National Tidal and Sea Level Facility

Annual Report for 2006 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 2006 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	- Web 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.

All maps are based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office ©Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. NERC 100017897 2006

Foreword

The National Tidal and Sea Level Facility (NTSLF) is the UK centre of excellence for all scientific matters relating to tides, sea level change, storm surges and coastal flood forecasting. Our coastline is important both economically and environmentally. Tidal processes, increasing mean sea level, and changes to extreme water levels all have implications for coastal protection, sustainable development, and management of the marine environment. The expertise of the NTSLF is therefore of vital importance to government, local authorities, the general public and the academic community. Established in 2002, it brings together skills from the Proudman Oceanographic Laboratory (POL) and the British Oceanographic Data Centre (BODC), with university experts in the fields of sea level and geodesy. This report contains a summary of NTSLF activity for the period January-December 2006.

The NTSLF comprises the UK strategic tide gauge network, geodetic networks for monitoring vertical land movements, and gauges in British Overseas Territories. It is supported by the expertise of BODC in data processing, quality control and dissemination. Practical and scientific applications of the data include tidal prediction, flood warning, navigation and climate change studies. Quality controlled tide gauge data are available free of charge via our web pages. Data from Gibraltar are now available, as are real-time data from Ascension Island and Port Stanley. Information on technological developments, network status, numerical model forecasts and software products for tidal analysis can all be obtained from the web site.

The national tide gauge network records sea level every 15 minutes at 44 sites around the coastline. During 2006 all sites were maintained and geodetic levelling was completed at 14 locations. At Hinkley Point the underwater measuring system was replaced, whilst the Leith site had a complete refurbishment. The POL diving team also carried out inspection and maintenance of measuring systems at Bangor and Portrush. Following the December 2004 Indian Ocean tsunami, the NTSLF assisted Defra in a risk assessment study which recommended suitable detection equipment for tsunamis. A prototype rapid sampling and data acquisition system has been developed, installed and tested at three UK strategic sites. The high frequency sampling will also improve the monitoring of swell waves and storm surges, and will thus improve coastal flood warning systems.

NTSLF scientists continue to upgrade the storm surge models used operationally for flood warning. Major projects in 2006 included an assessment of real-time data assimilation techniques, and a new ensemble forecasting system to quantify uncertainty. Working with partners in the UK Met Office, we have developed a set of probabilistic surge forecasting tools based on a 24 member ensemble.

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

Dr Kevin Horsburgh
Head of NTSLF

Tide gauge instrument information, data processing procedures and gauge location

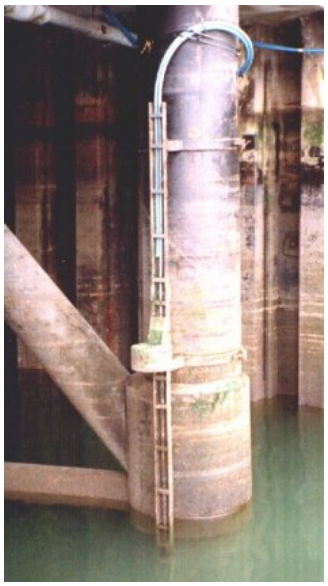
Instrument documentation

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.

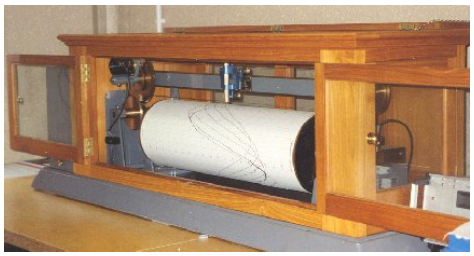


Pressure Transducer

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.

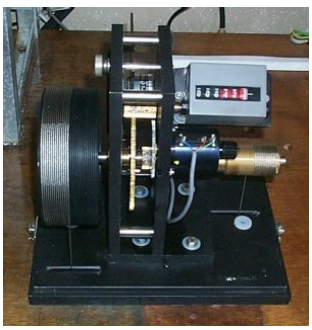
Munro float gauge

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

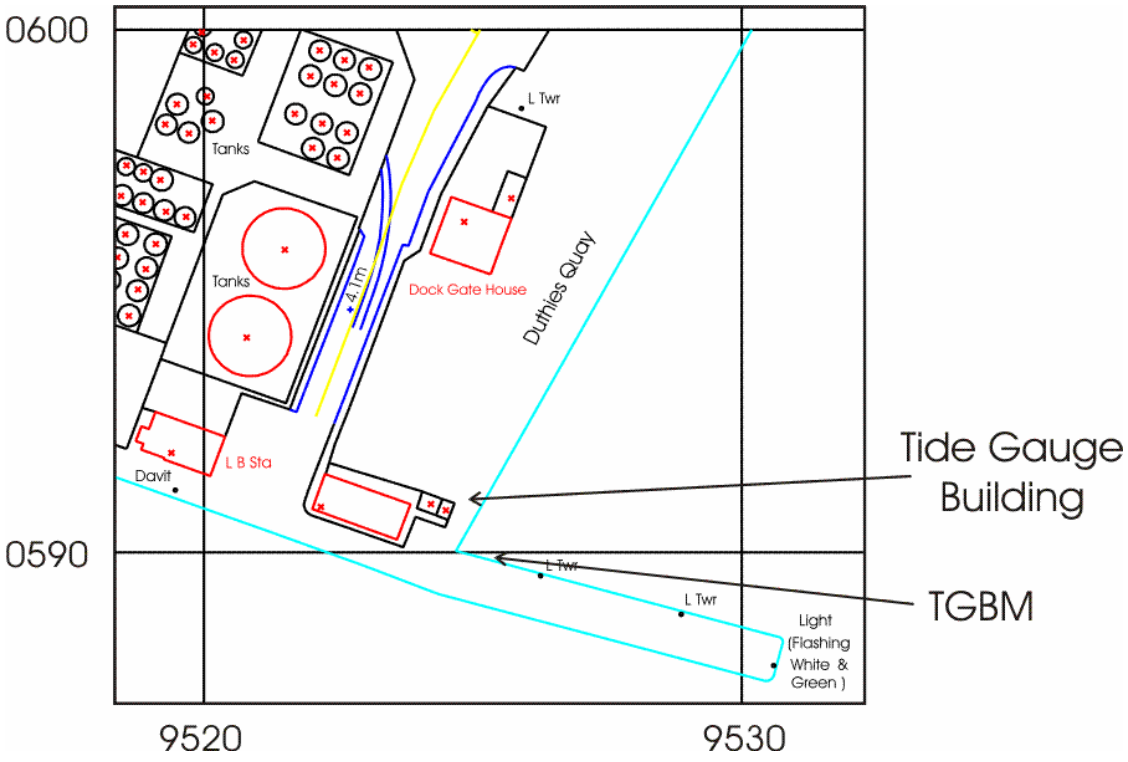
Latitude: 57° 08' 38.5" N Longitude: 02° 04' 48.8" W

Grid Reference: NJ 9524 0591

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



©Crown copyright. All rights reserved NERC 100017897 2006

Tide gauge location

Aerial view of site

Avonmouth Tide Gauge

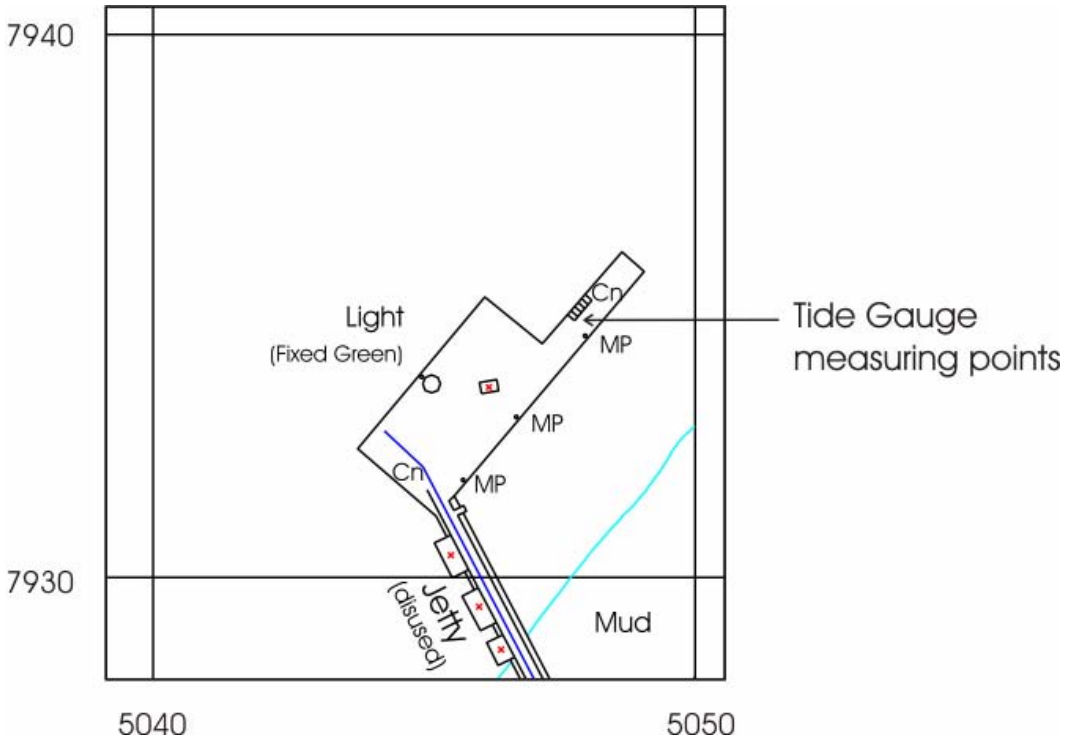
Latitude: 51° 30' 27.9" N Longitude: 02° 42' 45.9" W

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Bangor Tide Gauge

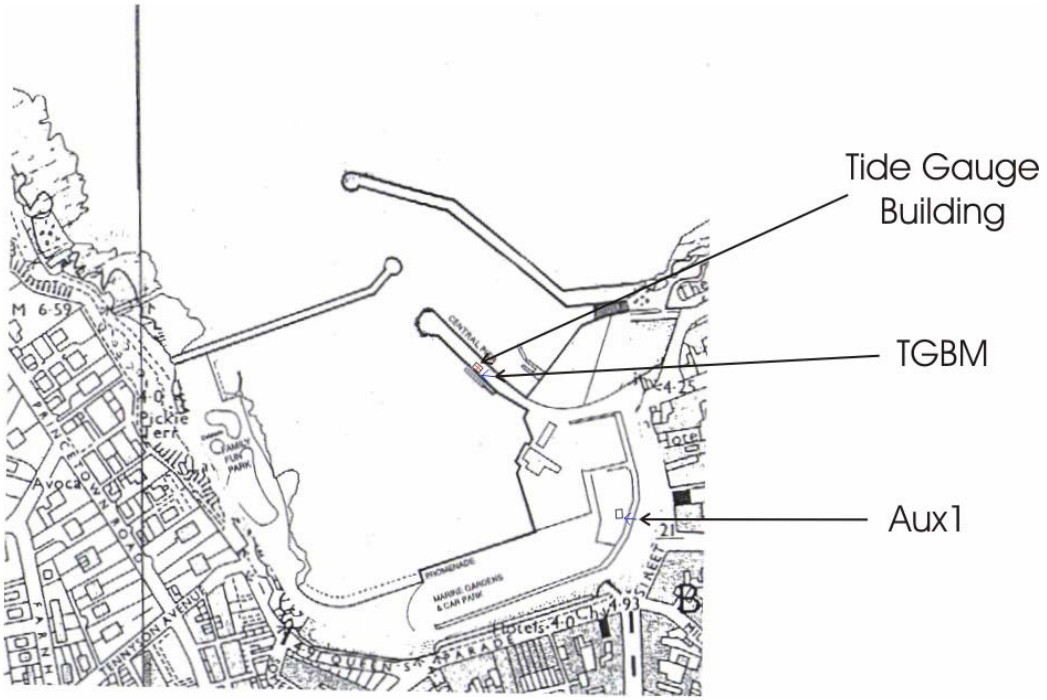
Latitude: 54° 39' 53.1" N Longitude: 05° 40' 10.1" W

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.



©Ordnance Survey of Northern Ireland 2006

Barmouth Tide Gauge

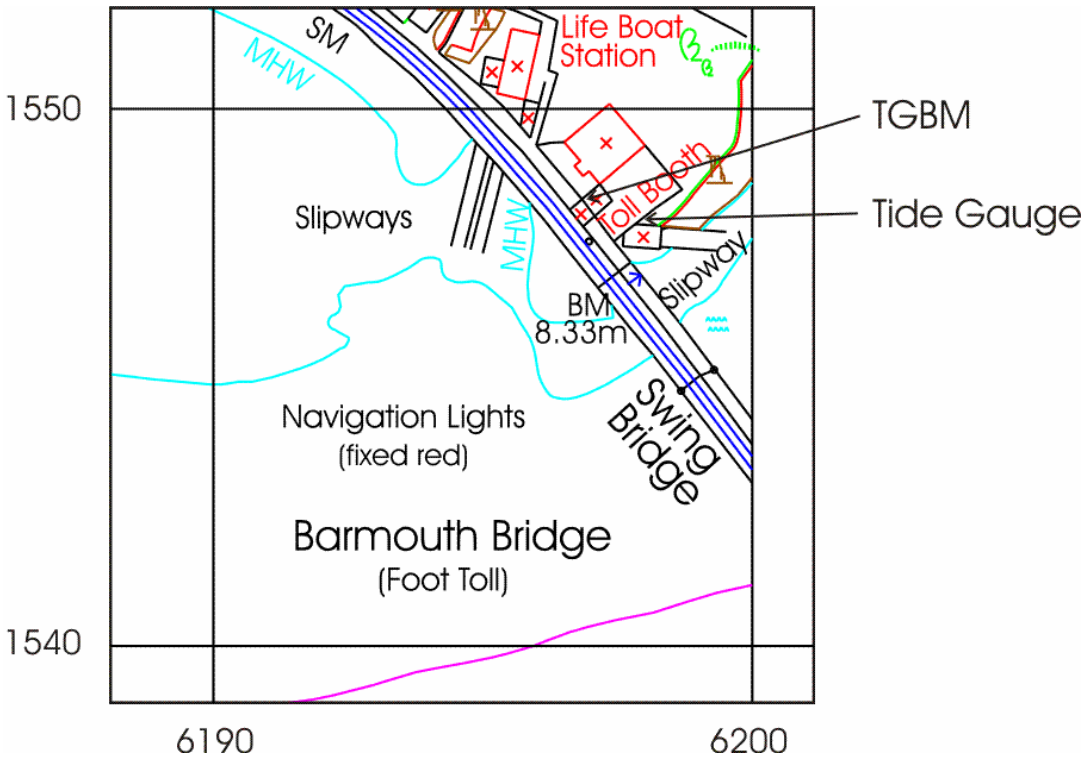
Latitude: 52° 43' 09.4" N Longitude: 04° 02' 41.9" W

Grid Reference: SH 6197 1548

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



©Crown copyright. All rights reserved NERC 100017897 2006

Bournemouth Tide Gauge

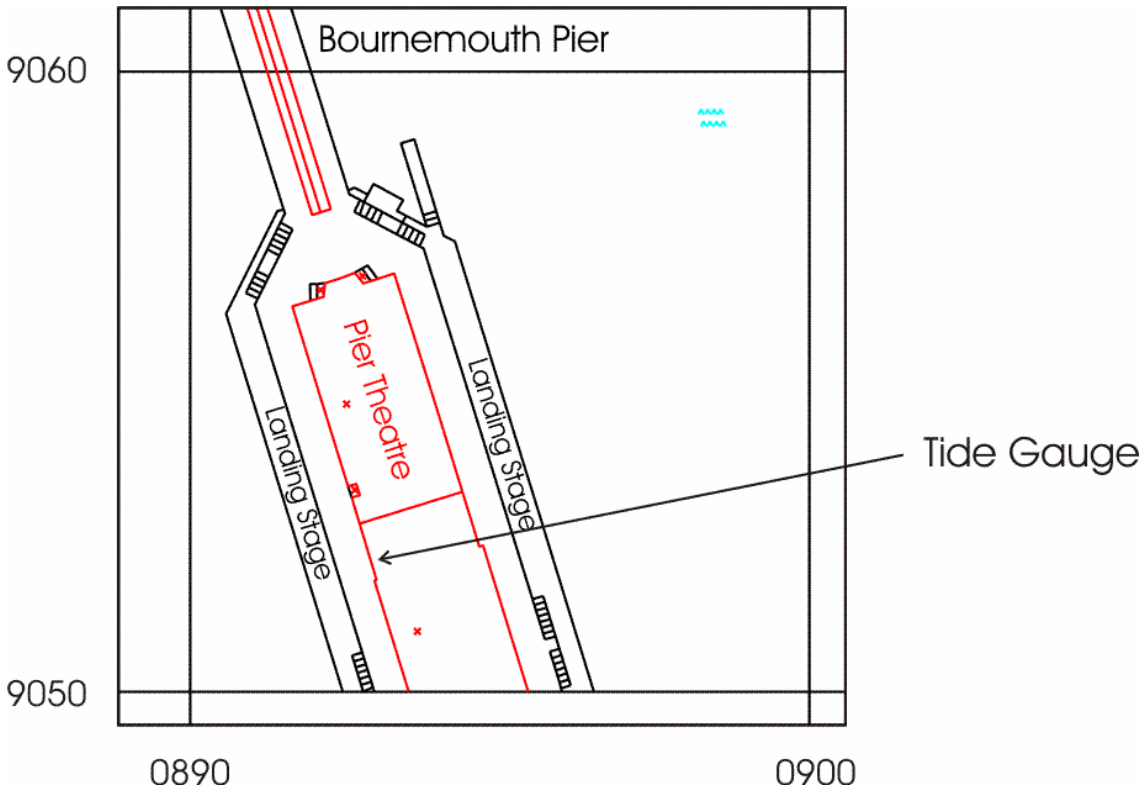
Latitude: 50° 42' 51.6" N Longitude: 01° 52' 29.5" W

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Cromer Tide Gauge

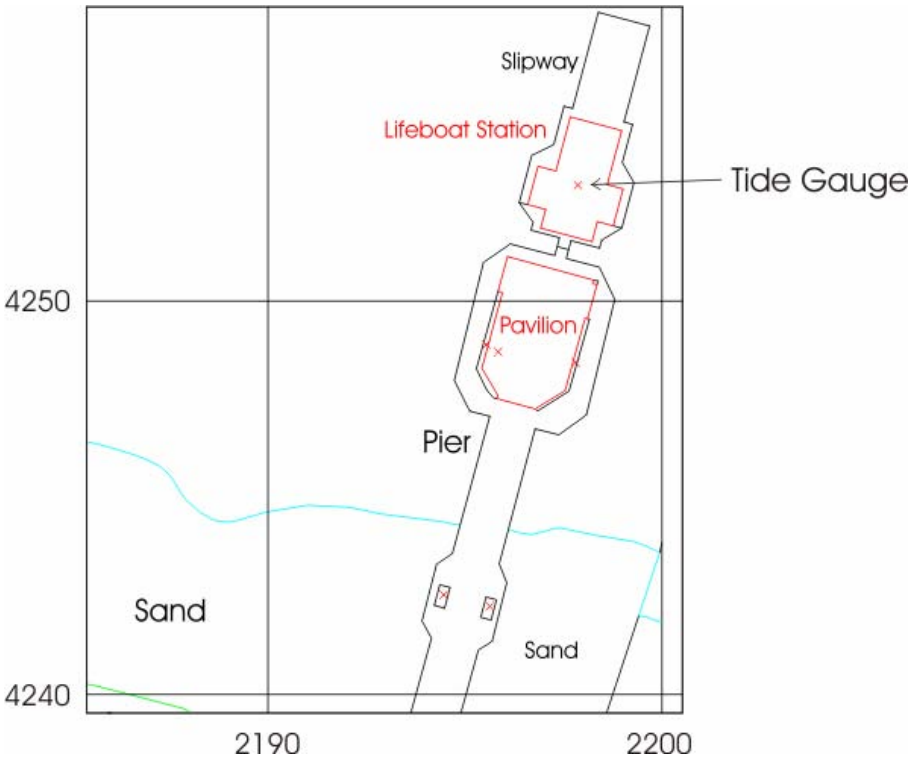
Latitude: 52° 56' 03.1" N Longitude: 01° 18' 05.9" E

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Devonport Tide Gauge

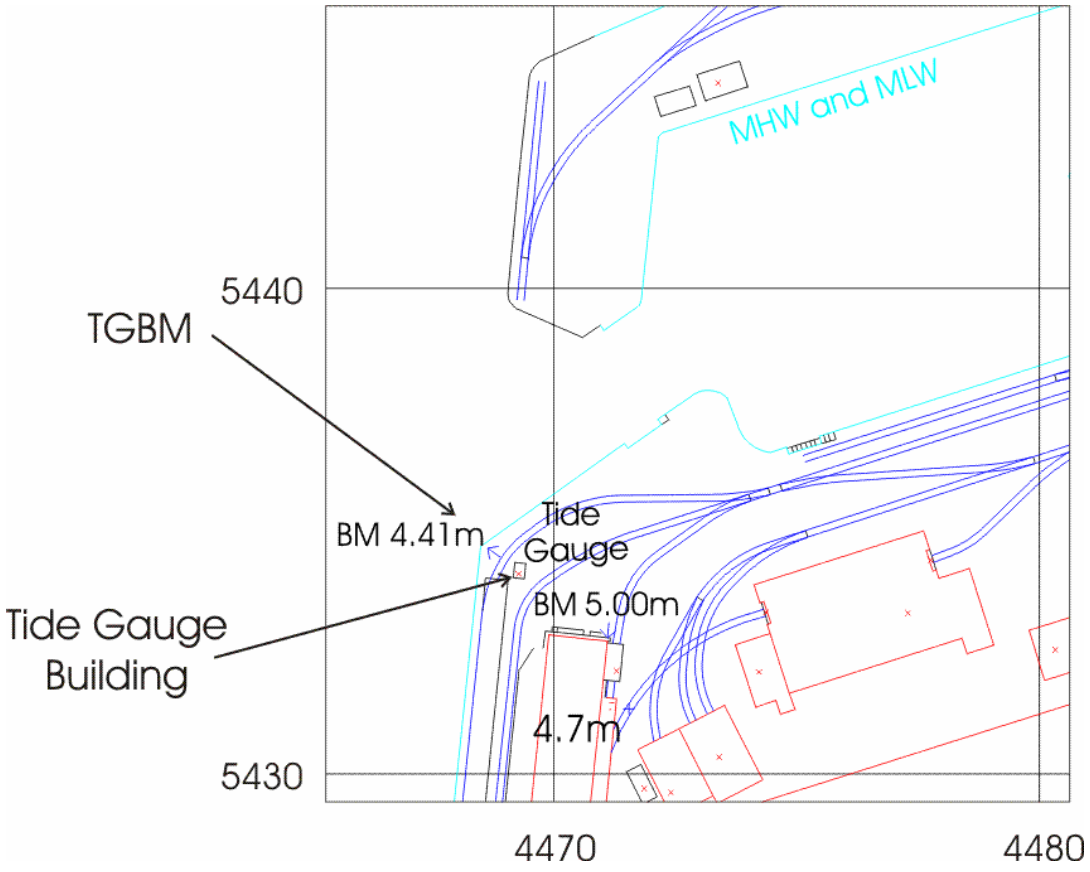
Latitude: 50° 22' 06. 3" N Longitude: 04° 11' 06.7" W

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Dover Tide Gauge

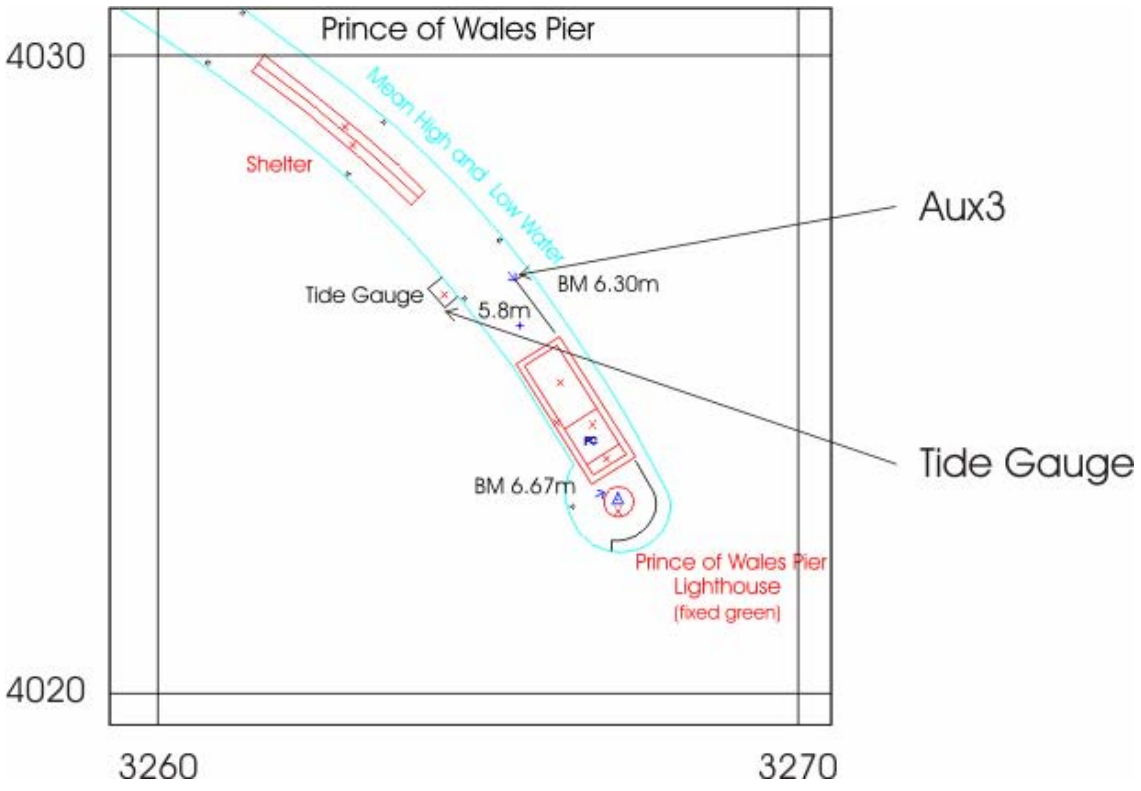
Latitude: 51° 06' 51.9" N Longitude: 01° 19' 21.2" E

Grid Reference: TR 3264 4026

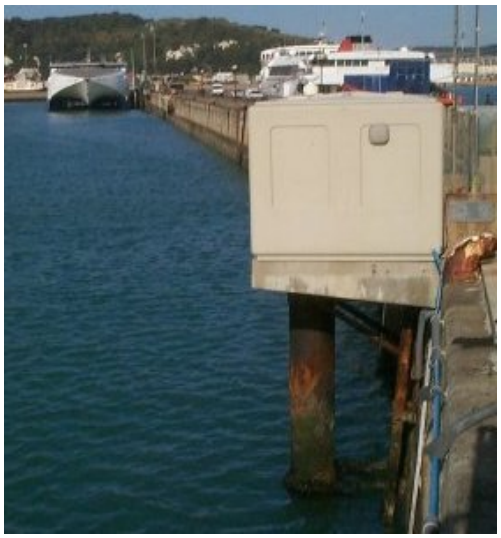
Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

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.



