, POL has collected extensive sets of such ancillary data from meteorological agencies for its own analysis purposes, and should be able to provide further advice.



UK Contribution to GLOSS

Red dots on the above map indicate sites of POL's South Atlantic coastal tide gauge network, while the yellow dots show gauges (not necessarily operational) committed to the GLOSS programme by other countries in the region.

At the present time the tide gauge sites at Ascension, St. Helena, Port Stanley and Rothera can be considered to be complete 'Phase 2' sites, while Tristan and Signy remain 'Phase 1' (i.e. simple pressure transducer sites). At Vernadsky (now owned by the Ukraine) there is a conventional float gauge, which constitutes the longest tide gauge record in Antarctica, together with a 'Phase 1' transducer.

Information on data presented below is from the latest series collected. More information on this and previous data collected can be found at the ACCLAIM website:

http://www.pol.ac.uk/ntslf/acclaimdata

There are three directories: bprs, phase1 and phase2. Each has an inventory file, giving more information about the tide gauges.

Ascension

Latitude: 07° 54.0' S Longitude: 014° 23.0' W

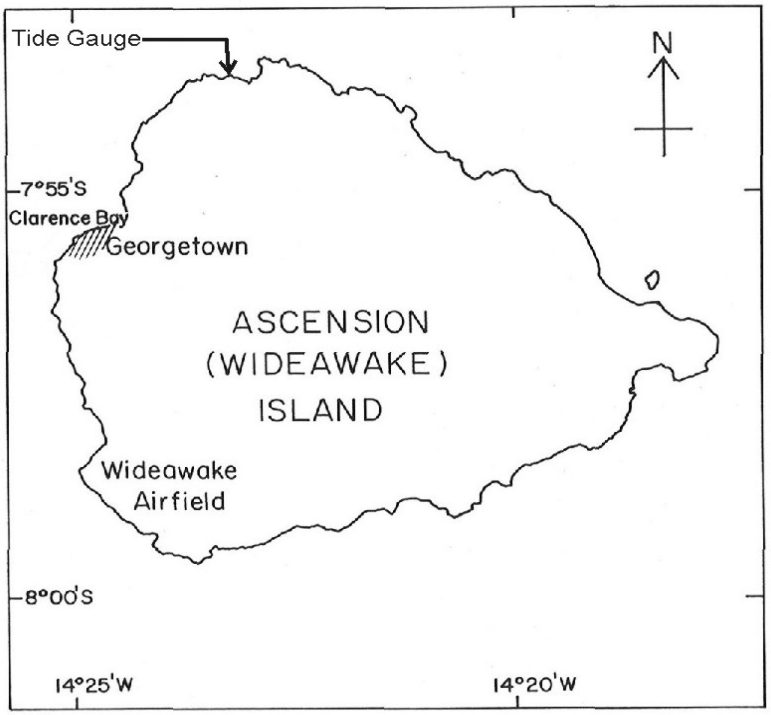
Instrument type: All-in-one ‘B’ pressure gauge, Kalesto radar gauge with Orbcomm

Site of Gauge: English Bay, Hook Jetty.

Benchmarks and Benchmark relationships:
“Ascension B-datum March 1999” is 3.176m below benchmark POL13 (POL13 BM).

The system was last refurbished in September 2005.

Real/near-real time data:
http://www.pol.ac.uk/ntslf/sadata_islands_ntslf_radar.php?code=0008&span=1



King Edward Point, South Georgia

Latitude: 54° 17.0' S Longitude: 036° 30.0' W

Instrument type: Real time Portux gauge with two KPSI pressure sensors returning data by email.

Site of Gauge: Located in boat shed next to jetty, with sensors mounted on quayside.

Benchmarks and Benchmark relationships:
TGZ is approximately 1878mm below the edge of the quayside. The quayside is 1340mm above ACD. Levelling needs to be carried out to confirm this.