©Crown copyright. All rights reserved NERC 100017897 2006



Felixstowe Tide Gauge

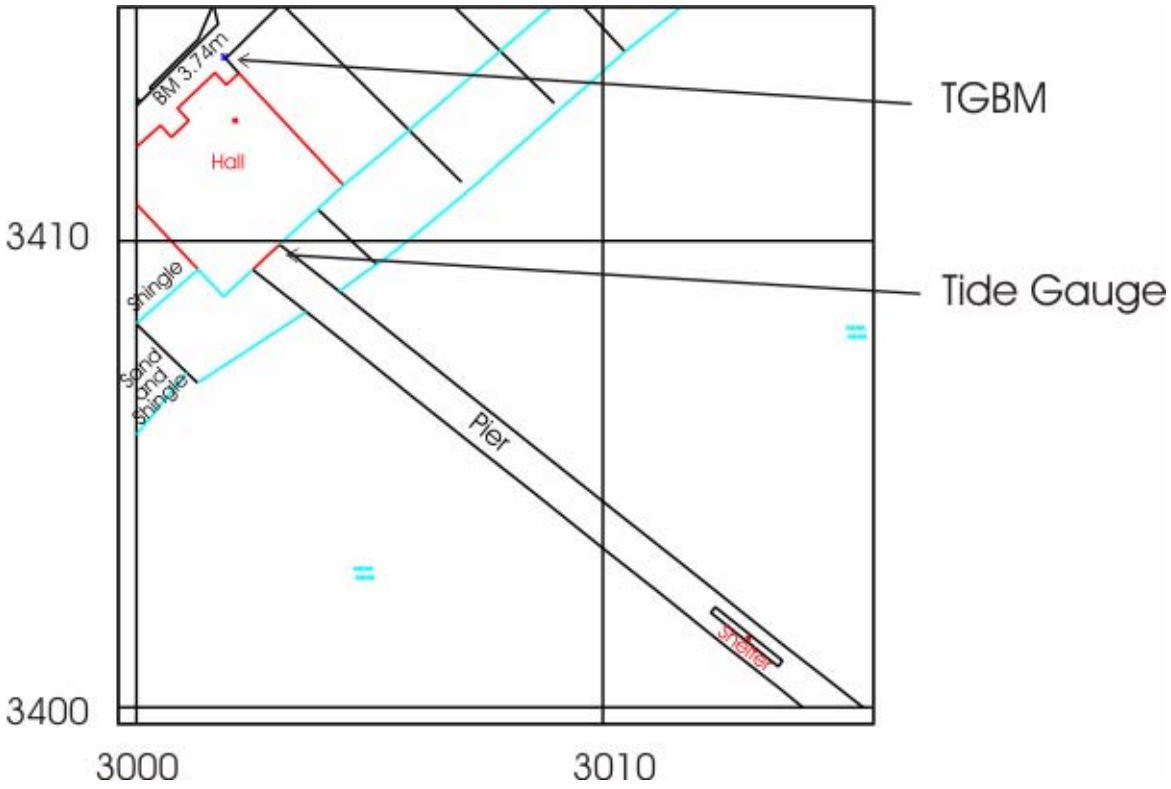
Latitude: 51° 57' 27.8" N Longitude: 01° 20' 47.6" E

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Fishguard Tide Gauge

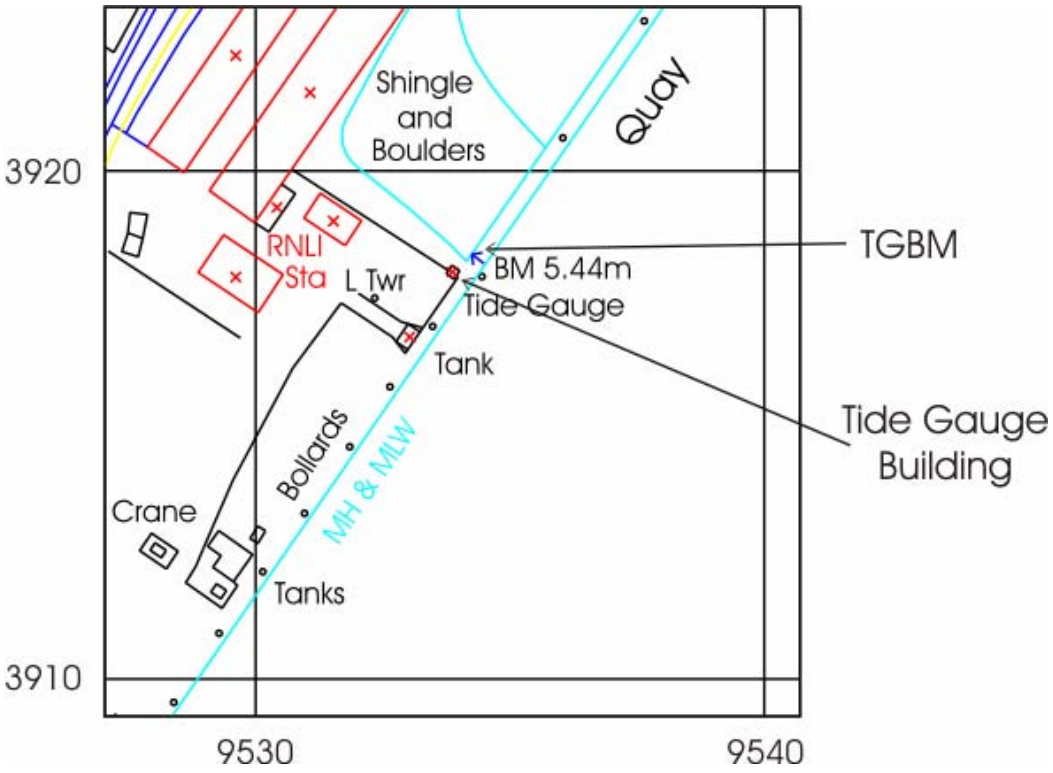
Latitude: 52° 00' 47.5" N Longitude: 04° 59' 01.4" W

Grid Reference: SM 9534 3918

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



©Crown copyright. All rights reserved NERC 100017897 2006

Harwich Tide Gauge

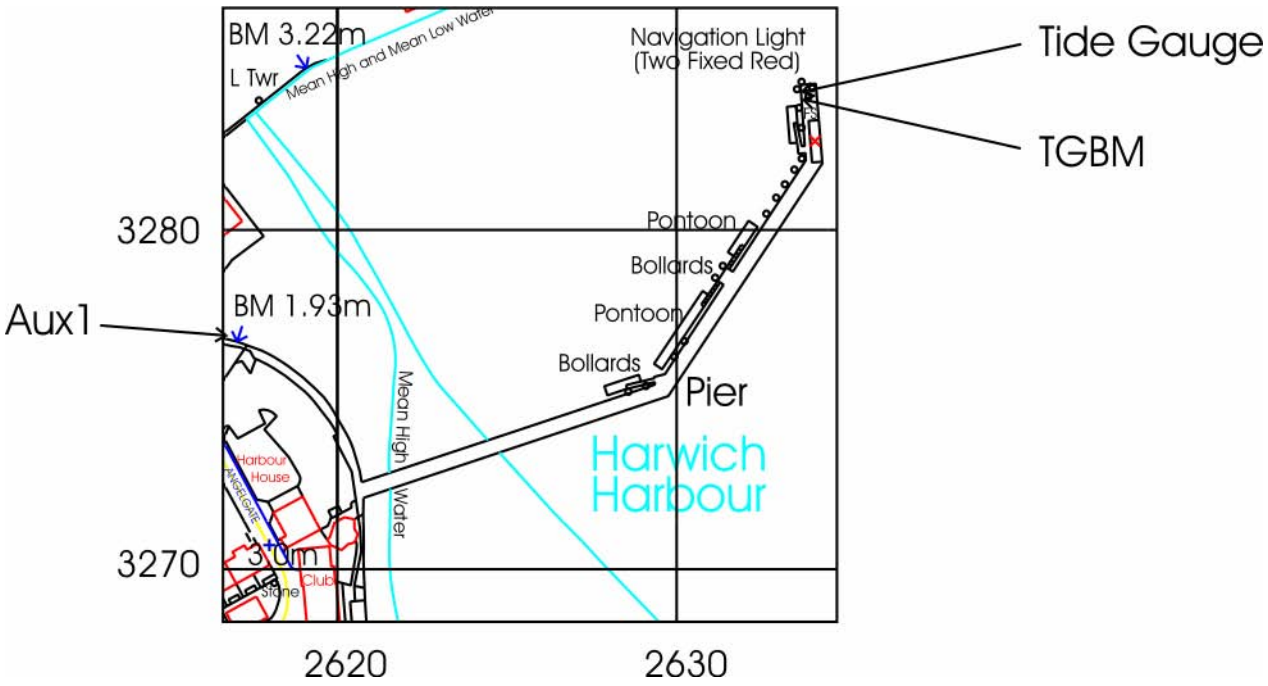
Latitude: 51° 56' 52.8" N Longitude: 01° 17' 31.4" E

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Heysham Tide Gauge

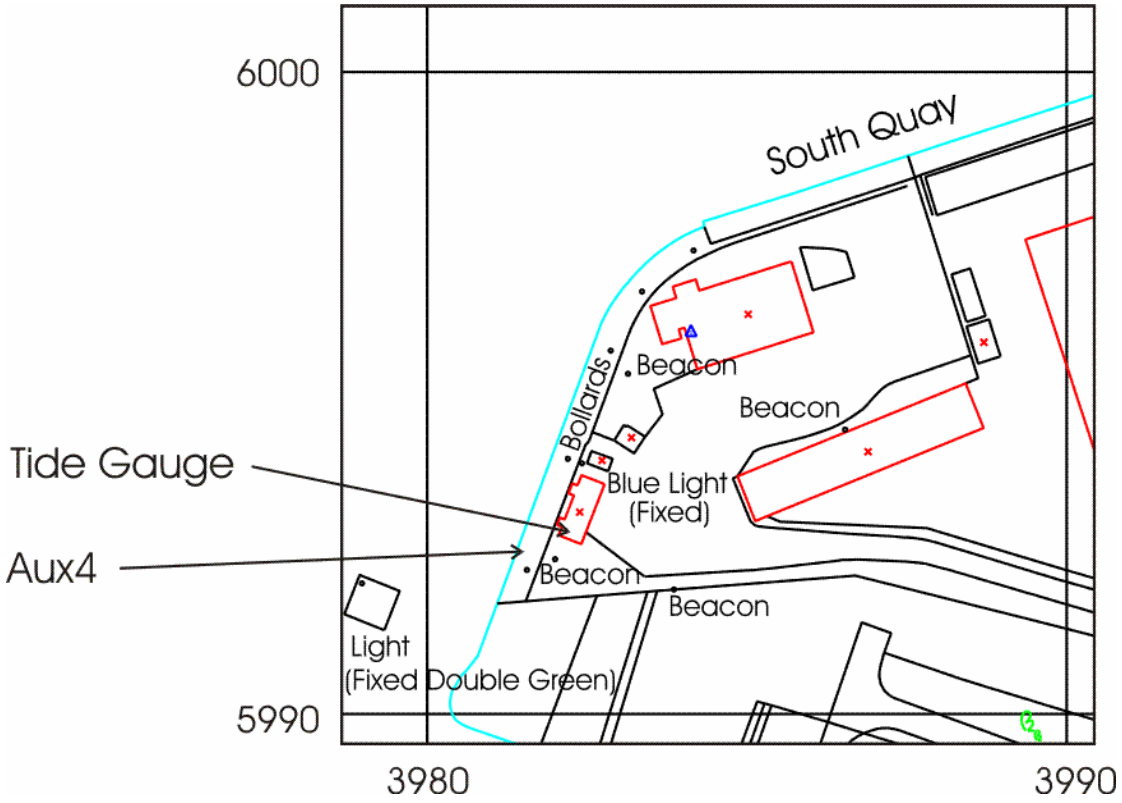
Latitude: 54° 01' 54.5" N Longitude: 02° 55' 12.9" W

Grid Reference: SD 3982 5993

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

Site of Gauge:

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



©Crown copyright. All rights reserved NERC 100017897 2006

Hinkley Point Tide Gauge

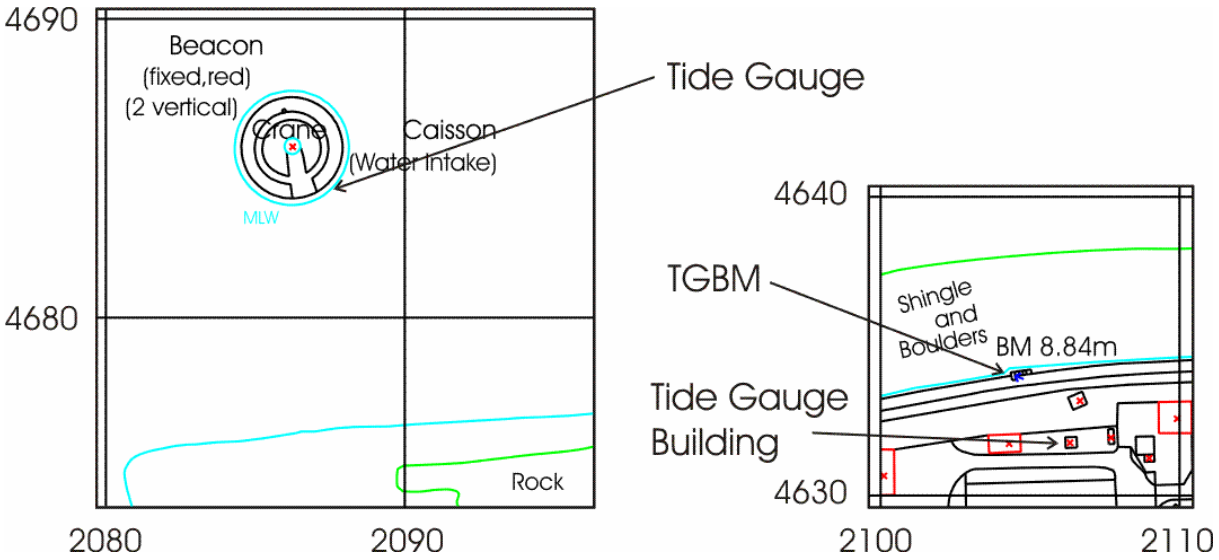
Latitude: 51° 12' 38.2" N Longitude: 03° 07' 52.6" W

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Holyhead Tide Gauge

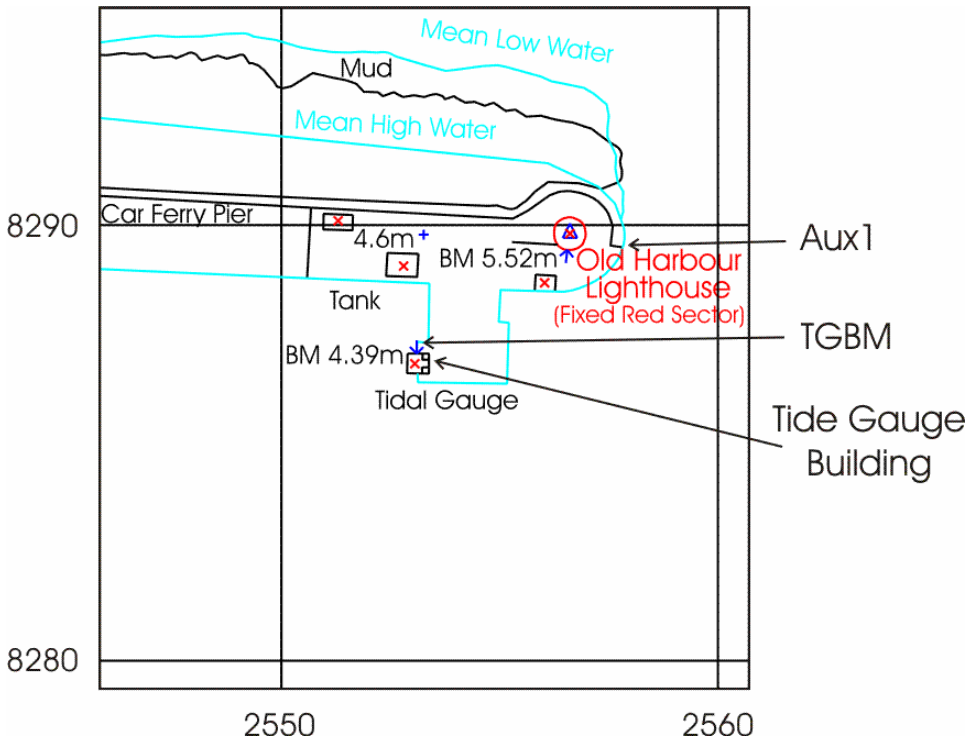
Latitude: 53° 18' 50.2" N Longitude: 04° 37' 13.5" W

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Ilfracombe Tide Gauge

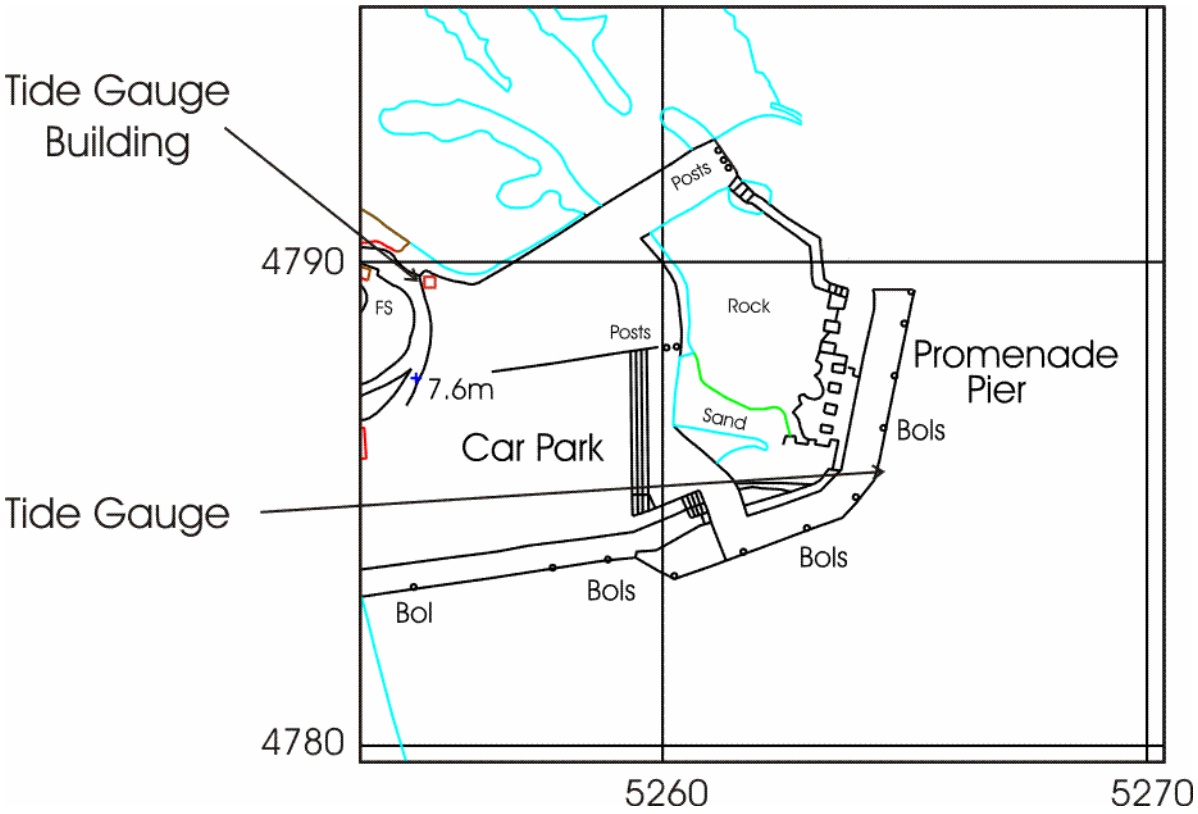
Latitude: 51° 12' 40.1" N Longitude: 04° 06' 44.3" W

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Immingham Tide Gauge

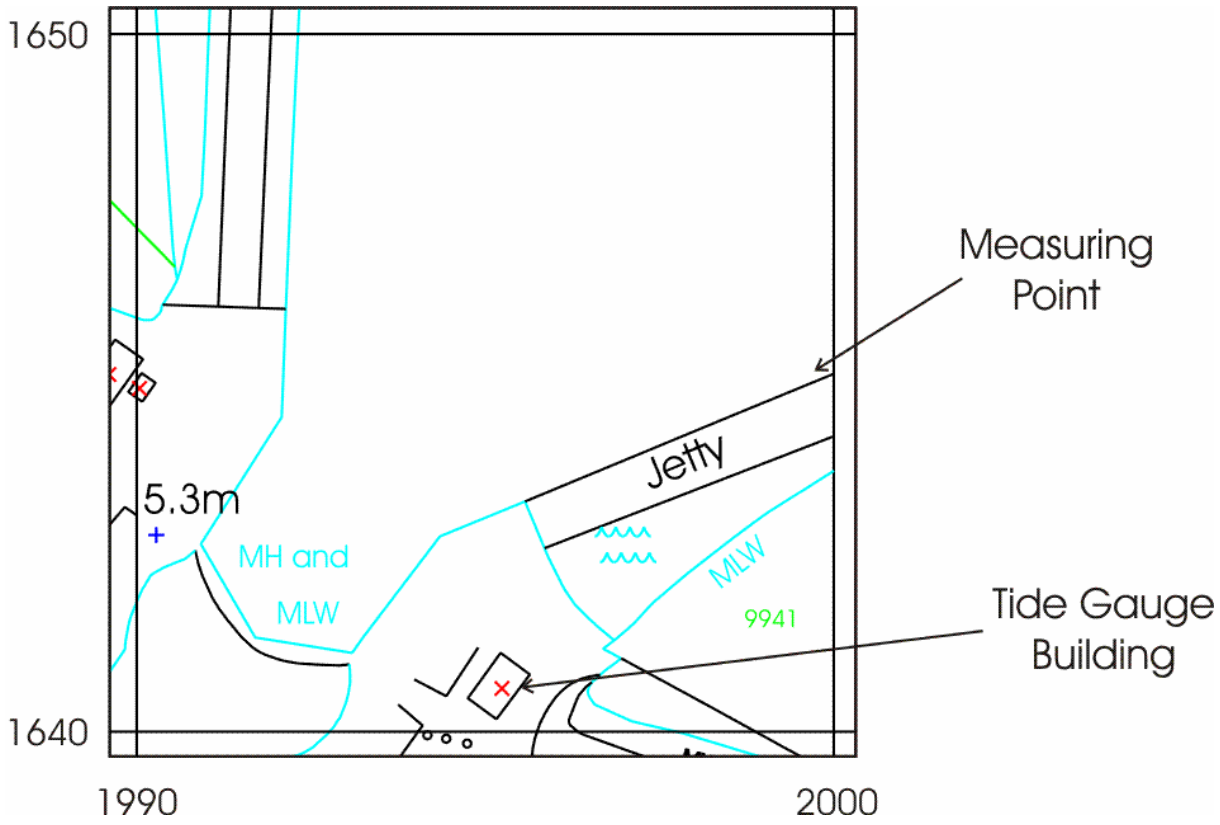
Latitude: 53° 37' 49.5" N Longitude: 00° 11' 15.1" W

Grid Reference: TA 1995 1640

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



©Crown copyright. All rights reserved NERC 100017897 2006

Port Erin (Isle of Man) Tide Gauge

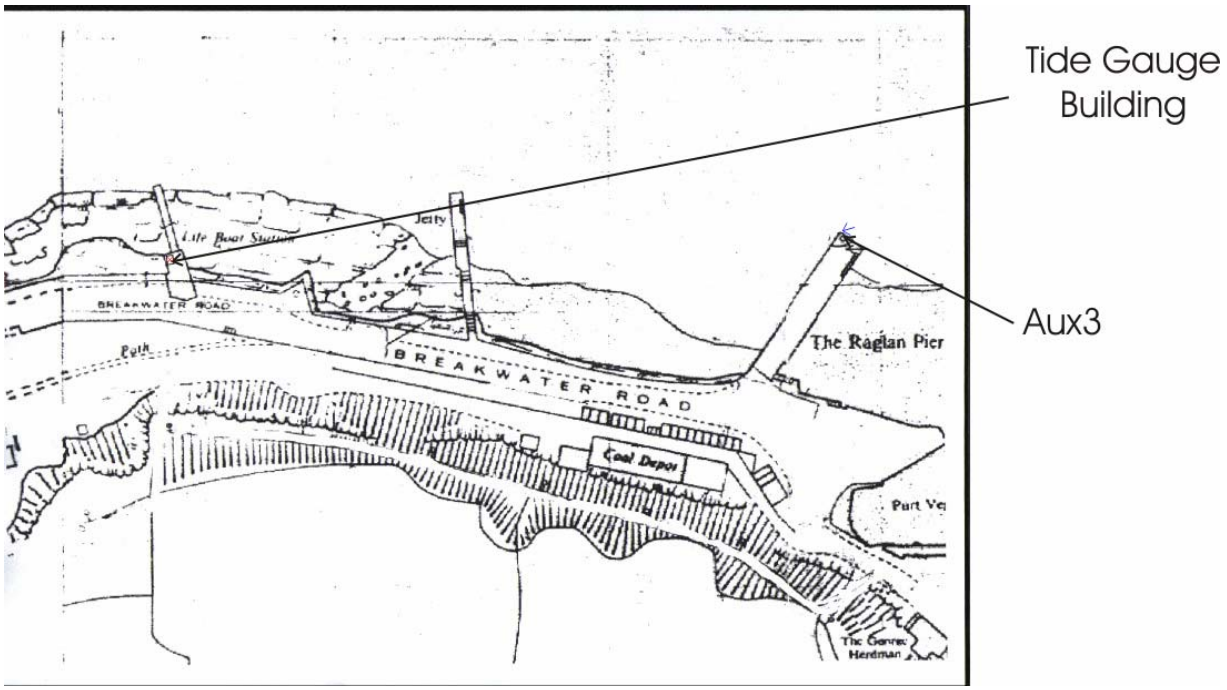
Latitude: 54° 05' 06.8" N Longitude: 04° 46' 05.0" W

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.



©Isle of Man Harbours 2006

Port Ellen (Isle of Islay) Tide Gauge

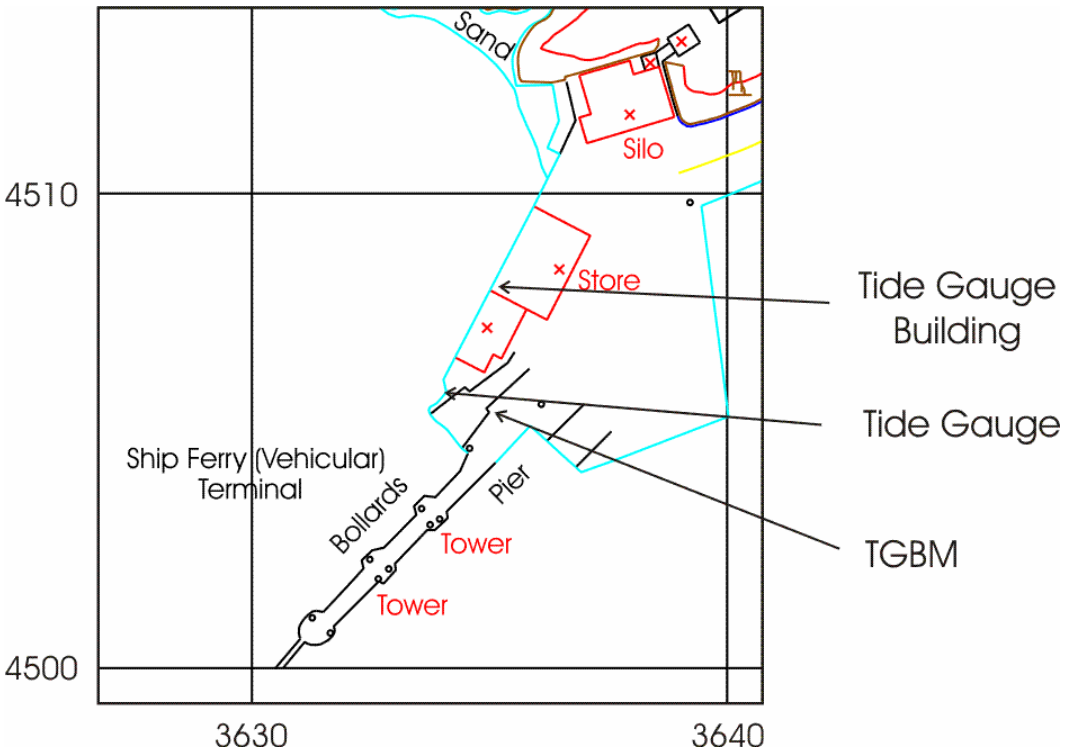
Latitude: 55° 37' 39.3" N Longitude: 06° 11' 23.7" W

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.



©Crown copyright. All rights reserved NERC 100017897 2006

St. Helier (Jersey) Tide Gauge

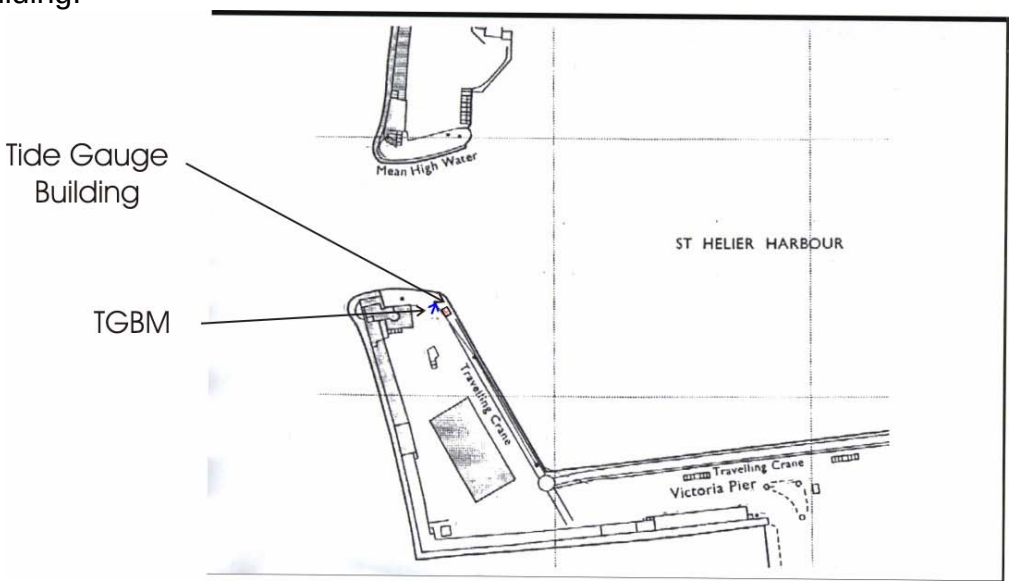
Latitude: 49° 11' 00" N Longitude: 02° 07' 00 " W

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.



©States of Jersey 2006

Kinlochbervie Tide Gauge

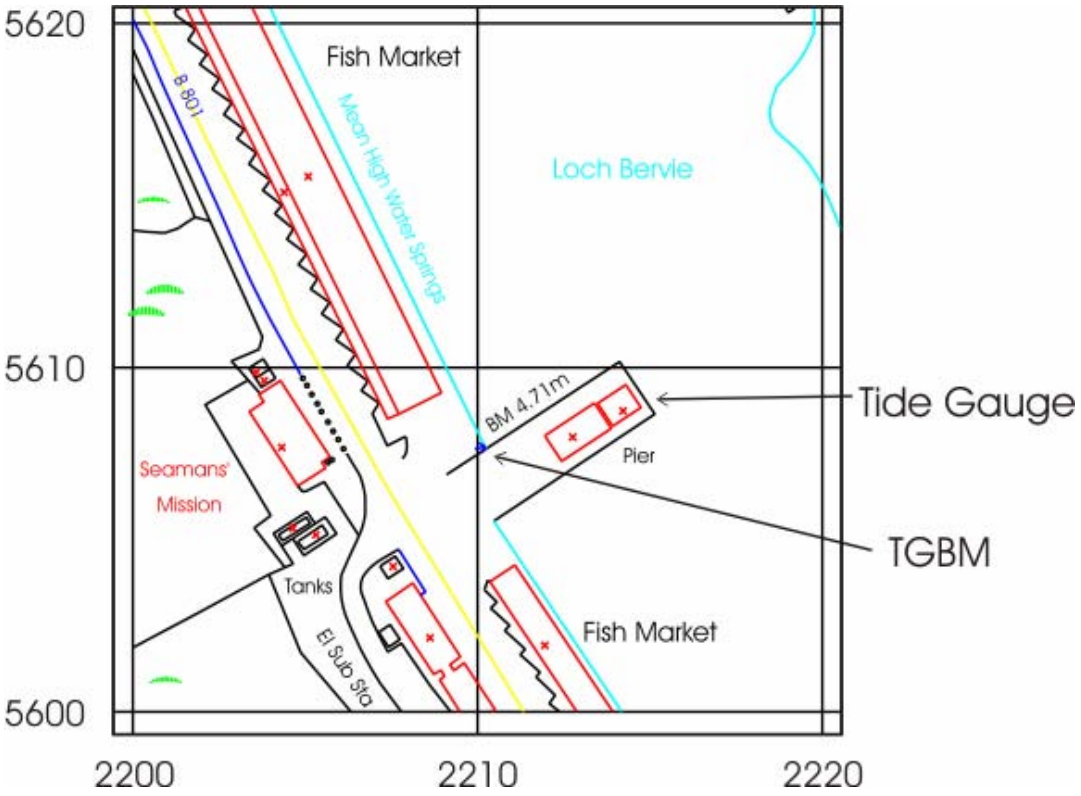
Latitude: 58° 27' 24.3" N Longitude: 05° 03' 00.8" W

Grid Reference: NC 2214 5609

Instrument type: Dataring system with two full tide bubbler gauges 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.



©Crown copyright. All rights reserved NERC 100017897 2006

Leith Tide Gauge

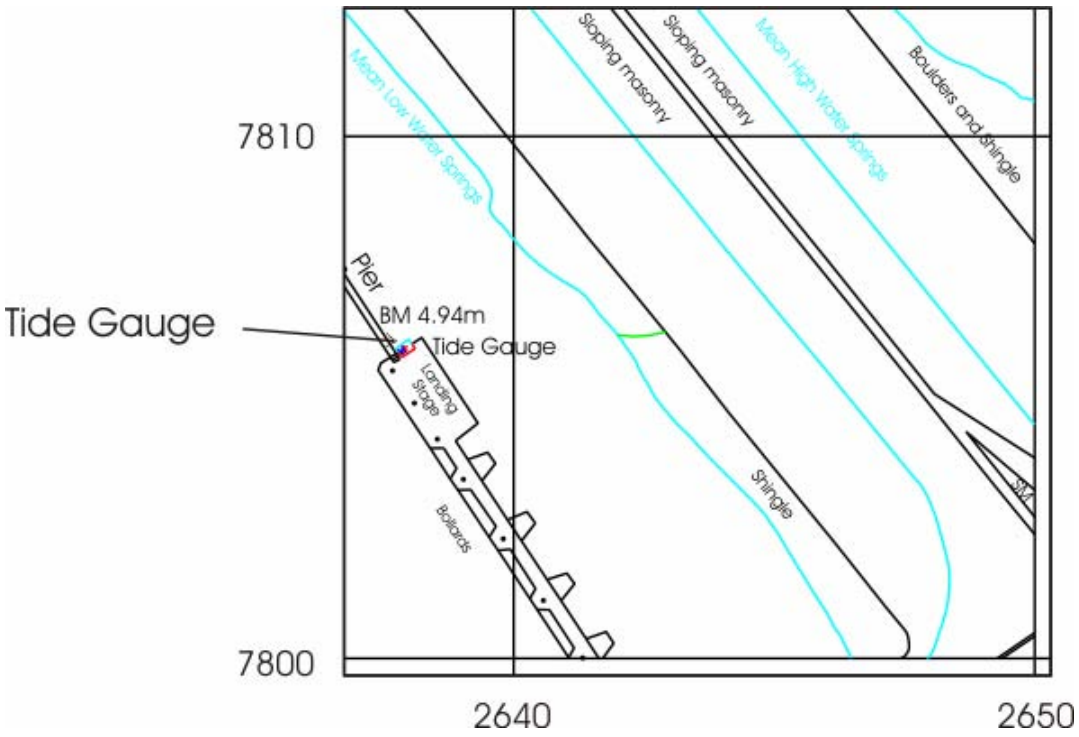
Latitude: 55° 59' 23.4"N Longitude: 03° 10' 54.1"E

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Lerwick Tide Gauge

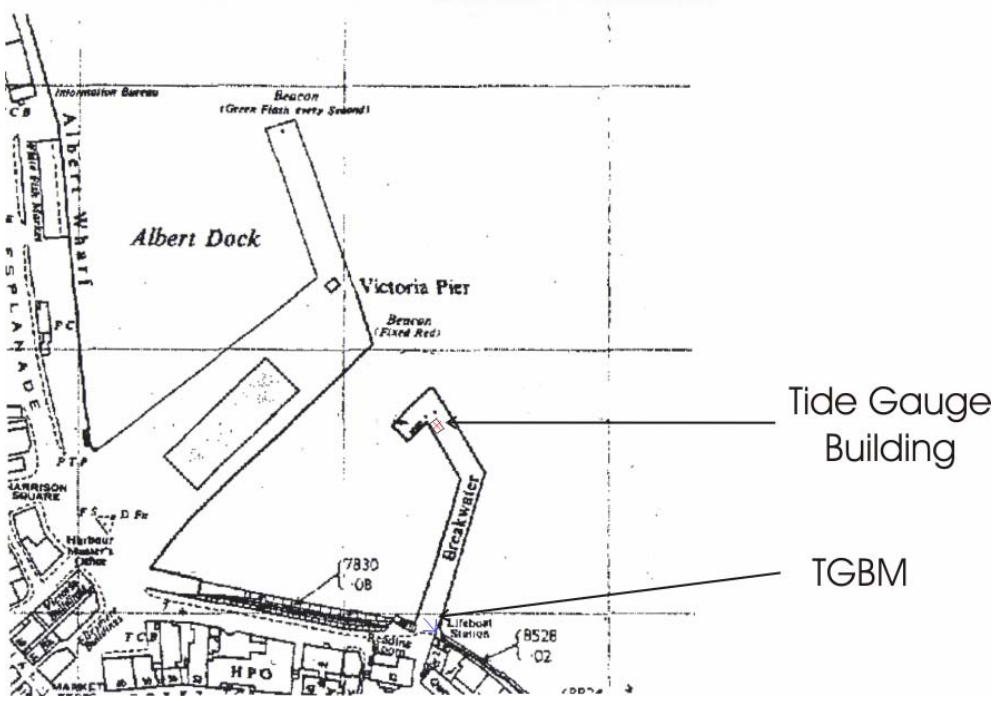
Latitude: 60° 09' 14.5" N Longitude: 01° 08' 25.1" W

Grid Reference: HU 4783 4137

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

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Liverpool Tide Gauge

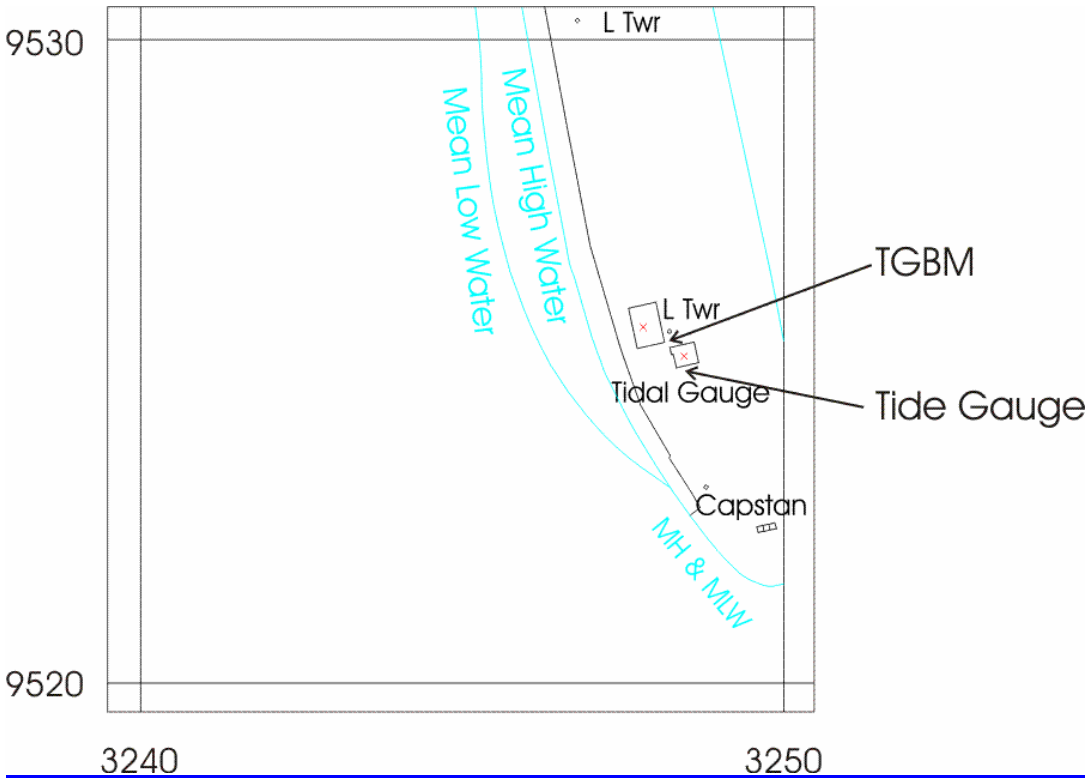
Latitude: 53° 26' 58.8" N Longitude: 03° 01' 05.3" W

Grid Reference: SJ 3248 9525

Instrument type: Data acquisition system with two full tide and a mid-tide bubbler gauge installed. Wind speed and wind direction also recorded up until June 2004.

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Llandudno Tide Gauge

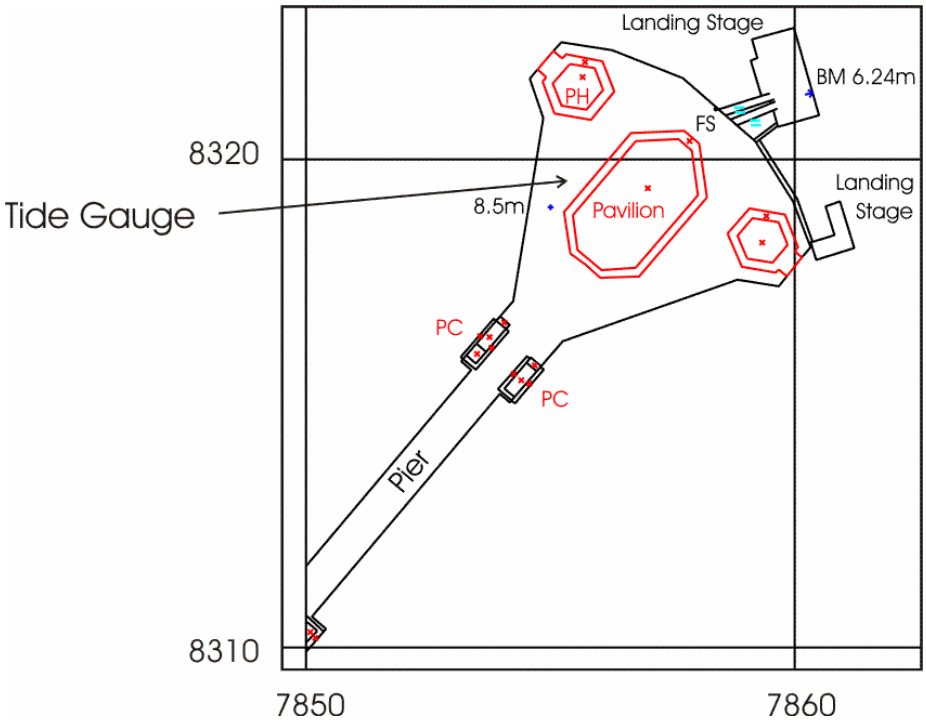
Latitude: 53° 19' 54.0" N Longitude: 03° 49' 30.8" W

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Lowestoft Tide Gauge

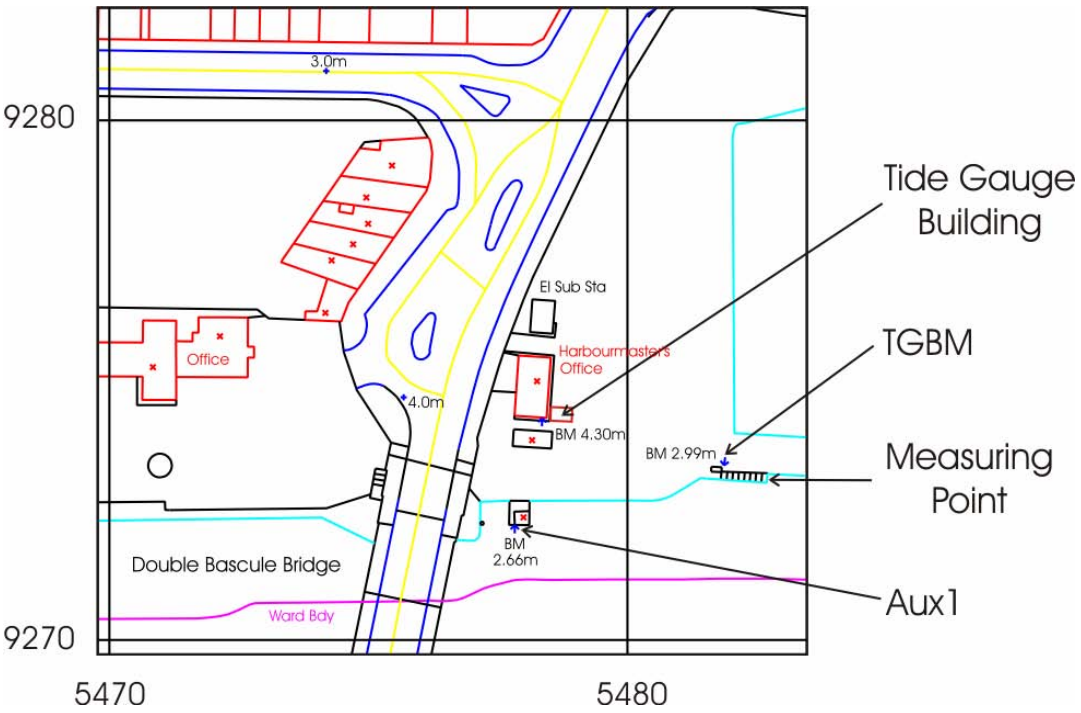
Latitude: 52° 28' 23.1" N Longitude: 01° 45' 00.9" E