Real/near-real time data:
http://www.pol.ac.uk/ntslf/sadata_kep.php?code=PORTK001&span=1&opt=prs

Port Stanley-B

Latitude: 51° 41.0' S Longitude: 057° 49.0' W

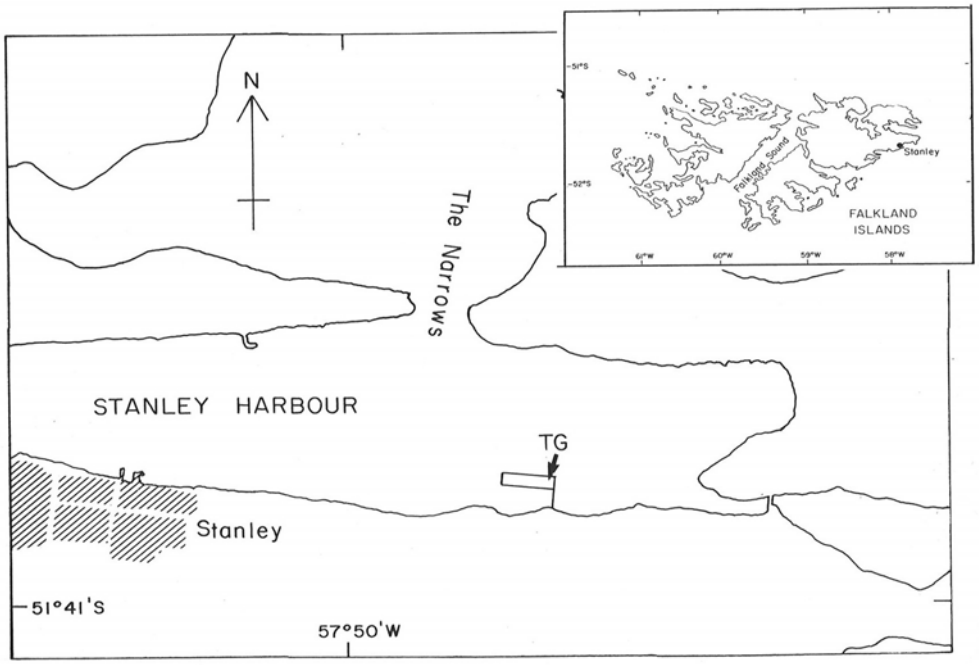
Instrument type: Old style and new all-in-one ‘B’ pressure gauges, Kalesto radar gauge with DCP.

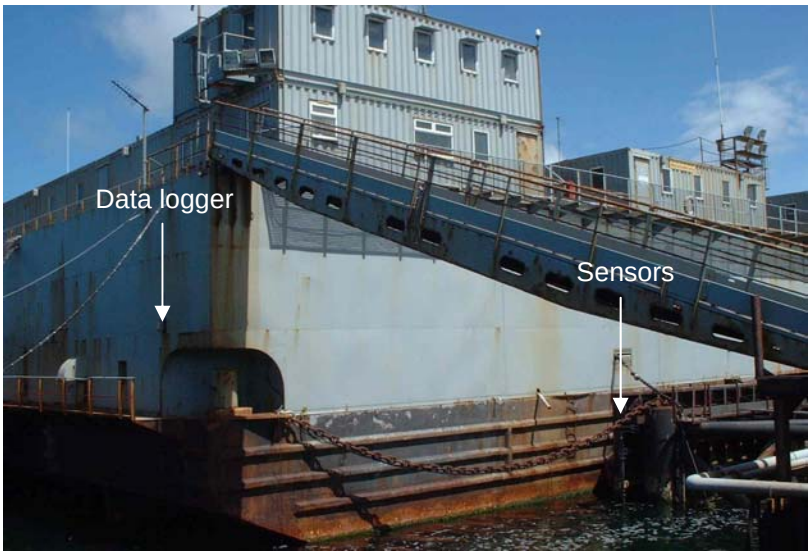
Site of Gauge: Eastern end of Port Stanley harbour by the 'floating warehouses' (FIPASS).

Benchmarks and Benchmark relationships:
“Stanley B-datum November 1998” is 2.935m below benchmark A (BM A).

The system was last refurbished in November 2005.

Real/near-real time data:
http://www.pol.ac.uk/ntslf/sadata_sa.php?code=STN&span=1





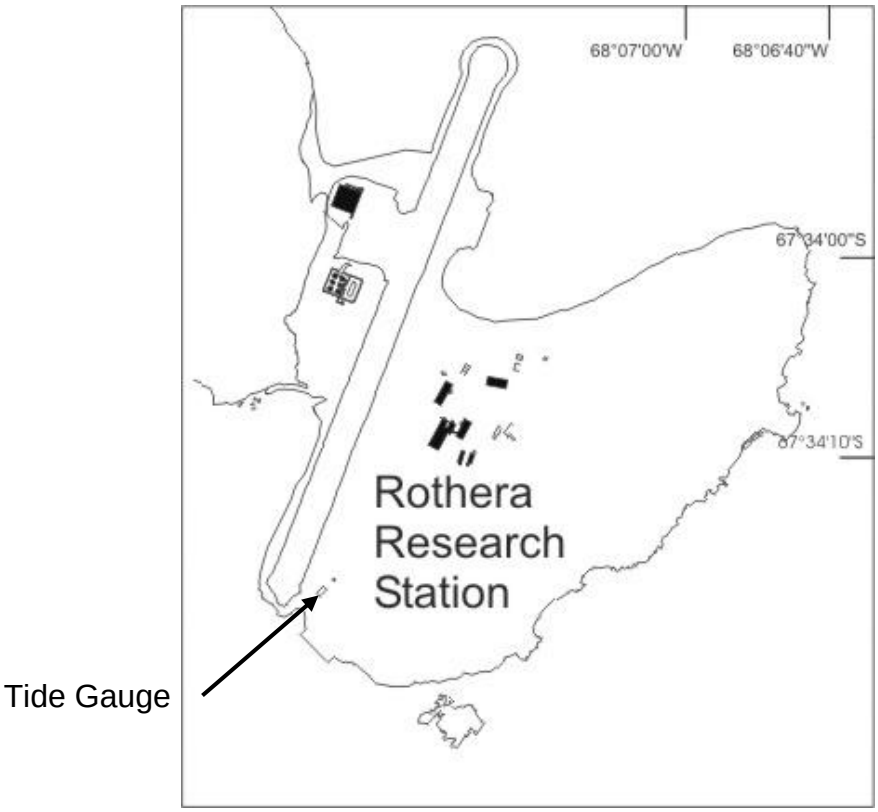
Rothera Tide Gauge

Latitude: 67° 34.3' S Longitude: 068° 07.7' W

Instrument type: 'B' pressure gauge.

Site of Gauge: The tide gauge is mounted in a sea water well, approximately 100 metres shorewards of the main jetty.

Real/near-real time data:
http://www.pol.ac.uk/ntslf/sadata_gumstix_rothera.php?code=TGUMR001&span=1&option=prs



St. Helena

Latitude: 15° 55.0' S Longitude: 005° 43.0' W

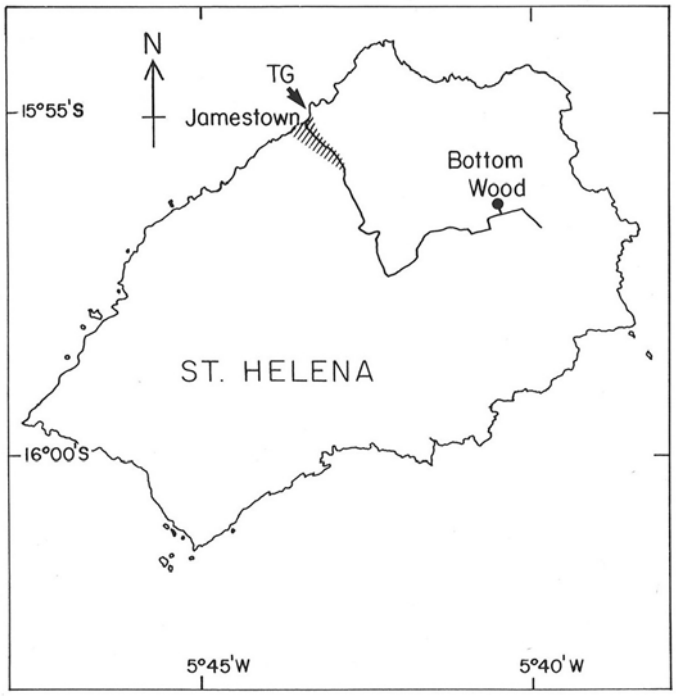
Instrument type: 'B' pressure gauge

Site of Gauge: Jamestown Harbour, by the landing steps.