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Milford Haven Tide Gauge

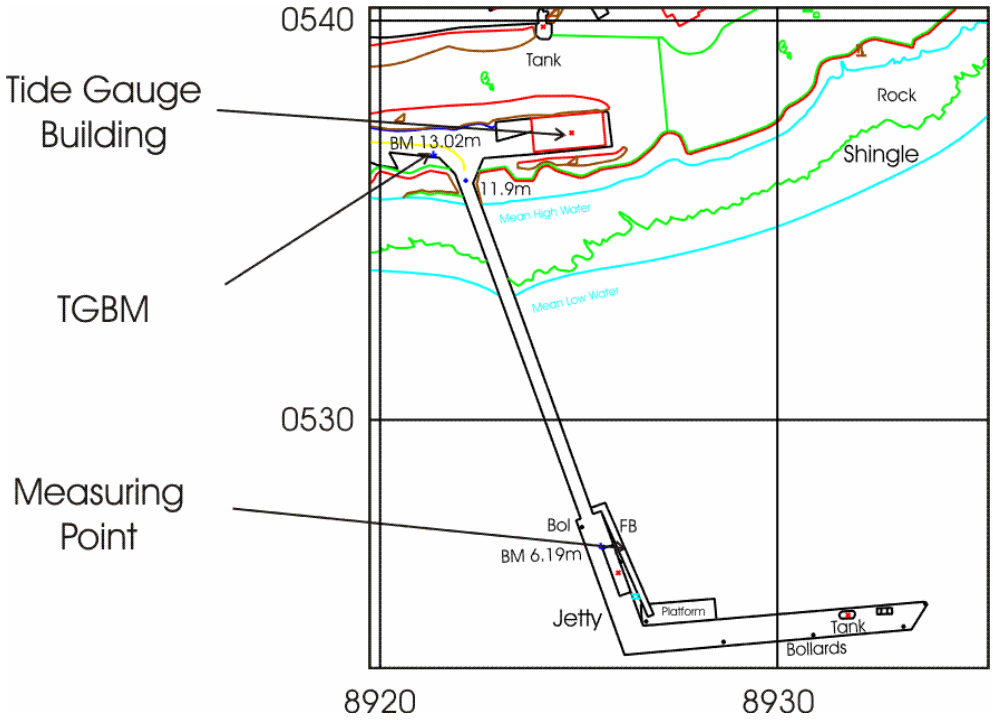
Latitude: 51° 42' 26.6" N Longitude: 05° 03' 06.4" W

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Millport Tide Gauge

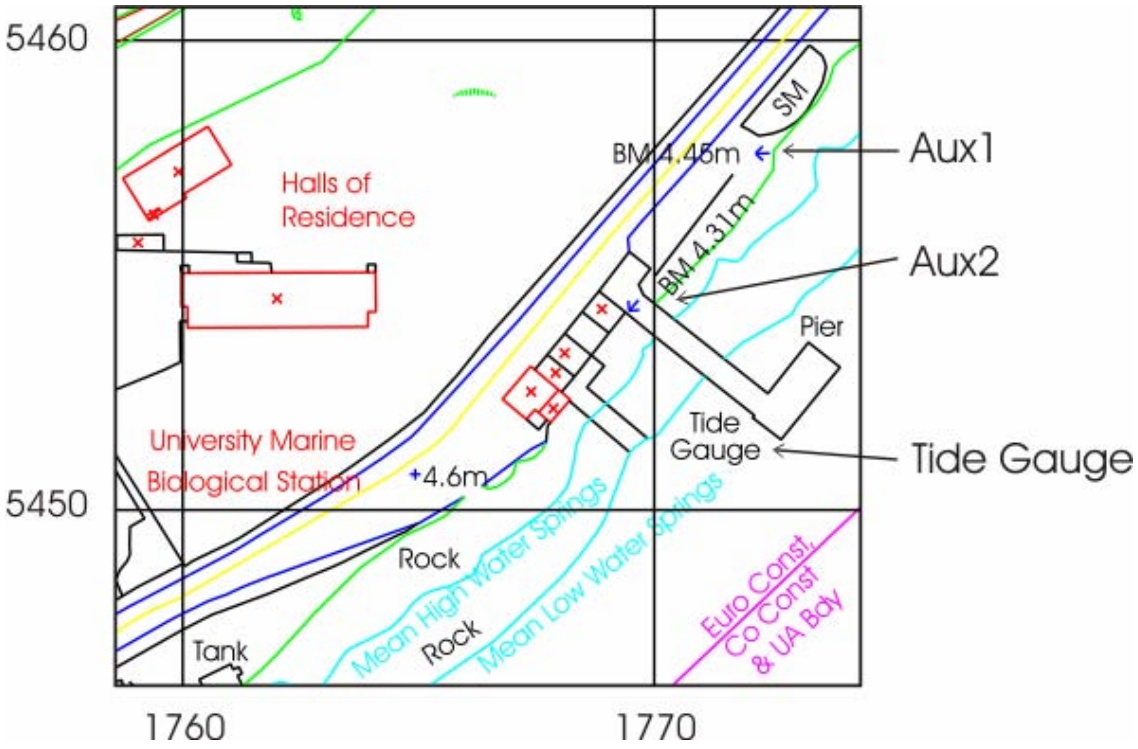
Latitude: 55° 44' 59.3" N Longitude: 04° 54' 22.8" W

Grid Reference: NS 1769 5454

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



©Crown copyright. All rights reserved NERC 100017897 2006

Mumbles (West Glamorgan) Tide Gauge

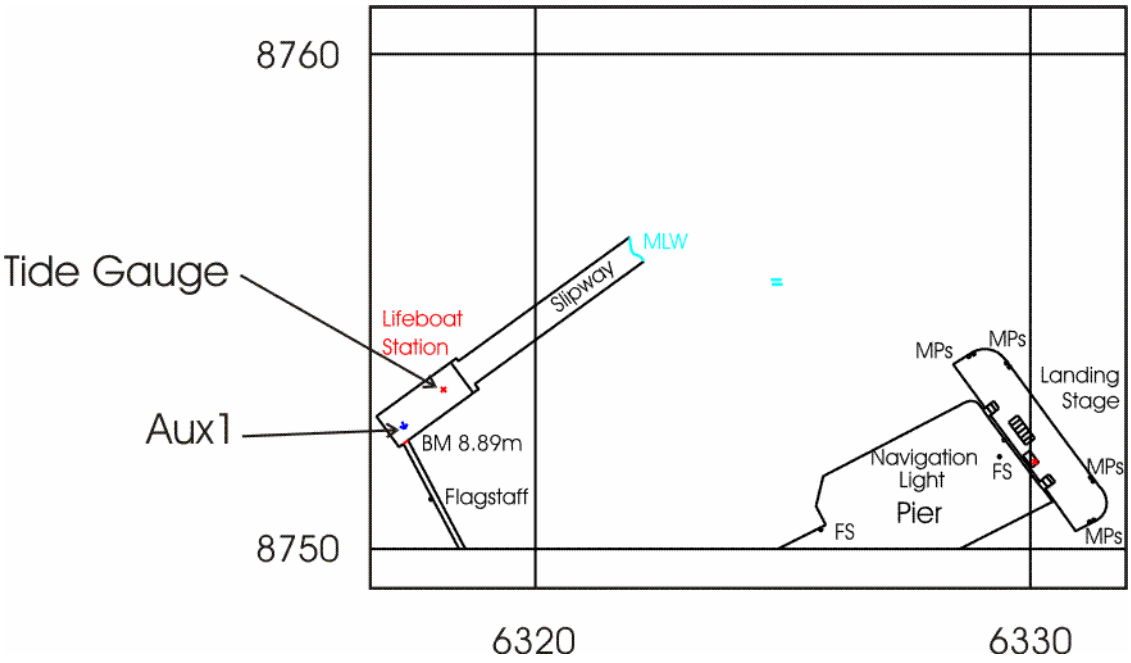
Latitude: 51° 34' 12.0" N Longitude: 03° 58' 31.7" W

Grid Reference: SS 6319 8753

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



©Crown copyright. All rights reserved NERC 100017897 2006

Newlyn Tide Gauge

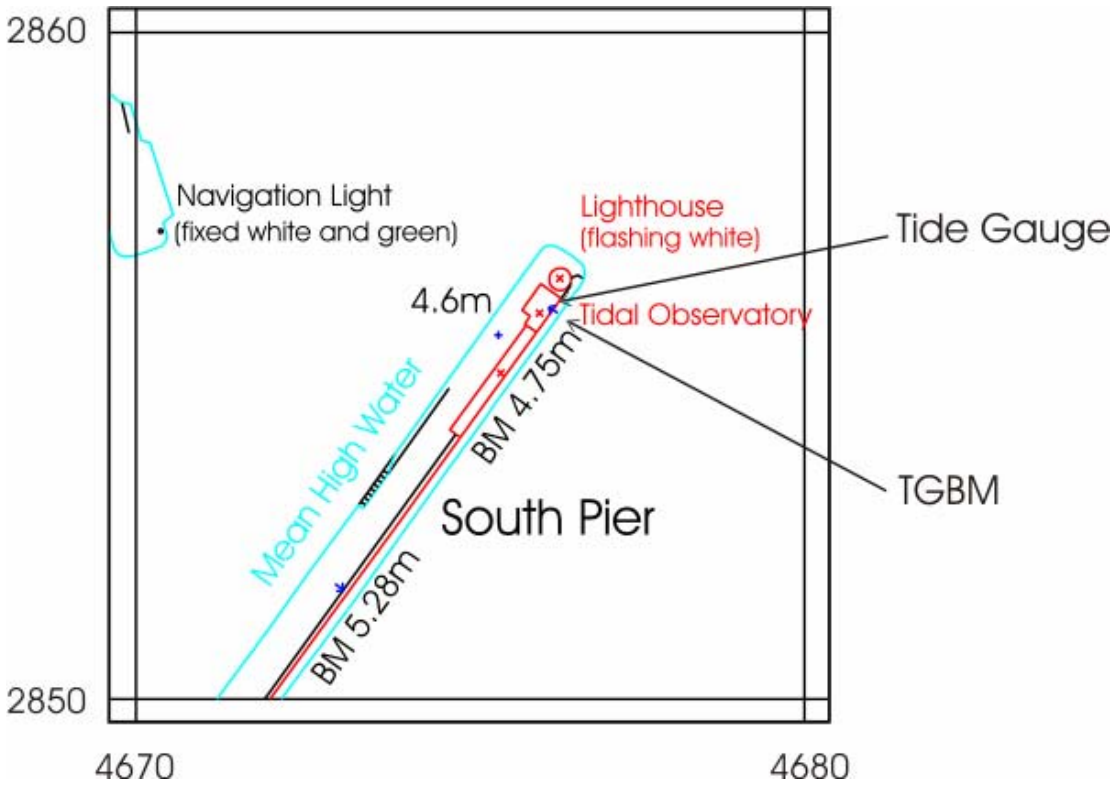
Latitude: 50° 06' 10.8" N Longitude: 05° 32' 33.9" W

Grid Reference: SW 4676 2856

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



©Crown copyright. All rights reserved NERC 100017897 2006

Newhaven (Sussex) Tide Gauge

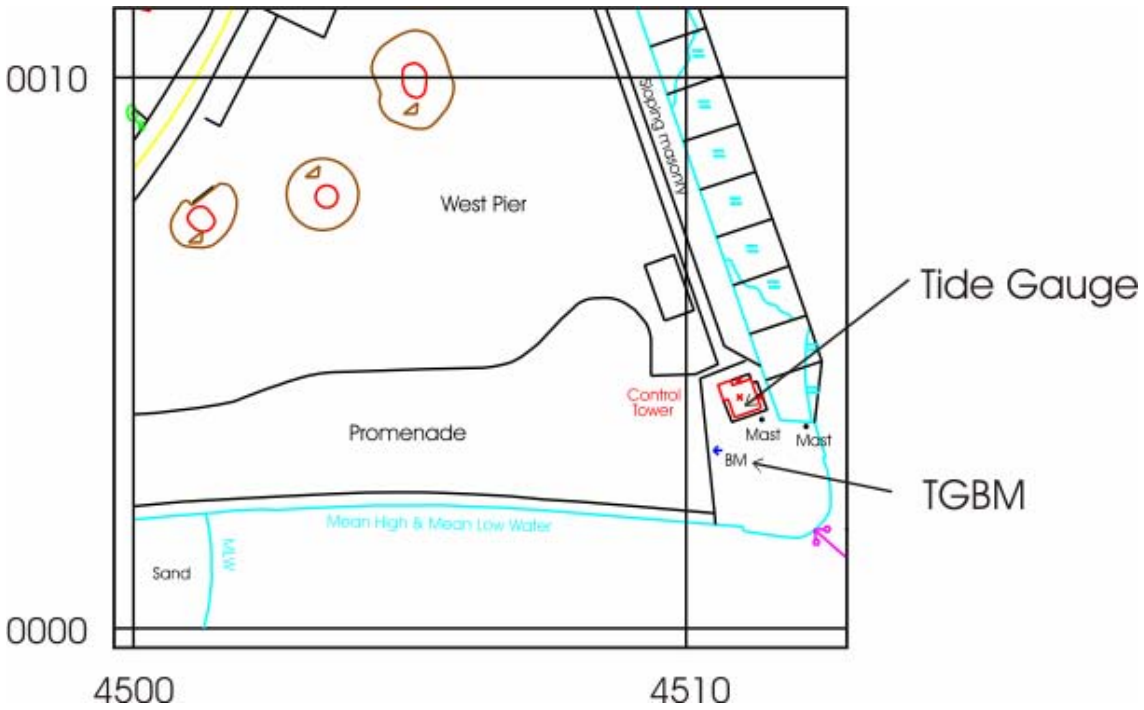
Latitude: 50° 46' 54.6" N Longitude: 00° 03' 25.3" E

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.



©Crown copyright. All rights reserved NERC 100017897 2006

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 bubbler gauges 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.

©Crown copyright. All rights reserved NERC 100017897 2006

North Shields (Tyne and Wear) Tide Gauge

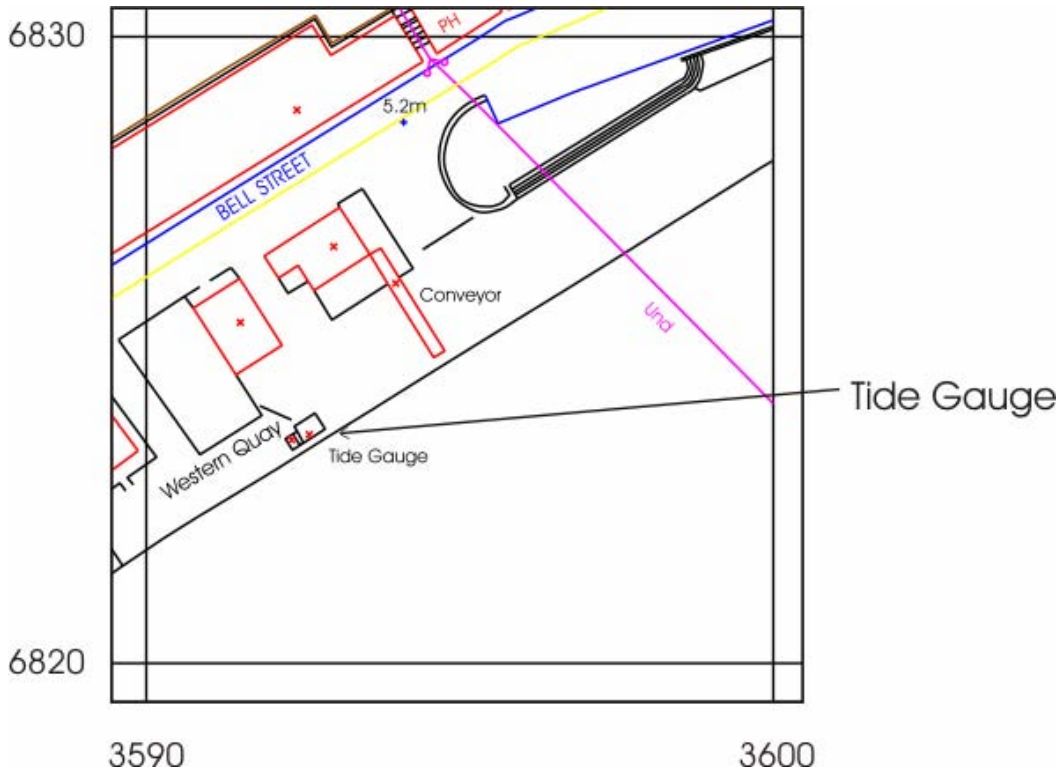
Latitude: 55° 00' 26.8" N Longitude: 01°26' 23.4" W

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Portpatrick (Scotland) Tide Gauge

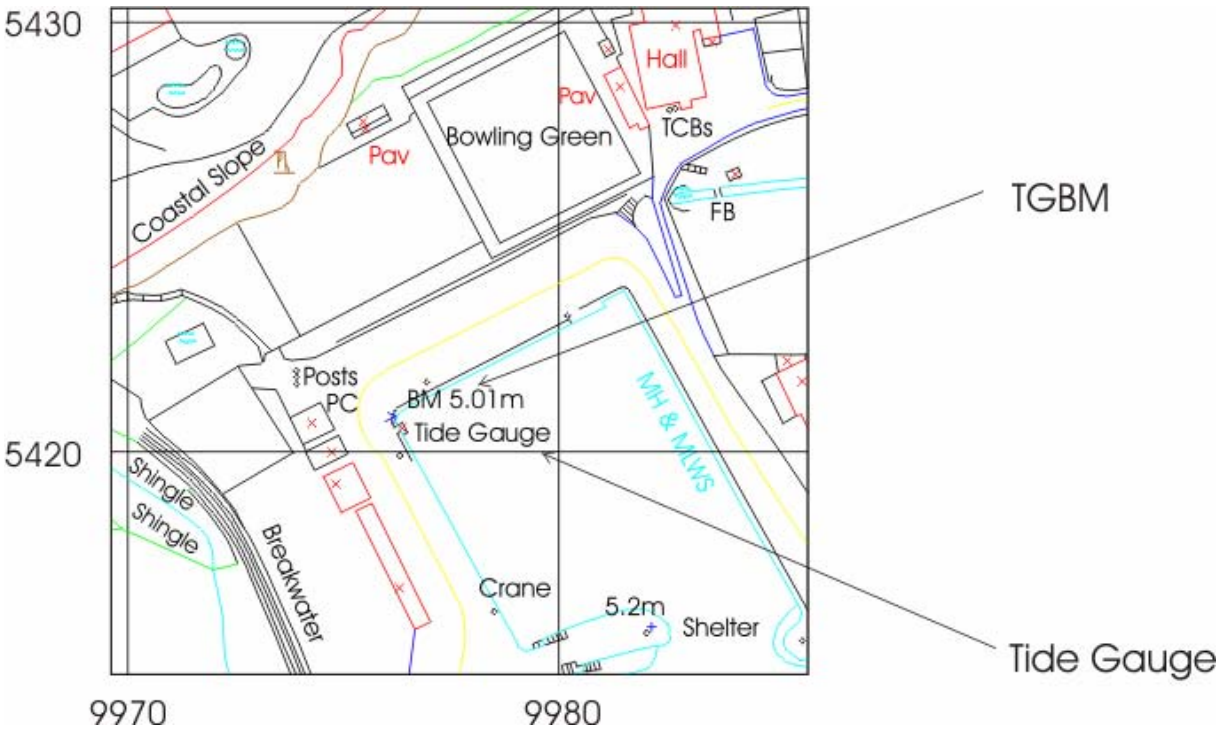
Latitude: 54° 50' 33.0" N Longitude: 05° 07' 12.1" W

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Portrush (Northern Ireland) Tide Gauge

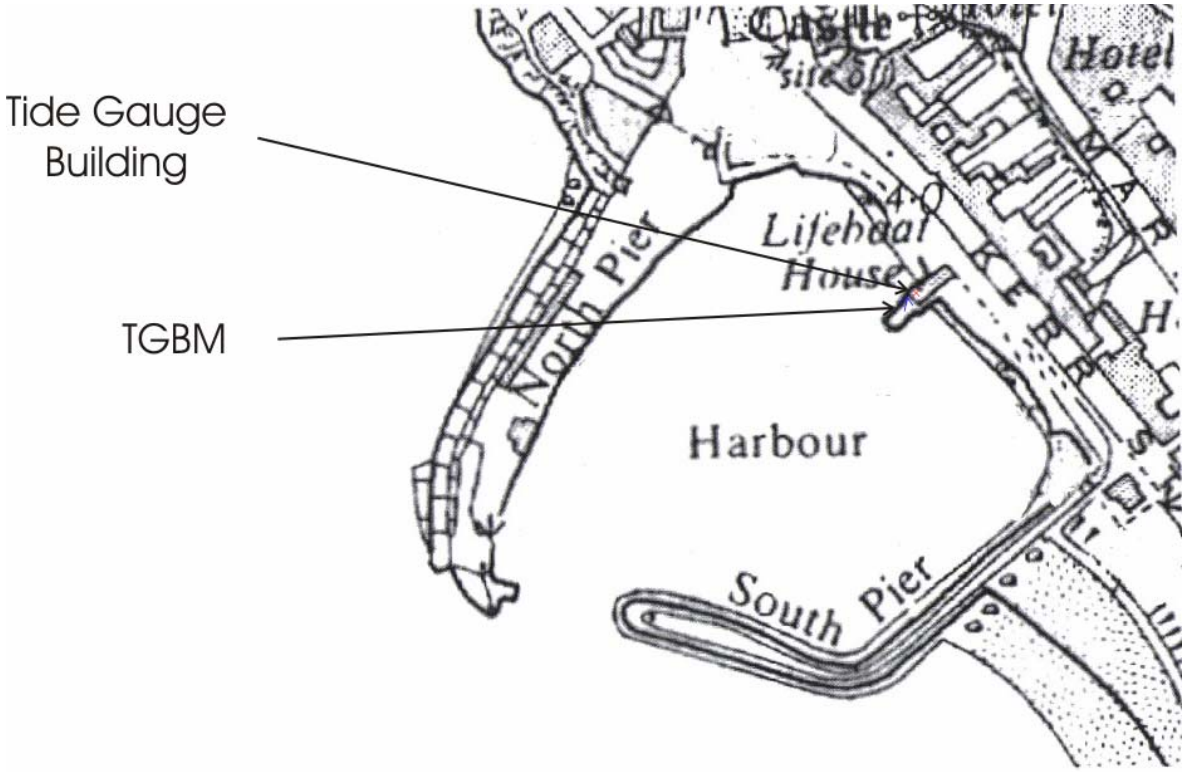
Latitude: 55° 12' 24.4" N Longitude: 06° 39' 24.6" W

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.



©Ordnance Survey of Northern Ireland 2006

Portsmouth (Hampshire) Tide Gauge

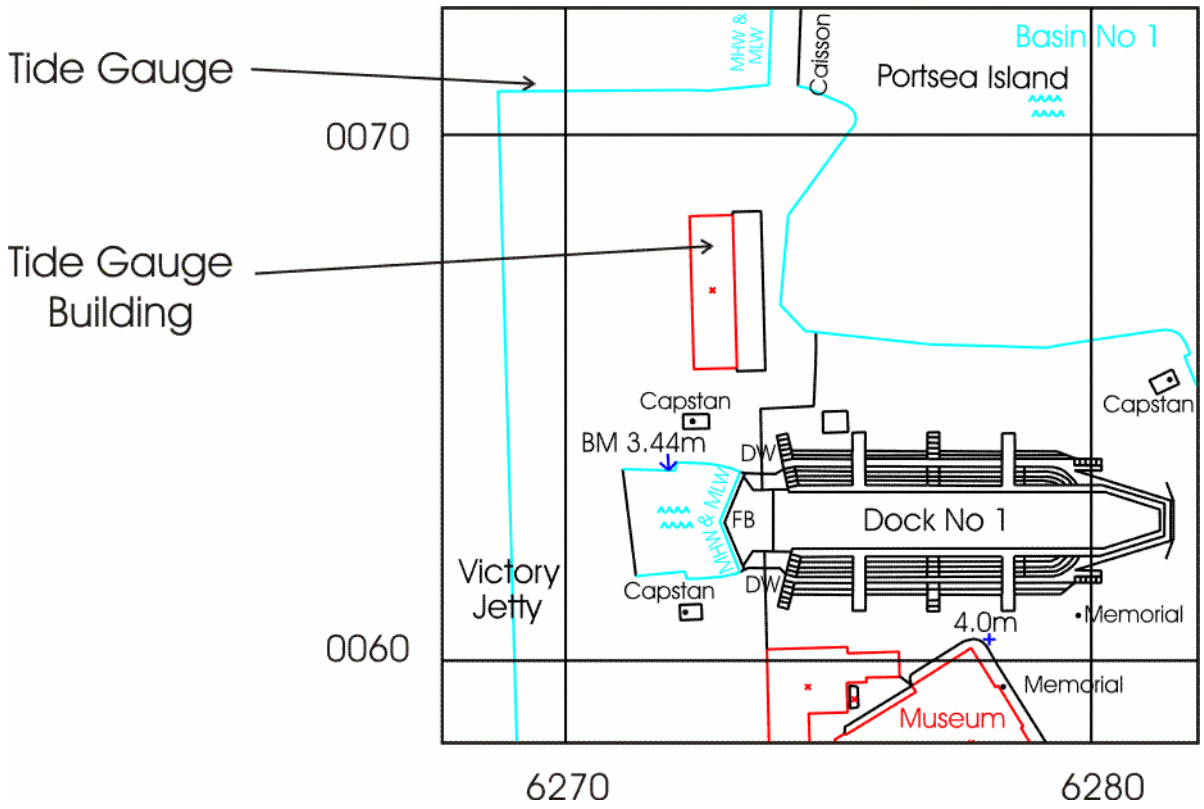
Latitude: 50° 48' 08.1" N Longitude: 01° 06' 40.5" W

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.



©Crown copyright. All rights reserved NERC 100017897 2006

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.

©Crown copyright. All rights reserved NERC 100017897 2006

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

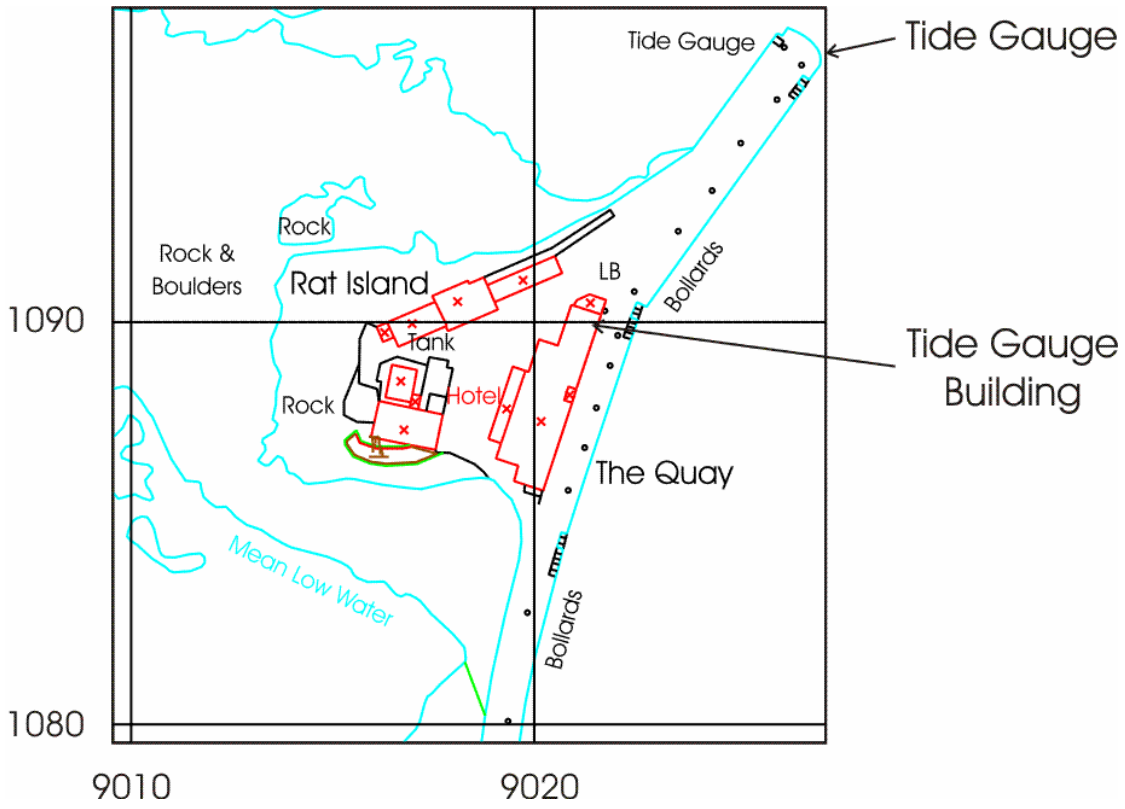
Latitude: 49° 55' 04.2" N Longitude: 06° 19' 01.7" W

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Stornoway (Hebrides) Tide Gauge

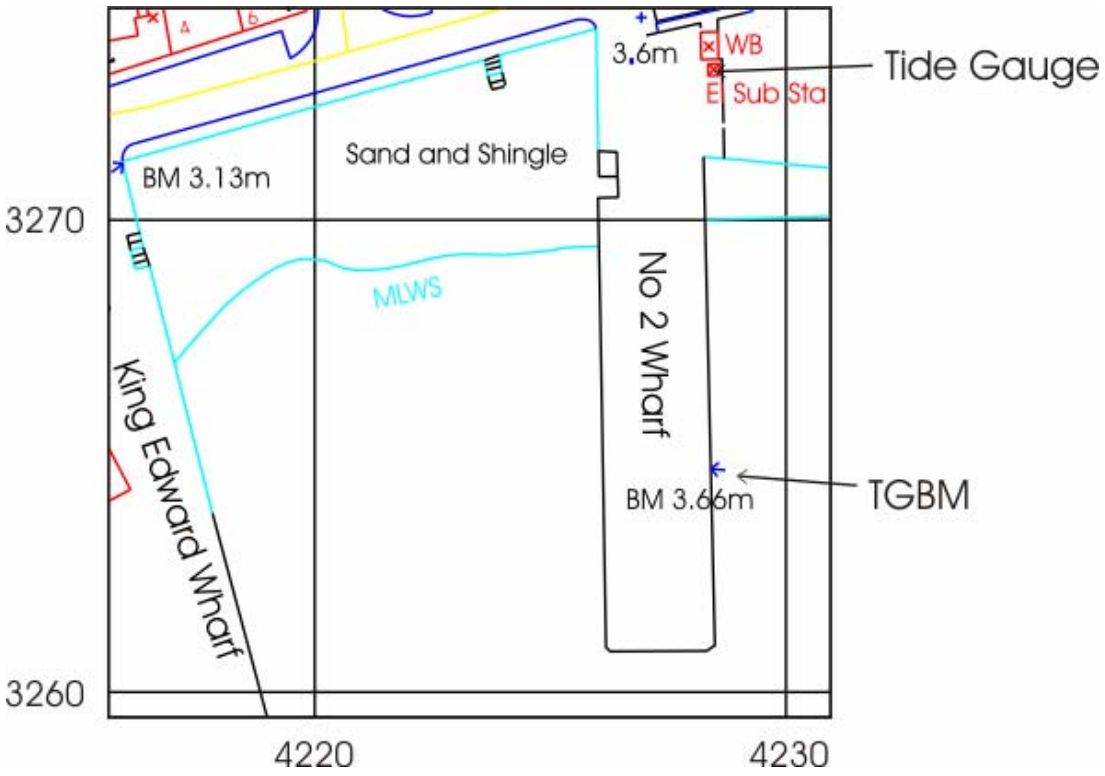
Latitude: 58° 12' 28.0" N Longitude: 06° 23' 20.0" W

Grid Reference: NB 4229 3273

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



©Crown copyright. All rights reserved NERC 100017897 2006

Tobermory (Mull) Tide Gauge

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

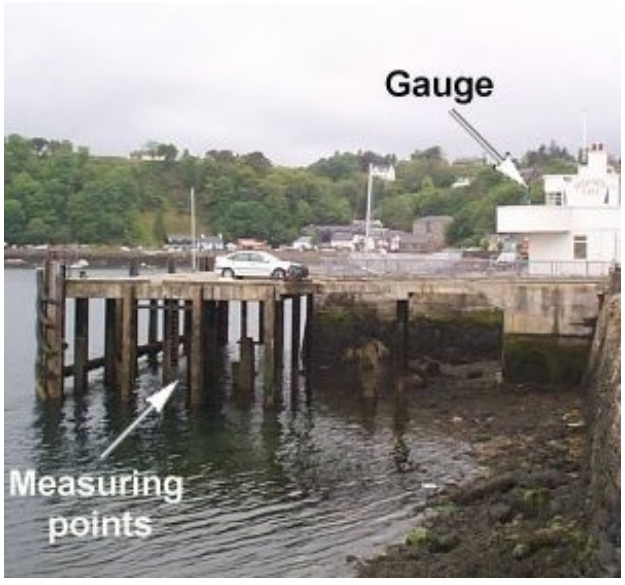
Grid Reference: NM 5079 5531

Instrument type: Dataring 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.

©Crown copyright. All rights reserved NERC 100017897 2006



Ullapool (Scotland) Tide Gauge

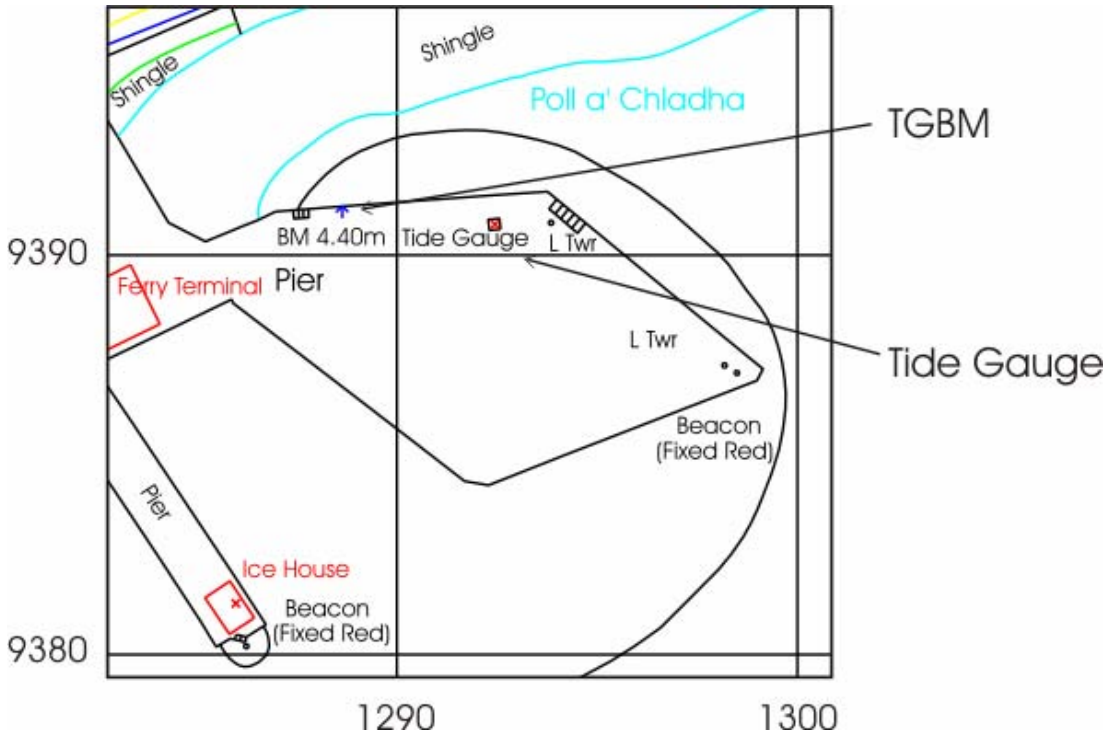
Latitude: 57° 53' 42.9" N Longitude: 05° 09' 28.8" W

Grid Reference: NH 1292 9391

Instrument type: Data acquisition system with a full tide, a mid-tide bubbler gauge and a potentiometer attached to an installed Munro float gauge. Wind speed and wind direction also recorded.

Site of Gauge:

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



©Crown copyright. All rights reserved NERC 100017897 2006

Weymouth (Dorset) Tide Gauge

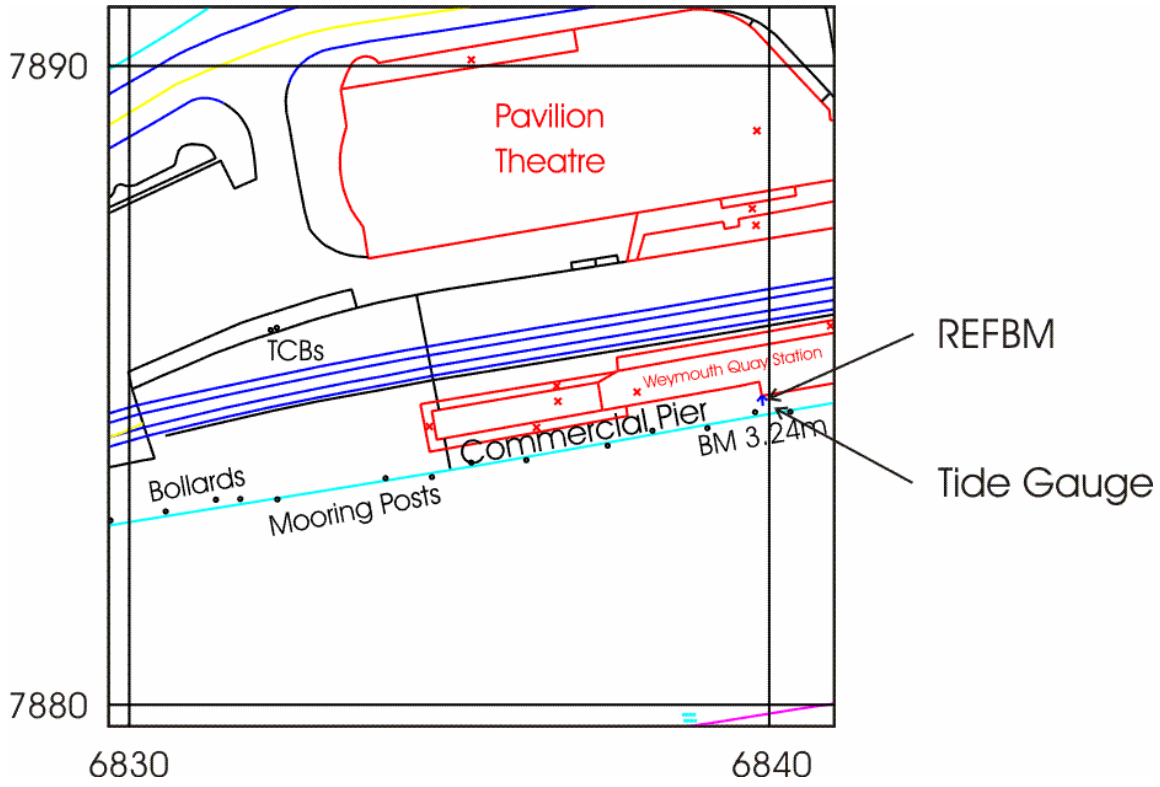
Latitude: 50° 36' 30.6" N Longitude: 02° 26' 52.6" W

Grid Reference: SY 6840 7885

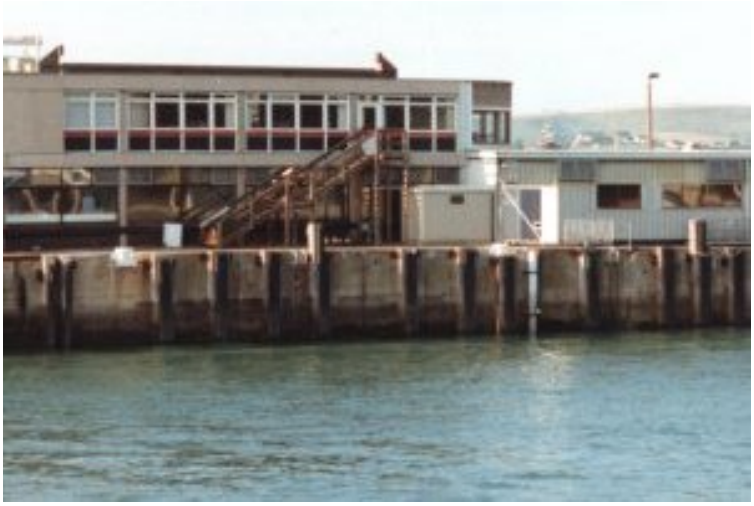
Instrument type: Data acquisition system with two full tide bubbler gauges installed.

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.



©Crown copyright. All rights reserved NERC 100017897 2006



Whitby (Yorkshire) Tide Gauge

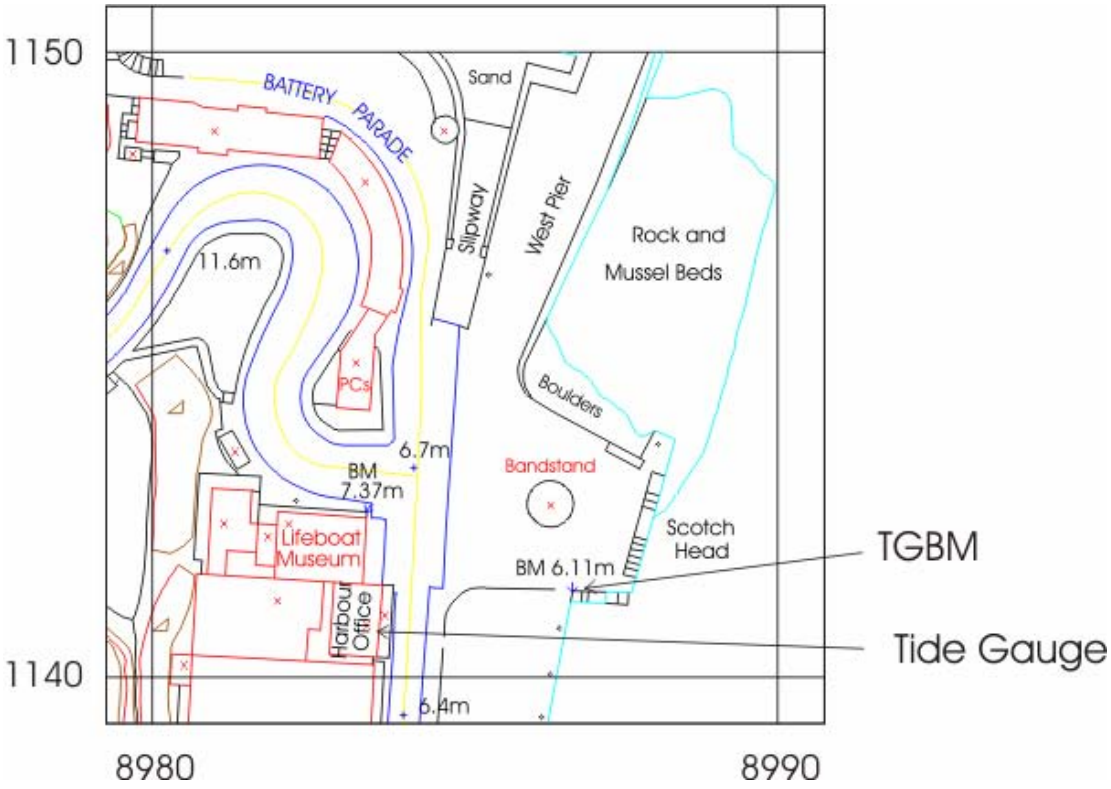
Latitude: 54° 29' 24.0" N Longitude: 00° 36' 52.9" W

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.



©Crown copyright. All rights reserved NERC 100017897 2006

Wick (Scotland) Tide Gauge

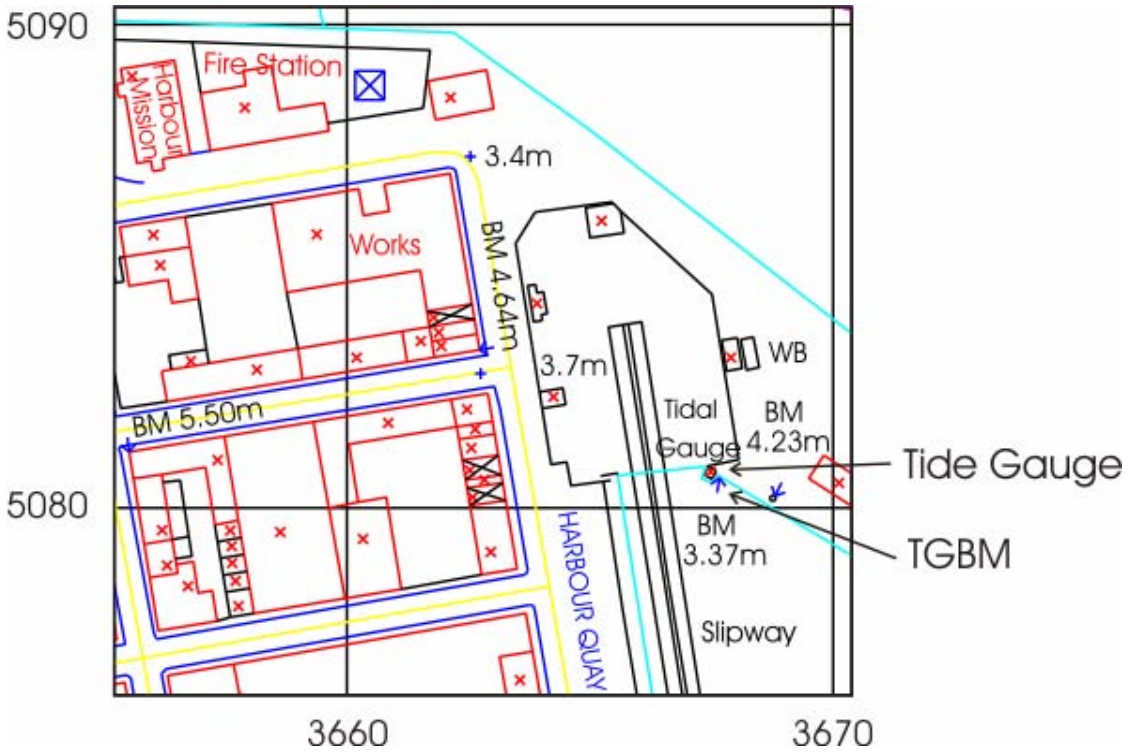
Latitude: 58° 26' 27.5" N Longitude: 03° 05' 11.0" W

Grid Reference: ND 3667 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.



©Crown copyright. All rights reserved NERC 100017897 2006

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.

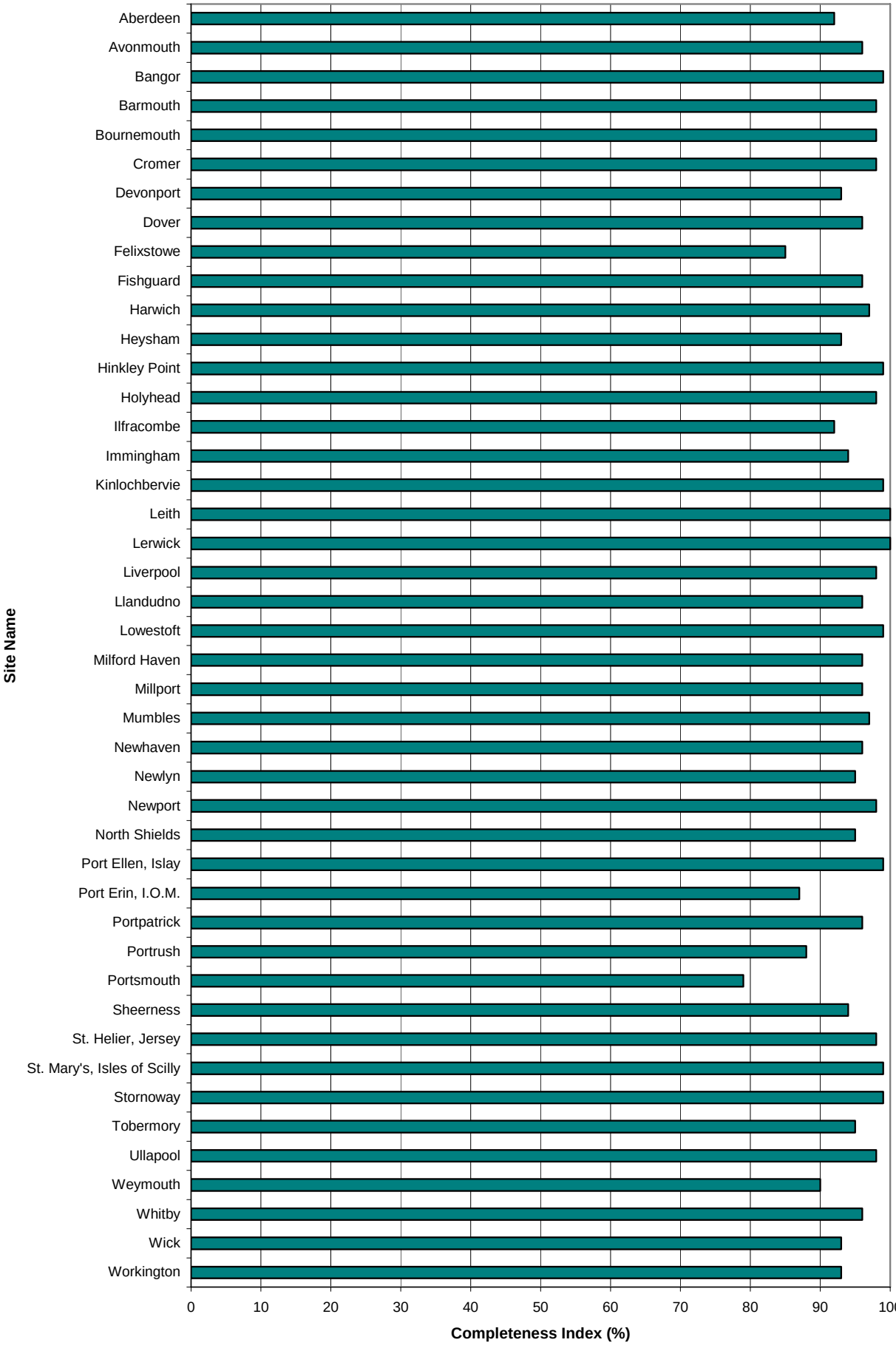
Site of Gauge:

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.

©Crown copyright. All rights reserved NERC 100017897 2006

Report for 2006 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' 48.8" W
Grid Reference: NJ 9524 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 171.