Benchmarks and Benchmark relationships:
"St. Helena B-datum April 1997" is 2.871m below the top step benchmark (BM top step).

Dial-up data downloads have not been available from St Helena for some time. Storm damage to the gauge was repaired locally during the year but it our intention to install a replacement gauge in St Helena during 2009 after harbour works are completed.

Real/near-real time data:
http://www.pol.ac.uk/ntslf/sadata.php?code=STH&span=1

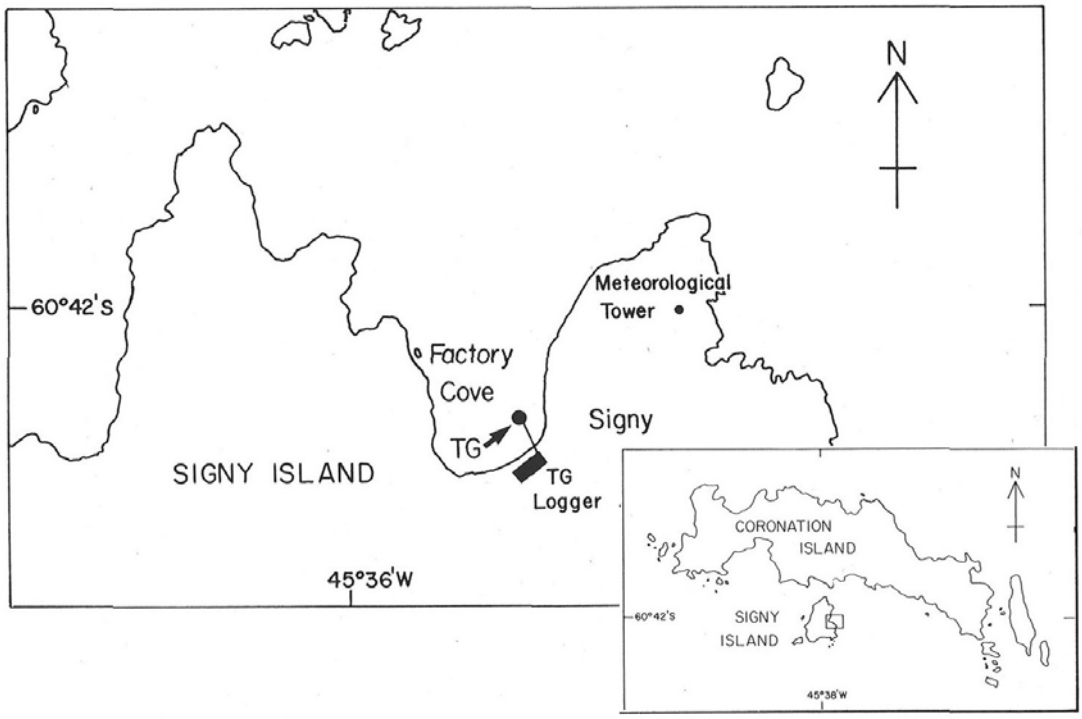


Signy (South Orkney Islands)

Latitude: 60° 43.0' S Longitude: 045° 34.0' W

Instrument type: Single Digiquartz pressure sensor

Site of Gauge: Data logger in nearby British Antarctic Survey boat house / generator building.



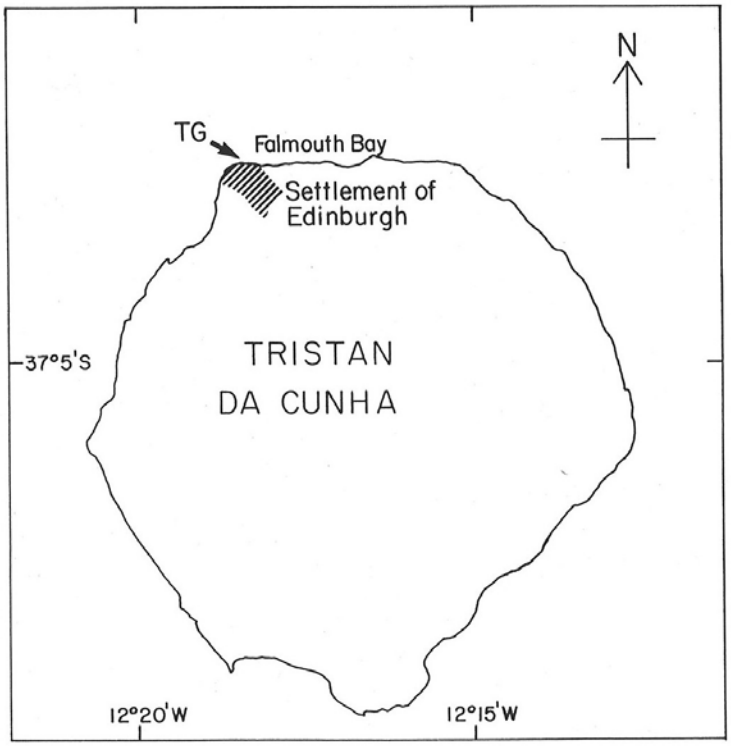
Tristan da Cunha

Latitude: 37° 03.0' S Longitude: 012° 18.0' W

Instrument type: Single Digiquartz pressure sensor

Site of Gauge: Tristan da Cunha harbour (data logger in the nearby settlement of Edinburgh).

System totally destroyed by a storm in 2001. No repair is possible. A totally new installation is required but has been delayed due to a major fire at the cannery which provides power for the whole island, including the tide gauge. The installation is now provisionally scheduled for 2009.



Faraday / Vernadsky

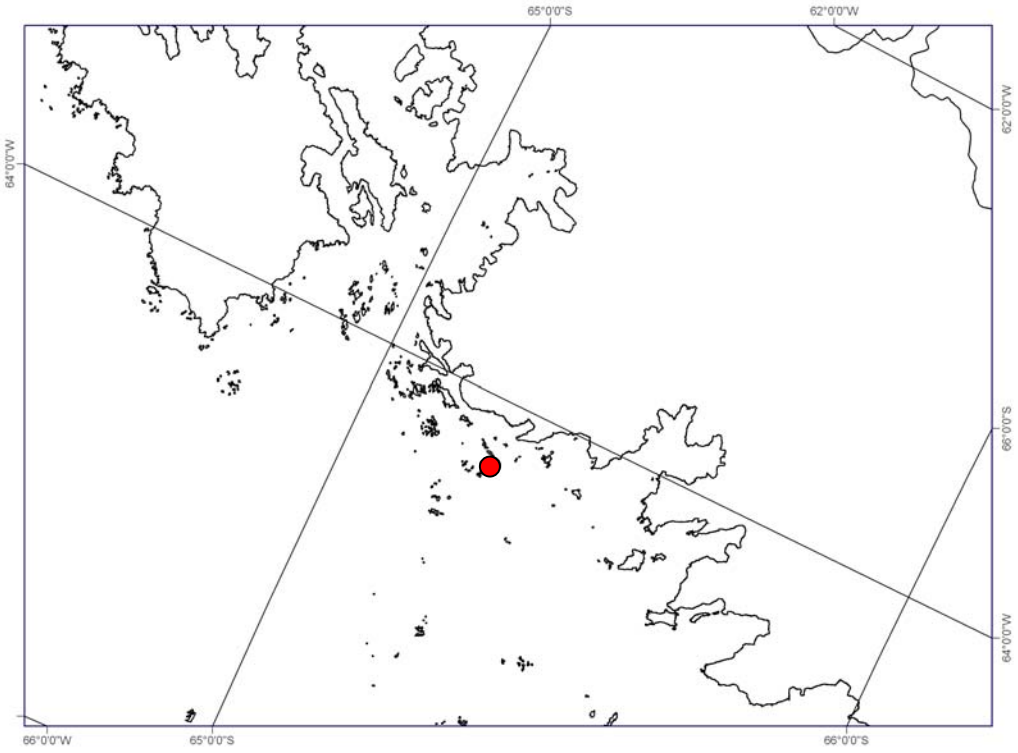
Latitude: 65° 15.0' S Longitude: 064° 16.0' W