T.G.I. visits to site: Day 171 On site installing new software and compressor change.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
92	15 minutes	032-038,060-061,067-074,081-083,108-115,165-171	None

Statistics:

Surge maxima	Value	Day	Time
January	0.837	11	07:15:00
February	0.5	15	19:45:00
March	0.368	28	08:30:00
April	0.378	6	13:45:00
May	0.379	19	00:45:00
June	0.402	13	11:15:00
July	0.306	30	12:45:00
August	0.281	28	15:30:00
September	0.476	28	15:30:00
October	0.612	31	12:15:00
November	0.711	20	09:45:00
December	0.663	14	16:00:00

Surge minima	Value	Day	Time
January	-0.35	5	04:00:00
February	-0.404	24	20:15:00
March	-0.298	17	17:45:00
April	-0.166	29	02:30:00
May	-0.166	8	20:00:00
June	-0.189	5	13:45:00
July	-0.234	14	16:30:00
August	-0.155	13	14:30:00
September	-0.169	8	11:30:00
October	-0.226	26	16:15:00
November	-0.273	1	20:15:00
December	-0.336	25	10:15:00

Extreme Maxima	Value	Day	Time
January	4.559	31	14:30:00
February	4.569	15	14:45:00
March	4.912	30	13:30:00
April	4.668	1	15:15:00
May	4.304	27	13:15:00
June	4.344	13	14:15:00
July	4.357	13	02:15:00
August	4.567	12	02:45:00
September	4.79	11	03:15:00
October	4.984	9	02:00:00
November	4.927	6	01:00:00
December	4.858	5	00:45:00

Extreme minima	Value	Day	Time
January	0.088	31	21:00:00
February	0.07	28	19:30:00
March	0.132	2	21:15:00
April	0.237	27	19:00:00
May	0.703	13	19:30:00
June	0.747	27	08:15:00
July	0.165	14	09:30:00
August	0.088	12	09:15:00
September	0.004	9	08:00:00
October	0.301	8	07:45:00
November	0.682	4	05:45:00
December	0.572	24	22:00:00

Mean sea level	No days	MSL
January	30	2.539
February	19	2.525
March	14	2.523
April	22	2.557
May	31	2.508
June	21	2.46
July	31	2.531
August	31	2.575
September	30	2.685
October	31	2.735
November	30	2.832
December	31	2.73
	Sum	Avg
	321	2.6

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 2006.

T.G.I. visits to site:

Day 068	On site installing new software patch and general maintenance.
Day 320	On site for general maintenance of gauge.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
96	15 minutes	054-068	None

Statistics:

Surge maxima	Value	Day	Time
January	0.985	20	06:00:00
February	1.032	7	21:30:00
March	1.22	30	03:30:00
April	0.921	20	18:30:00
May	0.932	21	21:45:00
June	0.748	18	20:15:00
July	0.885	9	01:00:00
August	0.838	28	05:30:00
September	1.292	30	06:15:00
October	1.446	26	04:45:00
November	1.568	23	05:45:00
December	1.615	3	05:15:00

Surge minima	Value	Day	Time
January	-0.7	8	02:45:00
February	-0.798	22	14:00:00
March	-0.679	16	03:15:00
April	-0.562	9	23:30:00
May	-0.733	7	21:00:00
June	-0.813	2	17:00:00
July	-0.674	1	17:00:00
August	-0.479	7	09:30:00
September	-0.488	8	02:45:00
October	-0.603	16	08:15:00
November	-0.646	2	23:30:00
December	-0.779	11	16:15:00

Extreme Maxima	Value	Day	Time
January	13.873	31	08:30:00
February	14.058	1	09:15:00
March	14.845	30	07:45:00
April	14.201	1	09:15:00
May	13.231	26	06:15:00
June	12.744	13	20:30:00
July	13.143	13	21:00:00
August	14.025	11	21:00:00
September	14.641	9	20:30:00
October	14.804	8	20:00:00
November	14.035	5	19:00:00
December	13.86	3	05:15:00

Extreme minima	Value	Day	Time
January	0.358	31	15:45:00
February	0.457	1	16:30:00
March	0.553	29	14:30:00
April	0.382	28	14:45:00
May	1.266	28	02:15:00
June	1.269	14	03:15:00
July	0.733	14	04:15:00
August	0.465	12	04:15:00
September	0.201	9	03:15:00
October	0.423	8	02:45:00
November	0.658	6	02:15:00
December	1.123	22	15:00:00

Mean sea level	No days	MSL
January	31	6.869
February	21	6.975
March	21	6.995
April	30	6.939
May	31	6.98
June	30	6.878
July	31	6.938
August	31	7.007
September	30	7.107
October	31	7.199
November	30	7.207
December	31	7.08
	Sum	Avg
	348	7.015

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 2006.

T.G.I. visits to site:		
	Day 046	TGI and POL diving team on site to clear underwater Blockage.
	Day 164	On site to install new software.
	Day 326	On site, system purged and channel 2 looks better. Compressor changed.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	164	001-007,023-031,044-047,113,116,137,143-146,149-150,245,279-292,295-297,299-319,321-326

Statistics:

Surge maxima	Value	Day	Time
January	0.448	11	02:15:00
February	0.535	16	18:00:00
March	0.573	27	09:30:00
April	0.397	2	10:00:00
May	0.517	18	15:15:00
June	0.518	20	17:30:00
July	0.41	9	08:45:00
August	0.251	31	02:30:00
September	0.6	21	23:15:00
October	0.583	26	00:00:00
November	0.935	19	21:00:00
December	1.081	3	07:15:00

Surge minima	Value	Day	Time
January	-0.404	28	15:45:00
February	-0.352	24	23:30:00
March	-0.318	17	04:30:00
April	-0.29	9	16:30:00
May	-0.283	30	19:45:00
June	-0.291	2	22:15:00
July	-0.279	14	07:00:00
August	-0.29	7	16:30:00
September	-0.219	7	08:30:00
October	-0.035	4	06:15:00
November	-0.062	19	01:45:00
December	-0.43	22	18:00:00

Extreme Maxima	Value	Day	Time
January	3.88	15	11:30:00
February	3.744	2	14:00:00
March	4.085	30	11:15:00
April	3.904	1	13:00:00
May	3.604	18	02:00:00
June	3.543	12	23:45:00
July	3.618	30	02:00:00
August	3.598	15	03:00:00
September	3.997	21	22:45:00
October	3.961	21	23:00:00
November	4.204	19	22:00:00
December	4.338	3	21:30:00

Extreme minima	Value	Day	Time
January	0.102	31	18:30:00
February	-0.089	28	17:30:00
March	0.02	1	18:00:00
April	0.097	28	17:15:00
May	0.341	30	07:00:00
June	0.389	15	07:15:00
July	0.063	14	07:00:00
August	0.024	12	06:45:00
September	0.041	8	05:00:00
October	0.512	5	03:00:00
November	0.801	30	00:15:00
December	0.29	23	19:00:00

Mean sea level	No days	MSL
January	14	2.133
February	22	1.91
March	31	2.014
April	27	1.976
May	24	1.976
June	30	1.959
July	31	1.982
August	31	1.992
September	28	2.155
October	5	2.225
November	8	2.471
December	31	2.198
	Sum	Avg
	282	2.083

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 2006.

T.G.I. visits to site: Day 109 On site installing new software patch.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	060-064,071-073,102,214-216	149-151

Statistics:

Surge maxima	Value	Day	Time
January	0.849	20	03:45:00
February	0.708	15	01:30:00
March	0.802	27	07:00:00
April	0.617	11	11:00:00
May	0.614	21	20:30:00
June	0.722	20	20:45:00
July	0.545	9	01:45:00
August	0.373	31	08:15:00
September	0.962	21	22:00:00
October	1.027	22	00:15:00
November	1.2	23	04:45:00
December	1.419	3	03:30:00

Surge minima	Value	Day	Time
January	-0.512	28	21:15:00
February	-0.391	26	08:30:00
March	-0.383	16	23:15:00
April	-0.325	28	04:30:00
May	-0.232	31	06:00:00
June	-0.294	2	20:00:00
July	-0.333	14	00:45:00
August	-0.335	7	21:15:00
September	-0.27	8	04:45:00
October	-0.438	31	20:00:00
November	-0.316	10	00:15:00
December	-0.522	24	00:00:00

Extreme Maxima	Value	Day	Time
January	5.368	31	09:30:00
February	5.473	1	10:15:00
March	6.188	30	08:45:00
April	5.627	1	10:00:00
May	5.143	26	07:00:00
June	4.871	12	20:45:00
July	5.017	12	21:15:00
August	5.406	11	21:45:00
September	5.785	9	21:15:00
October	6.008	8	20:45:00
November	5.455	5	19:45:00
December	5.879	3	06:30:00

Extreme minima	Value	Day	Time
January	0.695	30	17:00:00
February	0.679	28	17:00:00
March	0.667	17	17:15:00
April	0.648	29	04:45:00
May	0.833	14	03:45:00
June	0.823	15	05:45:00
July	0.721	15	07:00:00
August	0.725	12	18:15:00
September	0.763	8	04:30:00
October	0.845	10	05:30:00
November	0.81	5	15:30:00
December	0.831	23	17:45:00

Mean sea level	No days	MSL
January	31	2.621
February	27	2.616
March	23	2.739
April	27	2.627
May	27	2.709
June	30	2.604
July	31	2.653
August	27	2.675
September	30	2.835
October	31	2.921
November	30	2.951
December	31	2.88
	Sum	Avg
	345	2.736

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 2006.

T.G.I. visits to site:

Day 031	On site to change compressor and general maintenance.
Day 062	On site installing new software patch.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	004,054-062	None

Statistics:

Surge maxima	Value	Day	Time
January	0.345	11	23:45:00
February	0.501	16	07:00:00
March	0.429	24	06:00:00
April	0.257	1	00:00:00
May	0.457	22	01:00:00
June	0.17	14	02:15:00
July	0.224	19	18:45:00
August	0.294	17	19:00:00
September	0.43	30	15:45:00
October	0.631	24	00:45:00
November	0.589	25	07:15:00
December	0.855	3	05:45:00

Surge minima	Value	Day	Time
January	-0.459	29	23:30:00
February	-0.259	22	13:30:00
March	-0.415	18	01:00:00
April	-0.283	27	23:15:00
May	-0.226	31	12:30:00
June	-0.349	2	14:15:00
July	-0.284	15	07:15:00
August	-0.192	6	05:45:00
September	-0.217	8	11:30:00
October	-0.227	15	15:45:00
November	-0.443	20	12:15:00
December	-0.419	23	00:30:00

Extreme Maxima	Value	Day	Time
January	2.331	31	09:45:00
February	2.409	16	10:30:00
March	2.75	30	09:00:00
April	2.414	1	10:30:00
May	2.407	21	19:15:00
June	2.189	13	22:00:00
July	2.29	13	22:30:00
August	2.464	11	22:15:00
September	2.591	9	21:45:00
October	2.761	8	21:30:00
November	2.589	23	09:30:00
December	2.931	3	06:15:00

Extreme minima	Value	Day	Time
January	-0.03	30	16:30:00
February	0.022	1	17:45:00
March	0.257	3	18:00:00
April	0.136	27	15:15:00
May	0.478	28	04:00:00
June	0.451	15	06:00:00
July	0.098	15	06:30:00
August	0.077	12	05:15:00
September	-0.013	9	04:15:00
October	0.176	8	04:00:00
November	0.289	5	02:45:00
December	0.299	22	16:45:00

Mean sea level	No days	MSL
January	31	1.471
February	21	1.556
March	27	1.543
April	30	1.508
May	31	1.562
June	30	1.515
July	31	1.556
August	31	1.609
September	30	1.683
October	31	1.782
November	30	1.767
December	31	1.628
	Sum	Avg
	354	1.598

Cromer Tide Gauge

Latitude: 52° 56' 03.1" N
Longitude: 01° 18' 05.9" 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: Geodetic levelling completed on day 094.

T.G.I. visits to site: Day 094 On site to install new software patch.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	067-072,094	345-346

Statistics:

Surge maxima	Value	Day	Time
January	1.17	11	13:30:00
February	1.081	8	11:00:00
March	0.5	6	07:00:00
April	0.484	9	12:45:00
May	0.651	22	20:00:00
June	0.531	13	16:30:00
July	0.311	30	19:45:00
August	0.588	3	07:30:00
September	0.586	28	18:45:00
October	1.677	31	18:15:00
November	1.389	1	00:30:00
December	0.882	31	00:00:00

Surge minima	Value	Day	Time
January	-0.729	12	15:00:00
February	-0.505	14	15:15:00
March	-0.951	13	14:45:00
April	-0.442	11	13:30:00
May	-0.372	24	00:15:00
June	-0.404	20	23:45:00
July	-0.315	16	19:15:00
August	-0.234	31	03:30:00
September	-0.489	20	15:00:00
October	-0.614	26	20:45:00
November	-1.327	20	03:00:00
December	-1.232	10	18:00:00

Extreme Maxima	Value	Day	Time
January	5.361	31	19:45:00
February	5.673	28	18:45:00
March	5.679	2	20:15:00
April	5.34	26	17:15:00
May	5.081	30	08:00:00
June	5.056	13	19:30:00
July	5.21	13	07:45:00
August	5.687	12	08:15:00
September	5.631	10	07:45:00
October	5.902	7	06:00:00
November	5.789	6	06:15:00
December	5.323	6	19:00:00

Extreme minima	Value	Day	Time
January	0.361	3	03:15:00
February	0.257	1	03:15:00
March	0.217	2	02:45:00
April	0.41	28	01:15:00
May	0.733	1	15:15:00
June	0.81	15	15:30:00
July	0.432	14	15:45:00
August	0.547	13	16:00:00
September	0.183	9	14:15:00
October	0.387	8	13:45:00
November	0.744	20	00:45:00
December	0.185	3	11:30:00

Mean sea level	No days	MSL
January	31	2.856
February	28	2.991
March	23	2.906
April	30	2.938
May	31	2.92
June	30	2.887
July	31	2.923
August	31	3.051
September	30	3.052
October	31	3.085
November	30	3.134
December	28	2.952
	Sum	Avg
	354	2.975

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 2006.

T.G.I. visits to site: Day 030 On site to attempt purge of channel 2 but no use, divers needed. Compressor changed and general maintenance carried out.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
93	15 minutes	032-038,039,054-058,060-065,067-070,074-076,081-086	001-023,025-032,038-039,039-042,238-239,243-257,335,337-344

Statistics:

Surge maxima	Value	Day	Time
January	-0.07	24	20:45:00
February	0.415	18	04:45:00
March	0.396	27	09:15:00
April	0.295	1	03:30:00
May	0.6	21	22:00:00
June	0.191	18	19:15:00
July	0.233	29	16:45:00
August	0.313	17	07:00:00
September	0.498	21	17:45:00
October	0.599	19	14:30:00
November	0.562	24	15:00:00
December	0.851	3	04:15:00

Surge minima	Value	Day	Time
January	-0.299	24	15:45:00
February	-0.247	12	10:45:00
March	-0.216	17	23:00:00
April	-0.28	27	22:00:00
May	-0.221	31	12:45:00
June	-0.331	2	15:30:00
July	-0.281	15	10:30:00
August	-0.224	12	09:45:00
September	-0.125	25	23:00:00
October	-0.189	13	00:45:00
November	-0.303	12	02:15:00
December	-0.467	21	22:00:00

Extreme Maxima	Value	Day	Time
January	4.223	25	00:45:00
February	5.678	28	06:00:00
March	6.195	30	06:15:00
April	5.854	1	07:30:00
May	5.356	14	18:30:00
June	5.403	13	18:45:00
July	5.544	13	19:30:00
August	5.789	11	19:15:00
September	5.826	21	17:15:00
October	6.221	8	18:30:00
November	5.819	23	06:45:00
December	6.112	3	04:00:00

Extreme minima	Value	Day	Time
January	2.121	24	18:15:00
February	0.294	28	12:15:00
March	0.434	1	00:15:00
April	0.312	28	12:15:00
May	0.861	26	23:30:00
June	0.958	15	02:00:00
July	0.614	15	02:45:00
August	0.324	12	01:45:00
September	1.134	24	00:45:00
October	0.34	8	00:15:00
November	0.493	5	23:45:00
December	0.841	23	13:45:00

Mean sea level	No days	MSL
January		
February	9	3.48
March	9	3.409
April	30	3.299
May	31	3.356
June	30	3.311
July	31	3.343
August	27	3.37
September	15	3.553
October	31	3.589
November	30	3.565
December	21	3.34
	Sum	Avg
	264	3.42

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 2006.

T.G.I. visits to site: Day 097 On site installing new software patch.
Day 278 TGI visit to carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
96	15 minutes	081-097	None

Statistics:

Surge maxima	Value	Day	Time
January	0.735	11	20:45:00
February	0.752	8	11:45:00
March	0.353	5	10:00:00
April	0.402	13	21:45:00
May	0.678	20	13:45:00
June	0.372	13	23:00:00
July	0.258	31	00:30:00
August	0.393	29	00:00:00
September	0.557	28	23:45:00
October	1.329	31	22:30:00
November	1.22	1	00:00:00
December	0.77	4	07:30:00

Surge minima	Value	Day	Time
January	-0.607	11	07:45:00
February	-0.36	15	12:00:00
March	-0.642	13	10:30:00
April	-0.324	25	09:00:00
May	-0.306	1	13:15:00
June	-0.335	6	15:00:00
July	-0.398	15	11:45:00
August	-0.245	31	14:30:00
September	-0.364	2	20:45:00
October	-0.334	5	21:30:00
November	-1.037	20	09:45:00
December	-0.916	11	02:15:00

Extreme Maxima	Value	Day	Time
January	6.823	4	01:30:00
February	7.319	28	23:30:00
March	7.277	3	01:00:00
April	6.95	28	23:15:00
May	6.646	28	11:45:00
June	6.677	14	00:15:00
July	6.767	13	12:30:00
August	7.191	12	12:45:00
September	7.182	10	12:30:00
October	7.52	7	10:45:00
November	7.272	6	11:00:00
December	6.953	4	10:00:00

Extreme minima	Value	Day	Time
January	0.504	31	07:30:00
February	0.414	1	08:15:00
March	0.343	2	08:00:00
April	0.458	28	06:30:00
May	0.889	27	06:00:00
June	1	14	20:15:00
July	0.627	14	21:00:00
August	0.652	11	20:00:00
September	0.326	8	19:00:00
October	0.469	8	19:15:00
November	0.814	5	18:00:00
December	0.775	3	16:15:00

Mean sea level	No days	MSL
January	31	3.636
February	28	3.747
March	20	3.628
April	22	3.684
May	31	3.727
June	30	3.676
July	31	3.71
August	31	3.829
September	30	3.837
October	31	3.913
November	30	3.934
December	31	3.756
	Sum	Avg
	346	3.756

Felixstowe Tide Gauge

Latitude: 51° 57' 27.8" N
Longitude: 01° 20' 47.6" 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 2006.

T.G.I. visits to site:		
	Day 095	On site to install new software and re-enable the mid tide channel.
	Day 136	On site to fit new software.
	Day 213	TGI fitted a new modem.
	Day 312	Modem fault, Port Surveyor investigating.
	Day 324	New modem fitted and back on line.
	Day 331	Intermittent communications fault. Modem replaced.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
85	15 minutes	067-080,081-095,130-136,305-324,354-356	095-130,193-214

Statistics:

Surge maxima	Value	Day	Time
January	1.07	11	18:15:00
February	1.052	8	16:45:00
March	0.528	6	11:30:00
May	0.558	29	20:30:00
June	0.513	13	21:45:00
July	0.346	10	08:15:00
August	0.523	3	12:00:00
September	0.562	7	18:45:00
October	1.862	31	21:00:00
November	1.537	1	01:15:00
December	0.934	31	02:15:00

Surge minima	Value	Day	Time
January	-0.702	11	05:00:00
February	-0.594	15	08:30:00
March	-0.426	7	13:45:00
May	-0.309	24	03:45:00
June	-0.399	21	02:45:00
July	-0.26	11	04:45:00
August	-0.211	9	03:15:00
September	-0.437	2	19:15:00
October	-0.464	30	12:00:00
November	-0.511	27	17:15:00
December	-1.262	10	22:45:00

Extreme Maxima	Value	Day	Time
January	4.146	1	12:00:00
February	4.323	28	12:00:00
March	4.158	1	12:30:00
May	3.998	30	01:15:00
June	4.003	14	00:45:00
July	3.862	12	00:00:00
August	4.22	12	01:15:00
September	4.319	7	23:30:00
October	4.564	31	20:15:00
November	4.261	20	23:00:00
December	4.368	8	13:30:00

Extreme minima	Value	Day	Time
January	0.037	5	09:15:00
February	-0.008	1	07:15:00
March	-0.026	2	07:00:00
May	0.24	24	02:45:00
June	0.315	21	01:30:00
July	0.103	14	20:00:00
August	0.209	11	18:45:00
September	-0.038	8	17:45:00
October	0.111	6	16:45:00
November	0.588	30	13:30:00
December	-0.129	3	16:15:00

Mean sea level	No days	MSL
January	31	1.958
February	28	2.076
March	6	2.147
May	14	2.141
June	30	2.03
July	11	2.047
August	28	2.177
September	30	2.19
October	30	2.214
November	9	2.177
December	26	2.078
	Sum	Avg
	243	2.112

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: No levelling was carried out in 2006.

T.G.I. visits to site: Day 068 On site installing new software patch.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
96	15 minutes	054-067	None

Statistics:

Surge maxima	Value	Day	Time
January	0.44	20	04:30:00
February	0.582	15	03:15:00
March	0.72	27	05:00:00
April	0.453	1	16:30:00
May	0.654	21	20:00:00
June	0.46	20	20:00:00
July	0.391	9	03:00:00
August	0.388	17	19:15:00
September	0.665	21	20:45:00
October	0.689	21	23:15:00
November	0.766	23	02:45:00
December	1.037	3	04:30:00

Surge minima	Value	Day	Time
January	-0.25	28	19:30:00
February	-0.15	5	13:15:00
March	-0.124	17	10:30:00
April	-0.177	27	21:00:00
May	-0.114	31	14:15:00
June	-0.179	2	17:45:00
July	-0.123	13	11:00:00
August	-0.144	9	08:15:00
September	-0.114	7	07:15:00
October	-0.159	31	20:00:00
November	-0.172	12	06:15:00
December	-0.294	22	10:30:00

Extreme Maxima	Value	Day	Time
January	5.133	31	08:30:00
February	5.224	1	09:15:00
March	5.741	30	07:45:00
April	5.307	1	09:15:00
May	4.823	26	06:15:00
June	4.662	12	19:45:00
July	4.783	12	20:15:00
August	5.206	11	20:45:00
September	5.511	9	20:30:00
October	5.707	8	20:00:00
November	5.212	6	19:30:00
December	5.39	5	06:45:00

Extreme minima	Value	Day	Time
January	0.371	31	15:15:00
February	0.453	1	16:00:00
March	0.615	29	13:45:00
April	0.384	28	13:45:00
May	0.955	28	02:00:00
June	1.029	14	03:15:00
July	0.633	14	03:45:00
August	0.392	12	03:30:00
September	0.367	9	02:30:00
October	0.502	8	02:00:00
November	0.637	5	00:45:00
December	0.874	22	14:45:00

Mean sea level	No days	MSL
January	31	2.696
February	21	2.747
March	22	2.808
April	30	2.685
May	31	2.753
June	30	2.693
July	31	2.727
August	31	2.741
September	30	2.879
October	31	2.982
November	30	2.973
December	31	2.859
	Sum	Avg
	349	2.795

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 2006.

T.G.I. visits to site:		
	Day 096	On site installing new software patch. Compressor changed and maintenance-free battery installed.
	Day 277	TGI visited to carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
97	15 minutes	032-036,054-059,095-096	None

Statistics:

Surge maxima	Value	Day	Time
January	1.303	11	18:30:00
February	1.274	8	16:30:00
March	0.637	6	11:45:00
April	0.61	7	04:00:00
May	0.619	29	21:00:00
June	0.518	13	22:00:00
July	0.417	10	08:45:00
August	0.628	3	12:15:00
September	0.612	7	18:45:00
October	1.997	31	21:15:00
November	1.562	1	01:15:00
December	1.008	31	02:30:00

Surge minima	Value	Day	Time
January	-0.658	14	01:15:00
February	-0.417	14	14:00:00
March	-0.742	13	12:45:00
April	-0.321	13	01:00:00
May	-0.476	1	15:30:00
June	-0.356	21	02:45:00
July	-0.321	11	00:45:00
August	-0.275	31	05:00:00
September	-0.44	2	19:00:00
October	-0.547	26	15:00:00
November	-1.308	20	07:00:00
December	-1.212	3	10:45:00

Extreme Maxima	Value	Day	Time
January	4.368	1	12:15:00
February	4.522	28	12:00:00
March	4.491	29	11:30:00
April	4.361	1	01:15:00
May	4.17	30	01:15:00
June	4.214	14	01:00:00
July	4.204	14	01:45:00
August	4.389	12	01:30:00
September	4.487	7	23:45:00
October	4.648	7	11:30:00
November	4.537	1	07:45:00
December	4.554	8	13:45:00

Extreme minima	Value	Day	Time
January	0.072	5	09:15:00
February	0.177	15	07:15:00
March	-0.025	2	07:00:00
April	0.109	28	05:30:00
May	0.247	24	02:45:00
June	0.34	21	01:45:00
July	0.101	14	20:00:00
August	0.152	11	19:00:00
September	-0.049	8	18:00:00
October	0.078	6	16:45:00
November	0.113	20	05:30:00
December	-0.092	3	16:00:00

Mean sea level	No days	MSL
January	30	2.058
February	15	2.241
March	31	2.059
April	27	2.122
May	31	2.12
June	30	2.095
July	31	2.135
August	31	2.242
September	30	2.258
October	31	2.298
November	30	2.329
December	31	2.134
	Sum	Avg
	348	2.174

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 2006.

T.G.I. visits to site:

Day 061	TGI on site to repair a faulty data logger.
Day 090	TGI applied offset to channel 2.
Day 101	On site with Bob Lloyd (Mersey Docks & Harbour Co.) inspecting site. TGI believe harbour dredging is causing blocking problems, and divers are needed to clear pressure points.
Day 108	MDHC divers on site to clear pressure points. TGI reset gauge.
Day 116	TGI removed offset, channels look OK.
Day 179	TGI on site installing new software, system purged and as it was slow to recover, an offset was applied to channel 2 (this was later removed when system recovered).
Day 228	TGI on site to carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
93	15 minutes	016,060-063,067-073,102-108,130-138,179	060,063-067,073-090,108-116,138-144,151-179,182-186,204-228

Statistics:

Surge maxima	Value	Day	Time
January	0.839	20	04:00:00
February	0.784	15	04:30:00
March	0.539	31	19:15:00
April	0.609	2	10:30:00
May	0.532	2	20:30:00
June	0.215	29	00:45:00
July	0.563	9	06:15:00
August	0.369	31	06:30:00
September	1.083	22	00:30:00
October	1.042	26	07:45:00
November	1.128	19	22:30:00
December	1.564	3	15:30:00

Surge minima	Value	Day	Time
January	-0.554	29	03:00:00
February	-0.549	25	01:45:00
March	0.356	31	23:30:00
April	-0.303	28	08:00:00
May	-0.207	8	01:45:00
June	-0.129	30	22:00:00
July	-0.295	14	04:00:00
August	-0.168	22	03:30:00
September	-0.257	8	06:00:00
October	-0.747	31	21:00:00
November	-0.421	1	00:00:00
December	-0.543	22	04:45:00

Extreme Maxima	Value	Day	Time
January	10.178	31	12:30:00
February	10.304	1	13:15:00
March	9.409	31	23:45:00
April	10.455	1	13:00:00
May	9.672	26	10:15:00
June	9.059	29	01:15:00
July	9.603	13	00:15:00
August	9.417	26	00:15:00
September	10.718	10	00:15:00
October	10.981	9	00:00:00
November	10.293	5	22:45:00
December	10.328	7	12:30:00

Extreme minima	Value	Day	Time
January	0.343	31	19:30:00
February	0.416	1	20:15:00
March	0.972	31	19:15:00
April	0.486	28	18:15:00
May	1.371	26	04:30:00
June	1.779	29	08:00:00
July	0.727	14	08:00:00
August	1.419	26	07:15:00
September	0.282	9	06:45:00
October	0.524	8	06:15:00
November	0.792	6	05:45:00
December	1.204	23	19:45:00

Mean sea level	No days	MSL
January	31	5.113
February	27	5.118
March		
April	13	5.092
May	13	5.14
June		
July	17	5.138
August	15	5.246
September	30	5.315
October	31	5.401
November	30	5.459
December	31	5.374
	Sum	Avg
	238	5.24

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 2006.

T.G.I. visits to site:		
	Day 128	On site for general survey prior to site refurbishment in August.
	Day 223	TGI and divers on site. Nozzles removed and unblocked. Maintenance carried out to prevent future blocking by marine growth.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	074-075,198,237,255-256	255,345-355

Statistics:

Surge maxima	Value	Day	Time
January	0.575	20	05:44:59
February	0.562	7	20:14:59
March	0.851	24	08:45:00
April	0.525	1	16:15:00
May	0.663	21	21:15:00
June	0.399	18	18:45:00
July	0.396	9	00:15:00
August	0.468	28	04:29:59
September	0.565	21	21:30:00
October	0.974	26	05:45:00
November	1.134	23	04:45:00
December	1.315	3	04:45:00

Surge minima	Value	Day	Time
January	-0.512	24	15:59:59
February	-0.557	22	13:44:59
March	-0.43	17	12:15:00
April	-0.426	21	14:30:00
May	-0.394	31	15:15:00
June	-0.544	2	16:15:00
July	-0.374	14	23:00:00
August	-0.319	25	00:14:59
September	-0.312	8	01:29:59
October	-0.346	14	15:30:00
November	-0.341	20	20:30:00
December	-0.633	22	00:29:59

Extreme Maxima	Value	Day	Time
January	12.293	31	07:59:59
February	12.454	1	08:44:59
March	13.164	30	07:15:00
April	12.573	1	08:45:00
May	11.642	26	05:45:00
June	11.302	13	20:00:00
July	11.681	13	20:30:00
August	12.441	11	20:14:59
September	12.969	9	19:59:59
October	13.118	8	19:30:00
November	12.425	5	18:30:00
December	12.301	5	06:30:00

Extreme minima	Value	Day	Time
January	0.162	31	14:29:59
February	0.256	1	15:14:59
March	-0.059	1	14:14:59
April	0.171	28	13:15:00
May	1.144	27	00:15:00
June	1.242	14	02:00:00
July	0.614	14	03:00:00
August	0.234	12	02:44:59
September	-0.082	10	02:29:59
October	0.136	8	01:30:00
November	0.472	6	00:45:00
December	1.075	22	13:44:59

Mean sea level	No days	MSL
January	31	6.11
February	28	6.15
March	28	6.252
April	30	6.155
May	31	6.207
June	30	6.126
July	31	6.168
August	31	6.228
September	27	6.32
October	31	6.429
November	30	6.435
December	18	6.406
	Sum	Avg
	346	6.249

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 2006.

T.G.I. visits to site: Day 227 On site testing equipment (not dataring) resulting in large spikes on channel 1 which were later edited.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	060,069-075,081-082,144	None

Statistics:

Surge maxima	Value	Day	Time
January	0.503	10	23:30:00
February	0.649	15	02:45:00
March	0.594	27	09:00:00
April	0.441	2	08:15:00
May	0.498	21	18:45:00
June	0.476	20	20:15:00
July	0.401	9	05:00:00
August	0.278	17	20:45:00
September	0.736	21	23:15:00
October	0.7	22	00:15:00
November	0.932	19	23:15:00
December	1.156	3	03:30:00

Surge minima	Value	Day	Time
January	-0.378	29	01:45:00
February	-0.296	24	20:45:00
March	-0.269	16	18:15:00
April	-0.247	28	13:00:00
May	-0.195	30	19:30:00
June	-0.241	2	21:45:00
July	-0.191	14	02:45:00
August	-0.237	7	14:45:00
September	-0.173	7	09:30:00
October	-0.425	31	20:00:00
November	-0.288	1	00:00:00
December	-0.402	22	05:45:00

Extreme Maxima	Value	Day	Time
January	5.997	31	11:30:00
February	6.069	1	12:15:00
March	6.593	30	10:45:00
April	6.169	1	12:15:00
May	5.683	26	09:15:00
June	5.586	12	22:45:00
July	5.639	12	23:15:00
August	5.999	11	23:45:00
September	6.331	9	23:15:00
October	6.552	8	23:00:00
November	6.067	5	22:00:00
December	6.301	7	11:30:00

Extreme minima	Value	Day	Time
January	0.081	31	17:45:00
February	-0.023	28	16:30:00
March	-0.062	1	17:15:00
April	0.166	28	16:30:00
May	0.755	28	04:45:00
June	0.793	14	05:45:00
July	0.369	14	06:30:00
August	0.086	12	06:00:00
September	0.082	9	05:00:00
October	0.293	7	03:45:00
November	0.436	6	04:00:00
December	0.692	22	17:30:00

Mean sea level	No days	MSL
January	31	3.213
February	27	3.213
March	20	3.314
April	30	3.201
May	29	3.251
June	30	3.198
July	31	3.237
August	31	3.249
September	30	3.41
October	31	3.524
November	30	3.528
December	31	3.418
	Sum	Avg
	351	3.313

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 2006.

T.G.I. visits to site:

Day 221	On site for general maintenance and system purge.
Day 320	On site to fit new software patch on datalogger and general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
92	15 minutes	032-036,065,069-074,116-118,214-219,228-231,236-243,249,319-321	015-016,028-029,048,057-061,076-078,109,151-162,167-169,177-189,197-203,205-212,219-221,279-280,337-342

Statistics:

Surge maxima	Value	Day	Time
January	0.394	20	04:45:00
February	0.533	15	00:30:00
March	0.691	27	05:45:00
April	0.427	1	15:30:00
May	0.614	21	10:15:00
June	0.332	20	19:30:00
July	0.378	9	01:15:00
August	0.314	15	17:30:00
September	0.692	21	20:30:00
October	0.777	26	04:45:00
November	0.895	23	03:30:00
December	0.994	3	03:30:00

Surge minima	Value	Day	Time
January	-0.415	28	20:00:00
February	-0.354	24	02:30:00
March	-0.246	17	12:00:00
April	-0.258	28	19:15:00
May	-0.21	31	01:00:00
June	-0.159	14	23:30:00
July	-0.209	11	21:00:00
August	-0.169	13	09:30:00
September	-0.185	7	06:00:00
October	-0.182	14	14:45:00
November	-0.226	12	05:00:00
December	-0.512	22	10:30:00

Extreme Maxima	Value	Day	Time
January	9.607	31	07:15:00
February	9.49	28	06:00:00
March	10.364	30	06:30:00
April	9.859	1	07:45:00
May	9.085	26	05:00:00
June	8.839	13	19:00:00
July	9.157	14	20:30:00
August	9.751	11	19:30:00
September	10.186	9	19:00:00
October	10.377	8	18:45:00
November	9.722	5	17:30:00
December	9.681	5	05:30:00

Extreme minima	Value	Day	Time
January	0.253	31	13:15:00
February	0.197	28	12:15:00
March	0.016	1	13:00:00
April	0.234	28	12:00:00
May	1.093	28	12:15:00
June	1.247	14	01:00:00
July	0.693	14	01:45:00
August	0.26	12	01:45:00
September	0.081	10	01:15:00
October	0.19	8	00:00:00
November	0.512	5	23:45:00
December	1.102	22	12:45:00

Mean sea level	No days	MSL
January	28	4.876
February	16	4.948
March	17	5.089
April	24	4.921
May	29	4.978
June	10	4.959
July	5	4.828
August	7	4.876
September	27	5.1
October	29	5.201
November	26	5.17
December	24	4.982
	Sum	Avg
	242	4.994

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 2006.

T.G.I. visits to site:		
	Day 039	On site to reset gauge and modem.
	Day 074	On site to install new software patch and general maintenance.
	Day 277	On site for general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
94	15 minutes	011-022,036-039,054,067-074,075	004-005,282,332

Statistics:

Surge maxima	Value	Day	Time
January	0.322	25	09:30:00
February	0.766	9	04:30:00
March	0.436	5	04:00:00
April	0.484	9	11:00:00
May	0.603	22	18:45:00
June	0.537	13	16:15:00
July	0.314	30	17:30:00
August	0.435	13	03:45:00
September	0.582	28	19:15:00
October	1.514	31	17:45:00
November	1.019	20	14:15:00
December	0.881	30	21:45:00

Surge minima	Value	Day	Time
January	-0.632	10	23:45:00
February	-0.363	14	13:45:00
March	-0.404	7	11:45:00
April	-0.395	25	02:15:00
May	-0.267	2	22:15:00
June	-0.35	21	01:15:00
July	-0.323	14	22:15:00
August	-0.249	5	18:45:00
September	-0.321	20	15:00:00
October	-0.898	26	20:45:00
November	-1.114	20	02:15:00
December	-1.129	10	15:45:00

Extreme Maxima	Value	Day	Time
January	7.515	31	19:15:00
February	7.683	28	18:15:00
March	8.026	30	18:30:00
April	7.604	1	20:00:00
May	7.145	25	16:15:00
June	7.155	13	19:00:00
July	7.317	13	07:15:00
August	7.862	12	07:30:00
September	7.907	10	07:15:00
October	8.037	7	05:30:00
November	7.993	6	05:45:00
December	7.493	6	18:30:00

Extreme minima	Value	Day	Time
January	0.567	31	01:15:00
February	0.369	1	02:15:00
March	0.276	2	01:45:00
April	0.569	28	00:15:00
May	1.04	26	23:45:00
June	1.12	14	14:00:00
July	0.659	14	14:45:00
August	0.588	11	13:45:00
September	0.279	9	13:30:00
October	0.415	8	13:00:00
November	1.012	5	11:45:00
December	0.668	3	10:30:00

Mean sea level	No days	MSL
January	17	4.09
February	22	4.211
March	21	4.186
April	30	4.171
May	31	4.167
June	30	4.133
July	31	4.178
August	31	4.269
September	30	4.316
October	29	4.353
November	30	4.372
December	31	4.219
	Sum	Avg
	333	4.222

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 2006.

T.G.I. visits to site: Day 152 On site for meeting with IOM met office.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	361-365	152

Statistics:

Surge maxima	Value	Day	Time
January	0.504	11	01:00:00
February	0.631	15	03:45:00
March	0.65	27	09:45:00
April	0.455	2	10:00:00
May	0.539	18	14:45:00
June	0.444	20	21:00:00
July	0.423	9	08:15:00
August	0.232	17	22:45:00
September	0.724	21	22:30:00
October	0.68	21	23:00:00
November	0.937	19	22:45:00
December	1.101	3	06:30:00

Surge minima	Value	Day	Time
January	-0.4	29	02:15:00
February	-0.341	25	00:00:00
March	-0.283	17	17:00:00
April	-0.255	28	22:45:00
May	-0.247	29	22:15:00
June	-0.248	2	22:30:00
July	-0.224	14	05:00:00
August	-0.271	7	15:45:00
September	-0.213	7	09:45:00
October	-0.45	31	21:30:00
November	-0.383	1	00:00:00
December	-0.41	22	19:00:00

Extreme Maxima	Value	Day	Time
January	5.57	31	12:30:00
February	5.645	1	13:15:00
March	6.193	30	11:30:00
April	5.831	1	13:00:00
May	5.358	26	10:15:00
June	5.235	12	23:45:00
July	5.247	13	00:15:00
August	5.548	12	00:45:00
September	5.887	10	00:15:00
October	6.158	8	23:45:00
November	5.835	19	22:15:00
December	6.05	7	12:45:00

Extreme minima	Value	Day	Time
January	-0.142	31	18:45:00
February	-0.331	28	17:30:00
March	-0.284	1	18:15:00
April	-0.107	28	17:30:00
May	0.415	30	07:00:00
June	0.443	15	07:30:00
July	0.028	14	07:15:00
August	-0.199	12	07:00:00
September	-0.143	9	06:00:00
October	0.028	7	04:45:00
November	0.189	5	04:15:00
December	0.344	22	18:30:00

Mean sea level	No days	MSL
January	31	2.855
February	28	2.835
March	31	2.907
April	30	2.836
May	31	2.884
June	30	2.83
July	31	2.863
August	31	2.873
September	30	3.039
October	31	3.135
November	30	3.172
December	25	3.065
	Sum	Avg
	359	2.941

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 2006.

T.G.I. visits to site: There were no visits to site in 2006.

Data quality:

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

Statistics:

Surge maxima	Value	Day	Time
January	0.494	10	19:30:00
February	0.605	15	00:45:00
March	0.634	27	09:00:00
April	0.398	1	12:00:00
May	0.571	18	01:30:00
June	0.618	21	01:15:00
July	0.483	8	23:45:00
August	0.272	31	01:00:00
September	0.722	22	00:00:00
October	0.664	26	11:30:00
November	0.968	19	21:30:00
December	1.186	3	07:15:00

Surge minima	Value	Day	Time
January	-0.444	1	18:45:00
February	-0.394	24	22:30:00
March	-0.334	17	06:00:00
April	-0.299	28	20:00:00
May	-0.226	29	21:15:00
June	-0.194	3	12:30:00
July	-0.218	14	06:45:00
August	-0.221	7	17:00:00
September	-0.195	8	07:00:00
October	-0.399	31	23:45:00
November	-0.424	1	00:30:00
December	-0.353	18	15:00:00

Extreme Maxima	Value	Day	Time
January	1.15	15	05:45:00
February	1.303	15	06:45:00
March	1.391	28	04:30:00
April	1.137	1	16:15:00
May	1.156	2	17:45:00
June	1.142	21	01:15:00
July	1.07	9	00:15:00
August	0.882	25	18:15:00
September	1.35	20	16:15:00
October	1.451	6	16:45:00
November	1.655	30	14:15:00
December	1.853	3	15:15:00

Extreme minima	Value	Day	Time
January	-0.262	31	23:45:00
February	-0.405	28	23:45:00
March	-0.402	17	00:00:00
April	-0.307	28	23:00:00
May	-0.192	30	12:00:00
June	-0.131	3	13:00:00
July	-0.23	14	13:00:00
August	-0.384	12	12:45:00
September	-0.179	7	10:30:00
October	-0.075	7	10:30:00
November	-0.1	1	01:00:00
December	-0.128	24	00:15:00

Mean sea level	No days	MSL
January	31	0.446
February	28	0.401
March	31	0.471
April	30	0.407
May	31	0.458
June	30	0.412
July	31	0.449
August	31	0.435
September	30	0.63
October	31	0.716
November	30	0.77
December	31	0.687
	Sum	Avg
	365	0.524

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 2006.

T.G.I. visits to site: Day 338 On site for general maintenance. Compressor changed.

Data quality:

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

Statistics:

Surge maxima	Value	Day	Time
January	0.618	1	03:00:00
February	0.742	15	05:30:00
March	0.622	30	03:15:00
April	0.468	1	04:45:00
May	0.769	20	08:30:00
June	0.266	11	02:15:00
July	0.344	9	00:45:00
August	0.473	17	19:15:00
September	0.528	30	19:15:00
October	0.83	24	04:00:00
November	0.967	23	04:15:00
December	0.731	5	16:00:00

Surge minima	Value	Day	Time
January	-0.457	28	20:30:00
February	-0.554	26	19:00:00
March	-0.368	17	23:00:00
April	-0.317	27	20:30:00
May	-0.226	14	11:30:00
June	-0.307	2	16:00:00
July	-0.319	14	11:15:00
August	-0.21	8	07:15:00
September	-0.279	8	08:45:00
October	-0.25	13	00:45:00
November	-0.302	1	09:45:00
December	-0.547	21	23:15:00

Extreme Maxima	Value	Day	Time
January	11.481	31	07:45:00
February	11.631	1	08:30:00
March	12.143	30	07:00:00
April	11.611	1	08:15:00
May	10.675	27	18:30:00
June	10.472	13	19:30:00
July	10.9	13	20:15:00
August	11.61	11	20:00:00
September	12.077	9	19:45:00
October	12.15	8	19:15:00
November	11.383	5	18:15:00
December	11.165	5	06:00:00

Extreme minima	Value	Day	Time
January	0.449	31	14:30:00
February	0.497	1	15:15:00
March	0.221	1	14:15:00
April	0.633	28	13:15:00
May	1.54	27	00:30:00
June	1.709	14	02:15:00
July	1.039	14	03:00:00
August	0.612	12	02:45:00
September	0.264	10	02:30:00
October	0.388	8	01:15:00
November	0.811	6	01:00:00
December	1.526	22	14:00:00

Mean sea level	No days	MSL
January	31	5.909
February	28	5.952
March	31	5.992
April	30	5.926
May	31	6.004
June	30	5.954
July	31	5.992
August	31	6.032
September	30	6.1
October	31	6.21
November	30	6.174
December	31	6.059
	Sum	Avg
	365	6.025

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 2006.

T.G.I. visits to site: Day 170 TGI on site installing new software.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	038-039,075,109-114,170	None

Statistics:

Surge maxima	Value	Day	Time
January	0.823	11	00:00:00
February	0.49	15	14:15:00
March	0.377	29	14:45:00
April	0.479	24	21:45:00
May	0.496	18	18:15:00
June	0.658	21	04:00:00
July	0.389	30	05:15:00
August	0.259	1	05:15:00
September	0.624	28	06:15:00
October	0.572	30	20:15:00
November	0.897	20	01:00:00
December	0.917	4	01:15:00

Surge minima	Value	Day	Time
January	-0.497	1	21:00:00
February	-0.458	24	12:00:00
March	-0.415	17	10:30:00
April	-0.318	28	20:30:00
May	-0.286	30	10:45:00
June	-0.169	3	18:45:00
July	-0.225	14	10:30:00
August	-0.247	12	09:45:00
September	-0.211	7	14:45:00
October	-0.288	31	23:00:00
November	-0.349	1	05:15:00
December	-0.354	18	23:30:00

Extreme Maxima	Value	Day	Time
January	5.23	31	08:15:00
February	5.277	1	09:15:00
March	5.557	30	07:30:00
April	5.251	1	08:45:00
May	4.825	27	19:15:00
June	4.967	12	20:00:00
July	4.934	12	20:15:00
August	5.104	11	20:30:00
September	5.489	9	20:30:00
October	5.736	8	19:45:00
November	5.483	5	18:45:00
December	5.63	3	18:00:00

Extreme minima	Value	Day	Time
January	0.123	31	15:00:00
February	-0.196	28	14:15:00
March	-0.242	1	14:30:00
April	0.111	28	13:45:00
May	0.723	13	13:30:00
June	0.77	14	03:00:00
July	0.33	14	03:15:00
August	-0.007	12	03:00:00
September	0.001	9	02:00:00
October	0.244	8	01:30:00
November	0.578	5	00:30:00
December	0.79	24	16:00:00

Mean sea level	No days	MSL
January	31	2.899
February	25	2.8
March	28	2.842
April	23	2.848
May	31	2.812
June	30	2.809
July	31	2.849
August	31	2.827
September	30	3.007
October	31	3.056
November	30	3.2
December	31	3.12
	Sum	Avg
	352	2.922

Leith Tide Gauge

Latitude: 55° 59' 23.4"N
Longitude: 03° 10' 54.1"E
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: Geodetic levelling completed on day 195.

T.G.I. visits to site:		
	Day 075	On site to install new software patch. Compressor changed and general maintenance.
	Day 195	TGI on site. Channel 2 and mid tide reconnected.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
96	15 minutes	032-037,060-066,075,195	None

Statistics:

Surge maxima	Value	Day	Time
January	1.059	11	07:15:00
February	0.745	15	19:15:00
March	0.509	28	09:30:00
April	0.479	6	20:00:00
May	0.489	22	12:15:00
June	0.519	13	12:00:00
July	0.349	30	14:00:00
August	0.302	1	17:15:00
September	0.513	28	13:45:00
October	0.709	31	11:00:00
November	0.773	20	10:00:00
December	0.738	30	17:45:00

Surge minima	Value	Day	Time
January	-0.196	18	21:45:00
February	-0.257	24	21:00:00
March	-0.467	13	14:30:00
April	-0.205	24	23:00:00
May	-0.159	5	05:15:00
June	-0.174	6	14:15:00
July	-0.333	14	21:30:00
August	-0.219	8	17:45:00
September	-0.279	8	13:30:00
October	-0.834	26	17:30:00
November	-0.427	20	02:15:00
December	-0.934	31	21:00:00

Extreme Maxima	Value	Day	Time
January	5.99	31	15:45:00
February	6.053	28	14:45:00
March	6.392	30	15:00:00
April	6.056	1	16:30:00
May	5.641	26	13:45:00
June	5.625	13	15:45:00
July	5.642	13	03:45:00
August	5.943	12	04:15:00
September	6.119	10	03:45:00
October	6.353	9	03:30:00
November	6.229	6	02:15:00
December	6.118	5	01:45:00

Extreme minima	Value	Day	Time
January	0.219	31	22:15:00
February	0.322	28	21:15:00
March	0.341	29	20:45:00
April	0.338	28	21:00:00
May	0.884	26	20:00:00
June	0.821	14	09:45:00
July	0.283	15	11:30:00
August	0.066	12	10:30:00
September	-0.119	9	09:30:00
October	0.22	8	08:45:00
November	0.651	5	07:45:00
December	0.701	23	22:30:00

Mean sea level	No days	MSL
January	30	3.354
February	21	3.4
March	21	3.206
April	30	3.213
May	31	3.216
June	30	3.189
July	28	3.207
August	31	3.203
September	30	3.302
October	31	3.35
November	30	3.387
December	31	3.278
	Sum	Avg
	344	3.275

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 2006.