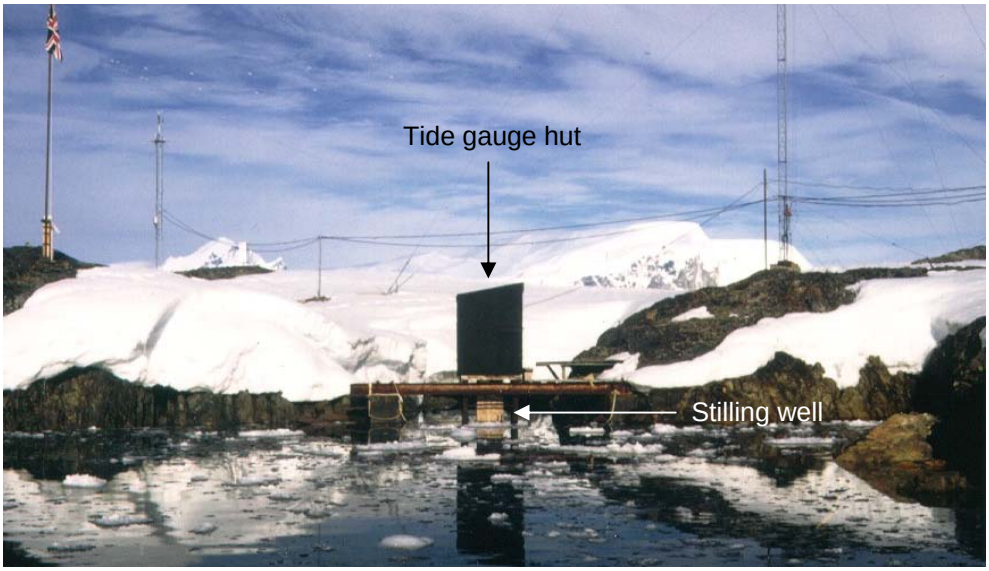
Instrument type: Float gauge, single Digiquartz pressure sensor, OTT pressure sensors with DCP.

Site of Gauge: Located in tide gauge hut near to camp.

Benchmarks and Benchmark relationships:
TGZ = 2.750m below benchmark C (BM C).

Real/near-real time data:
http://www.pol.ac.uk/ntslf/sadata_gts_faraday.php?code=UKVERNAD07&span=1





South Atlantic Activities in 2007

2007 was a relatively quiet year for tide gauge maintenance.

King Edward Point
A completely new installation was carried out in 2007 at King Edward Point in South Georgia. The gauge consists of two KPSI pressure sensors and a Portux Linux system which emails back one minute data samples every 5 minutes. The system was mostly installed by local BAS personnel prior to POL arriving, but a problem with the first sensor interface board was able to be fixed during the POL visit by replacing the module.

Port Stanley
A brief visit was made to Stanley in 2007. The data were downloaded from the Tidata logger and the system was powered down so that the SRAM battery could be replaced.

The dial-up modem replaced on the SOTG logger and the telephone line was tested by Cable & Wireless engineers to check the line quality. The Persistor module and CF1 card on the system were also replaced.
During the visit the old Orbcomm system was removed and replaced by a new OTT DCP system that returns data every 15 minutes via Meteosat.

Rothera
Rothera received an upgrade to real time status during 2007. All data was downloaded without any problems from the Tidata logger and new SRAM cards fitted to both the main logger and the back up unit. The firmware was changed on the backup logger before a Portux Linux unit was connected to the main logger that receives data directly from the Tidata system and sends back emails every 15 minutes. The Portux was a replacement for the Gumstix board that was installed during 2005.

Signy
A very brief visit was made to Signy Island during which a visual inspection of the tide gauge and pipework to the sensors was made. New lithium batteries were provided to the BAS personnel for the system along with a laptop for them to download the data with.

Vernadsky
The new OTT gauge consisting of two pressure sensors and a DCP had not been functioning properly since installation but this problem was fixed during the visit. The wiring on the RS232 connection was reversed and data is now being returned consistently by the system.

While there, the existing OTT pressure sensors were replaced with new titanium KPSI pressure sensors and the LogoSens2 logger unit was also replaced as it had a damaged display.

Data wasn't downloaded from the Tidata logger this year due to time constraints.