T.G.I. visits to site: There were no visits to site in 2006.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	109-110,144,284-285,354-355	304-321,335-354,355-365

Statistics:

Surge maxima	Value	Day	Time
January	0.553	11	11:30:00
February	0.443	16	19:45:00
March	0.246	28	08:45:00
April	0.412	6	15:45:00
May	0.315	22	10:45:00
June	0.411	21	10:30:00
July	0.233	31	13:45:00
August	0.253	1	13:15:00
September	0.268	28	11:30:00
October	0.316	7	01:30:00
November	0.614	21	08:45:00
December	0.407	1	18:15:00

Surge minima	Value	Day	Time
January	-0.305	29	01:00:00
February	-0.373	24	21:15:00
March	-0.331	17	15:00:00
April	-0.153	4	05:15:00
May	-0.134	8	08:45:00
June	-0.13	5	04:30:00
July	-0.218	14	16:30:00
August	-0.167	12	10:15:00
September	-0.163	8	06:30:00
October	-0.141	15	16:30:00
November	0.044	27	04:45:00
December	0.131	1	10:30:00

Extreme Maxima	Value	Day	Time
January	2.446	11	09:00:00
February	2.521	16	12:45:00
March	2.501	30	11:15:00
April	2.36	1	13:00:00
May	2.202	27	23:15:00
June	2.19	13	23:45:00
July	2.242	13	00:00:00
August	2.245	13	00:45:00
September	2.449	11	01:00:00
October	2.661	6	22:15:00
November	2.688	21	10:45:00
December	2.401	1	19:45:00

Extreme minima	Value	Day	Time
January	0.052	31	18:15:00
February	-0.107	28	17:15:00
March	-0.093	1	18:15:00
April	0.096	28	17:15:00
May	0.372	14	05:00:00
June	0.374	15	07:15:00
July	0.053	14	07:00:00
August	-0.015	12	06:30:00
September	0.003	9	05:30:00
October	0.257	8	05:15:00
November	0.809	19	03:30:00
December	0.982	1	00:45:00

Mean sea level	No days	MSL
January	31	1.309
February	28	1.262
March	31	1.21
April	27	1.285
May	29	1.231
June	30	1.25
July	31	1.276
August	31	1.307
September	30	1.405
October	26	1.444
November	12	1.658
December		
	Sum	Avg
	306	1.331

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 2006.

T.G.I. visits to site:

Day 236	On site and purged system.
Day 328	Telephone line fault. BT repaired the line.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
96	15 minutes	060-061,067-074,075-082	109-133,142-151,160-166,169-214

Statistics:

Surge maxima	Value	Day	Time
January	0.951	20	04:00:00
February	0.796	15	05:00:00
March	1.017	30	08:00:00
April	0.817	7	21:45:00
May	0.731	18	11:45:00
June	0.333	18	02:00:00
August	0.413	29	09:30:00
September	1.008	22	00:45:00
October	1.287	26	08:45:00
November	1.12	23	20:00:00
December	1.606	3	05:15:00

Surge minima	Value	Day	Time
January	-0.391	29	02:00:00
February	-0.39	25	01:30:00
March	-0.373	15	19:45:00
April	-0.171	4	05:00:00
May	-0.075	13	16:00:00
June	-0.178	2	22:15:00
August	-0.212	12	09:00:00
September	-0.24	10	08:30:00
October	-0.448	31	20:30:00
November	-0.219	1	00:15:00
December	-0.424	24	03:30:00

Extreme Maxima	Value	Day	Time
January	9.973	31	12:15:00
February	10.086	1	13:00:00
March	10.682	30	11:30:00
April	10.189	1	13:00:00
May	9.155	16	00:30:00
June	9.049	16	01:45:00
August	9.977	12	00:30:00
September	10.366	10	00:00:00
October	10.554	8	23:45:00
November	10.047	5	22:45:00
December	10.032	7	12:15:00

Extreme minima	Value	Day	Time
January	0.39	31	19:30:00
February	0.393	28	18:30:00
March	0.389	2	20:00:00
April	1.045	1	07:30:00
May	1.473	13	17:45:00
June	1.428	15	08:00:00
August	0.376	12	07:45:00
September	0.257	10	07:30:00
October	0.496	8	06:15:00
November	0.816	6	05:45:00
December	1.251	23	19:45:00

Mean sea level	No days	MSL
January	31	5.274
February	27	5.271
March	12	5.473
April	18	5.357
May	7	5.421
June	9	5.177
August	29	5.334
September	30	5.446
October	31	5.553
November	30	5.605
December	31	5.495
	Sum	Avg
	255	5.401

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 2006.

T.G.I. visits to site: Day 109 On site to install new software patch.
Day 227 TGI general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
96	15 minutes	032-038,067-071,108-114	207-215,227-235

Statistics:

Surge maxima	Value	Day	Time
January	0.603	20	04:45:00
February	0.629	15	03:30:00
March	0.603	30	07:00:00
April	0.448	7	21:00:00
May	0.483	21	16:15:00
June	0.501	20	21:00:00
July	0.366	9	05:45:00
August	0.206	31	23:45:00
September	0.828	22	00:00:00
October	0.764	26	08:30:00
November	0.863	19	22:30:00
December	1.177	3	05:45:00

Surge minima	Value	Day	Time
January	-0.495	29	02:00:00
February	-0.506	24	10:15:00
March	-0.466	16	20:30:00
April	-0.299	28	07:45:00
May	-0.333	30	08:30:00
June	-0.327	2	23:00:00
July	-0.304	14	03:00:00
August	-0.334	7	14:00:00
September	-0.255	7	10:45:00
October	-0.697	31	20:45:00
November	-0.47	1	00:00:00
December	-0.534	22	03:30:00

Extreme Maxima	Value	Day	Time
January	8.08	31	11:45:00
February	7.81	28	10:45:00
March	8.745	30	11:00:00
April	8.291	1	12:30:00
May	7.639	26	09:45:00
June	7.495	12	23:00:00
July	7.602	12	23:45:00
August	8.082	12	00:15:00
September	8.515	9	23:45:00
October	8.716	8	23:15:00
November	8.154	5	22:15:00
December	8.156	7	12:00:00

Extreme minima	Value	Day	Time
January	-0.209	31	18:45:00
February	-0.448	28	17:30:00
March	-0.453	1	18:15:00
April	-0.129	28	17:15:00
May	0.603	28	05:30:00
June	0.589	14	06:30:00
July	0.105	14	07:15:00
August	-0.269	12	07:00:00
September	-0.282	10	06:30:00
October	-0.077	8	05:15:00
November	0.143	6	05:00:00
December	0.522	23	19:00:00

Mean sea level	No days	MSL
January	30	3.994
February	21	3.961
March	24	4.027
April	22	3.974
May	31	4.033
June	30	3.983
July	24	3.994
August	18	3.978
September	30	4.184
October	31	4.269
November	30	4.293
December	31	4.187
	Sum	Avg
	322	4.073

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 2006.

T.G.I. visits to site: Day 095 TGI on site to install new software patch.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
97	15 minutes	032-038,081-083,095,186	None

Statistics:

Surge maxima	Value	Day	Time
January	1.008	11	15:00:00
February	1.054	8	12:45:00
March	0.498	5	09:00:00
April	0.513	9	13:15:00
May	0.496	22	23:15:00
June	0.434	13	18:30:00
July	0.273	30	20:30:00
August	0.457	3	09:30:00
September	0.517	7	17:00:00
October	1.875	31	20:30:00
November	1.556	1	01:15:00
December	0.985	31	01:00:00

Surge minima	Value	Day	Time
January	-0.599	12	18:45:00
February	-0.401	15	06:15:00
March	-0.784	13	09:00:00
April	-0.348	25	06:30:00
May	-0.26	5	12:15:00
June	-0.284	21	01:15:00
July	-0.232	9	12:00:00
August	-0.207	31	11:00:00
September	-0.351	20	16:15:00
October	-0.391	26	21:00:00
November	-1.078	20	05:00:00
December	-1.026	10	20:15:00

Extreme Maxima	Value	Day	Time
January	3.148	11	19:00:00
February	3.017	28	21:45:00
March	2.93	2	23:15:00
April	2.752	3	00:15:00
May	2.735	30	11:00:00
June	2.704	13	22:30:00
July	2.733	13	10:45:00
August	3.016	12	11:15:00
September	2.91	11	11:30:00
October	3.544	31	20:15:00
November	3.74	1	05:15:00
December	2.963	31	04:45:00

Extreme minima	Value	Day	Time
January	0.079	5	07:30:00
February	0.276	15	05:15:00
March	-0.026	14	03:30:00
April	0.235	28	03:45:00
May	0.28	24	00:45:00
June	0.37	20	23:15:00
July	0.146	14	18:15:00
August	0.303	13	18:45:00
September	0.04	8	16:15:00
October	0.249	6	14:45:00
November	0.204	20	03:30:00
December	-0.198	3	14:00:00

Mean sea level	No days	MSL
January	30	1.544
February	21	1.698
March	26	1.537
April	27	1.613
May	31	1.611
June	30	1.581
July	31	1.622
August	31	1.746
September	30	1.745
October	31	1.789
November	30	1.831
December	31	1.64
	Sum	Avg
	349	1.663

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: No levelling was carried out in 2006.

T.G.I. visits to site: Day 067 On site to install software patch and general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
96	15 minutes	032-036,054-058,060-067	None

Statistics:

Surge maxima	Value	Day	Time
January	0.378	15	05:00:00
February	0.565	16	18:45:00
March	0.818	27	04:30:00
April	0.467	1	14:45:00
May	0.678	21	21:45:00
June	0.36	20	18:45:00
July	0.414	8	23:45:00
August	0.372	17	18:30:00
September	0.765	21	19:45:00
October	0.774	26	04:00:00
November	0.844	23	02:30:00
December	1.292	3	02:15:00

Surge minima	Value	Day	Time
January	-0.288	28	19:30:00
February	-0.22	28	08:15:00
March	-0.153	17	09:15:00
April	-0.211	27	19:45:00
May	-0.139	29	20:15:00
June	-0.218	2	16:00:00
July	-0.13	13	20:30:00
August	-0.179	9	08:00:00
September	-0.133	7	07:00:00
October	-0.129	31	19:00:00
November	-0.167	12	04:15:00
December	-0.346	21	23:30:00

Extreme Maxima	Value	Day	Time
January	7.397	31	07:30:00
February	7.245	28	06:15:00
March	8.074	30	06:30:00
April	7.614	1	08:00:00
May	6.947	26	05:00:00
June	6.762	12	18:45:00
July	6.949	12	19:15:00
August	7.449	11	19:45:00
September	7.858	9	19:15:00
October	8.108	8	18:45:00
November	7.497	6	18:30:00
December	7.578	3	03:45:00

Extreme minima	Value	Day	Time
January	0.221	31	13:45:00
February	0.093	28	12:45:00
March	0.188	1	01:00:00
April	0.22	28	12:30:00
May	0.949	27	00:00:00
June	1.054	14	01:30:00
July	0.59	14	02:30:00
August	0.216	12	02:00:00
September	0.13	10	01:45:00
October	0.262	8	00:30:00
November	0.474	6	00:15:00
December	0.937	22	13:15:00

Mean sea level	No days	MSL
January	30	3.833
February	15	3.932
March	22	3.952
April	30	3.817
May	31	3.885
June	30	3.823
July	31	3.858
August	31	3.862
September	30	4.013
October	31	4.122
November	30	4.12
December	31	4.015
	Sum	Avg
	342	3.936

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 2006.

T.G.I. visits to site:		
	Day 165	On site for general maintenance and compressor change.
	Day 353	On site to replace modem.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
95	15 minutes	107-109,118-123,340-351	None

Statistics:

Surge maxima	Value	Day	Time
January	0.521	12	11:00:00
February	0.673	15	00:30:00
March	0.625	27	09:30:00
April	0.414	1	10:30:00
May	0.594	18	15:15:00
June	0.669	20	17:30:00
July	0.522	9	00:45:00
August	0.232	1	02:30:00
September	0.956	22	00:30:00
October	0.82	26	12:00:00
November	1.168	19	20:45:00
December	1.58	31	19:45:00

Surge minima	Value	Day	Time
January	-0.489	1	10:00:00
February	-0.549	24	21:30:00
March	-0.473	16	18:45:00
April	-0.373	9	05:00:00
May	-0.321	30	01:00:00
June	-0.31	2	22:15:00
July	-0.306	14	08:00:00
August	-0.319	12	19:00:00
September	-0.264	8	06:30:00
October	-0.54	31	19:00:00
November	-0.549	1	00:30:00
December	-0.491	18	16:15:00

Extreme Maxima	Value	Day	Time
January	3.847	15	12:30:00
February	3.996	16	14:15:00
March	3.931	30	12:45:00
April	3.842	1	14:15:00
May	3.664	18	03:00:00
June	3.507	29	02:15:00
July	3.591	30	03:00:00
August	3.55	15	04:00:00
September	4.227	22	00:15:00
October	4.104	9	01:15:00
November	4.128	19	23:00:00
December	4.484	31	20:15:00

Extreme minima	Value	Day	Time
January	-0.096	31	19:15:00
February	-0.401	28	18:00:00
March	-0.215	1	18:45:00
April	-0.116	27	17:15:00
May	0.173	30	07:30:00
June	0.251	14	07:15:00
July	-0.121	14	08:00:00
August	-0.233	12	07:30:00
September	-0.182	8	05:45:00
October	0.032	7	05:15:00
November	0.202	5	04:45:00
December	0.128	23	19:45:00

Mean sea level	No days	MSL
January	31	1.944
February	28	1.886
March	31	1.957
April	22	1.931
May	28	1.931
June	30	1.898
July	31	1.93
August	31	1.917
September	30	2.118
October	31	2.208
November	30	2.284
December	17	2.152
	Sum	Avg
	340	2.013

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 2006.

T.G.I. visits to site: Day 068 On site to install new software patch. Compressor changed and general maintenance carried out.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	032-040,067-068	None

Statistics:

Surge maxima	Value	Day	Time
January	0.351	20	04:15:00
February	0.541	15	00:15:00
March	0.706	27	05:45:00
April	0.333	2	04:00:00
May	0.573	21	11:00:00
June	0.309	20	20:30:00
July	0.311	9	02:00:00
August	0.325	17	19:30:00
September	0.639	21	20:45:00
October	0.756	21	23:30:00
November	0.885	23	04:00:00
December	1.004	3	03:30:00

Surge minima	Value	Day	Time
January	-0.564	24	15:15:00
February	-0.494	22	14:15:00
March	-0.42	17	05:45:00
April	-0.468	9	21:00:00
May	-0.476	31	13:30:00
June	-0.442	1	14:15:00
July	-0.374	11	22:45:00
August	-0.432	7	21:30:00
September	-0.324	8	01:00:00
October	-0.401	13	01:45:00
November	-0.394	10	01:15:00
December	-0.74	22	11:15:00

Extreme Maxima	Value	Day	Time
January	9.845	31	07:30:00
February	9.772	28	18:45:00
March	10.624	30	06:45:00
April	10.104	1	08:00:00
May	9.359	26	05:15:00
June	9.091	12	18:45:00
July	9.362	13	20:00:00
August	9.96	11	19:45:00
September	10.403	9	19:30:00
October	10.628	8	19:00:00
November	9.951	5	18:00:00
December	9.961	5	06:00:00

Extreme minima	Value	Day	Time
January	0.39	31	13:30:00
February	0.317	28	12:45:00
March	0.104	1	13:15:00
April	0.373	28	12:30:00
May	1.232	28	12:45:00
June	1.351	14	01:30:00
July	0.799	14	02:15:00
August	0.374	12	02:00:00
September	0.214	10	01:30:00
October	0.361	8	00:30:00
November	0.635	6	00:00:00
December	1.215	22	13:15:00

Mean sea level	No days	MSL
January	30	5.094
February	19	5.136
March	27	5.188
April	30	5.11
May	31	5.175
June	30	5.104
July	31	5.14
August	31	5.162
September	30	5.291
October	31	5.395
November	30	5.397
December	31	5.293
	Sum	Avg
	351	5.207

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 2006.

T.G.I. visits to site: Day 320 On site to carry out general maintenance on gauge.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
95	15 minutes	037,060-065,068,075-078,102-108,117,214-216,320	None

Statistics:

Surge maxima	Value	Day	Time
January	0.256	15	16:15:00
February	0.41	18	05:30:00
March	0.529	27	01:30:00
April	0.284	1	01:45:00
May	0.582	21	21:30:00
June	0.197	18	20:15:00
July	0.238	29	08:45:00
August	0.339	17	17:00:00
September	0.59	21	17:30:00
October	0.596	23	15:45:00
November	0.664	25	04:00:00
December	0.708	3	03:00:00

Surge minima	Value	Day	Time
January	-0.274	11	13:00:00
February	-0.208	5	23:45:00
March	-0.192	10	12:15:00
April	-0.222	27	17:30:00
May	-0.173	30	14:45:00
June	-0.271	2	16:15:00
July	-0.18	15	10:30:00
August	-0.138	13	09:45:00
September	-0.082	7	05:15:00
October	-0.082	13	01:30:00
November	-0.22	12	02:45:00
December	-0.346	21	21:15:00

Extreme Maxima	Value	Day	Time
January	5.793	31	05:45:00
February	5.846	1	06:45:00
March	6.269	30	05:00:00
April	5.916	1	06:30:00
May	5.388	25	02:45:00
June	5.351	13	17:30:00
July	5.521	13	18:30:00
August	5.859	11	18:00:00
September	6.128	9	17:45:00
October	6.262	8	17:30:00
November	5.827	6	17:00:00
December	5.988	5	04:15:00

Extreme minima	Value	Day	Time
January	0.343	31	12:45:00
February	0.282	28	11:30:00
March	0.35	1	00:00:00
April	0.376	27	23:15:00
May	0.804	26	22:30:00
June	0.973	14	00:30:00
July	0.653	14	01:15:00
August	0.378	12	01:00:00
September	0.321	10	00:30:00
October	0.432	7	23:30:00
November	0.571	5	23:00:00
December	0.827	22	12:15:00

Mean sea level	No days	MSL
January	31	3.14
February	24	3.191
March	18	3.277
April	22	3.123
May	31	3.181
June	30	3.146
July	31	3.181
August	27	3.201
September	30	3.32
October	31	3.421
November	30	3.384
December	31	3.244
	Sum	Avg
	336	3.234

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 2006.

T.G.I. visits to site: Day 096 On site to fit new software patch.
Day 279 TGI general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	036-037,058-059,067-068,095-096	None

Statistics:

Surge maxima	Value	Day	Time
January	0.496	11	22:30:00
February	0.521	16	23:45:00
March	0.47	30	22:45:00
April	0.347	15	22:45:00
May	0.46	20	13:30:00
June	0.237	14	00:45:00
July	0.292	9	07:30:00
August	0.279	29	00:15:00
September	0.425	21	21:45:00
October	0.721	31	23:45:00
November	0.739	1	00:00:00
December	0.709	30	22:30:00

Surge minima	Value	Day	Time
January	-0.501	29	02:00:00
February	-0.387	26	20:00:00
March	-0.438	18	04:30:00
April	-0.274	22	07:45:00
May	-0.21	7	00:45:00
June	-0.283	2	09:45:00
July	-0.328	15	04:15:00
August	-0.189	8	13:30:00
September	-0.297	8	09:15:00
October	-0.261	30	17:30:00
November	-0.551	20	10:30:00
December	-0.412	23	04:00:00

Extreme Maxima	Value	Day	Time
January	6.814	31	12:30:00
February	7.154	28	23:45:00
March	7.372	31	00:00:00
April	7.219	1	00:45:00
May	6.589	26	22:30:00
June	6.583	14	00:30:00
July	6.631	13	12:45:00
August	7.018	12	13:15:00
September	7.14	10	12:45:00
October	7.361	7	11:00:00
November	7.123	6	11:15:00
December	7.02	5	10:45:00

Extreme minima	Value	Day	Time
January	0.267	31	19:00:00
February	0.305	1	19:45:00
March	0.297	1	18:45:00
April	0.366	28	05:30:00
May	0.785	27	05:00:00
June	0.892	13	06:00:00
July	0.493	15	08:15:00
August	0.455	12	07:15:00
September	0.227	9	06:15:00
October	0.409	8	05:45:00
November	0.631	5	17:00:00
December	0.724	22	18:30:00

Mean sea level	No days	MSL
January	31	3.509
February	23	3.596
March	27	3.561
April	26	3.567
May	31	3.608
June	30	3.551
July	31	3.588
August	31	3.675
September	30	3.718
October	31	3.815
November	30	3.818
December	31	3.673
	Sum	Avg
	352	3.64

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: No levelling was carried out in 2006.

T.G.I. visits to site:		
	Day 110	Data logger repair and general maintenance.
	Day 144	Communications fault, modem replaced.
	Day 145	On site to fit new software patch and replace modem. BT fault repaired and gauge back on line.
	Day 354	Measuring system destroyed by collapsing fender.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
87	15 minutes	067-068,110,115-144,347-365	283-290,292-307,313-315,329-331

Statistics:

Surge maxima	Value	Day	Time
January	0.872	20	05:30:00
February	0.895	7	21:15:00
March	1.399	30	14:30:00
April	0.938	1	03:15:00
May	0.602	27	15:00:00
June	0.741	20	21:30:00
July	0.903	9	00:30:00
August	0.832	28	05:00:00
September	1.128	30	05:45:00
October	1.299	1	06:15:00
November	1.49	23	03:30:00
December	1.545	3	05:15:00

Surge minima	Value	Day	Time
January	-0.824	29	01:30:00
February	-0.642	24	03:15:00
March	-0.9	16	03:00:00
April	-0.546	9	23:15:00
May	-0.572	31	16:00:00
June	-0.664	29	16:00:00
July	-0.582	28	15:45:00
August	-0.56	12	04:30:00
September	-0.723	8	02:45:00
October	-0.432	8	03:00:00
November	-0.566	4	00:30:00
December	-0.61	10	04:15:00

Extreme Maxima	Value	Day	Time
January	12.634	31	08:30:00
February	12.887	1	09:15:00
March	13.6	30	07:45:00
April	13.042	1	09:00:00
May	12.013	26	06:00:00
June	11.621	13	20:15:00
July	11.987	13	21:00:00
August	12.867	11	20:45:00
September	13.444	9	20:15:00
October	13.624	8	20:00:00
November	12.834	5	18:45:00
December	12.7	3	05:15:00

Extreme minima	Value	Day	Time
January	0.181	31	16:00:00
February	0.168	28	15:00:00
March	0.165	17	03:30:00
April	0.406	15	02:45:00
May	0.677	28	14:30:00
June	0.579	14	03:15:00
July	0.255	14	04:15:00
August	0.23	12	04:15:00
September	0.187	9	15:45:00
October	0.286	9	15:45:00
November	0.349	6	14:30:00
December	1.349	6	14:30:00

Mean sea level	No days	MSL
January	31	6.026
February	28	6.059
March	27	6.173
April	23	6.096
May	6	6.129
June	30	6.037
July	31	6.101
August	31	6.164
September	30	6.285
October	10	6.422
November	17	6.452
December	11	6.595
	Sum	Avg
	275	6.212

North Shields (Tyne and Wear) Tide Gauge

Latitude: 55° 00' 26.8" 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 2006.

T.G.I. visits to site:

Day 075	Site visit. Repaired repeater gauge fitted and general maintenance carried out.
Day 206	TGI visit to install software patch and carry out general maintenance.
Day 333	TGI visit to recalibrate the tide gauge and carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
96	15 minutes	032-038,075,081-086,200-202	087-088,104,119,147-148,164,252-253

Statistics:

Surge maxima	Value	Day	Time
January	0.804	11	09:00:00
February	0.59	8	07:15:00
March	0.398	30	13:00:00
April	0.44	8	15:00:00
May	0.539	22	11:15:00
June	0.436	13	14:15:00
July	0.259	30	18:45:00
August	0.307	2	20:45:00
September	0.469	28	18:15:00
October	0.954	31	14:15:00
November	0.739	20	12:00:00
December	0.748	30	19:45:00

Surge minima	Value	Day	Time
January	-0.338	12	10:30:00
February	-0.234	24	13:30:00
March	-0.6	13	02:15:00
April	-0.216	25	00:00:00
May	-0.172	5	04:45:00
June	-0.179	5	17:30:00
July	-0.222	14	17:00:00
August	-0.173	8	19:30:00
September	-0.268	8	11:45:00
October	-0.528	26	16:45:00
November	-0.524	20	01:00:00
December	-0.778	31	21:30:00

Extreme Maxima	Value	Day	Time
January	5.347	31	16:30:00
February	5.478	28	15:30:00
March	5.791	30	15:45:00
April	5.444	1	17:15:00
May	5.073	25	13:45:00
June	4.908	14	04:45:00
July	5.15	13	04:30:00
August	5.595	13	05:45:00
September	5.649	11	05:15:00
October	5.81	7	02:45:00
November	5.771	6	03:00:00
December	5.595	5	02:45:00

Extreme minima	Value	Day	Time
January	0.085	31	23:15:00
February	0.253	1	00:00:00
March	0.022	1	22:45:00
April	0.288	27	21:30:00
May	0.765	26	21:00:00
June	0.726	14	11:30:00
July	0.27	14	12:00:00
August	0.152	12	11:45:00
September	0	8	10:00:00
October	0.159	8	10:15:00
November	0.62	4	08:15:00
December	0.617	25	00:30:00

Mean sea level	No days	MSL
January	30	2.929
February	20	2.991
March	19	2.878
April	30	2.966
May	31	2.944
June	30	2.902
July	27	2.923
August	31	2.984
September	29	3.055
October	31	3.109
November	30	3.163
December	31	3.06
	Sum	Avg
	339	2.992

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 2006.

T.G.I. visits to site:

Day 011	On site and replaced faulty modem. However there is also a problem with the data logger.
Day 031-032	On site. New data logger fitted and Munro gauge calibrated.
Day 164	On site, general maintenance.
Day 352	On site, general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
88	15 minutes	001-032,081,102-106,116-118,214-219,228-230	059-061,118,223-225,251,253

Statistics:

Surge maxima	Value	Day	Time
February	0.588	15	01:30:00
March	0.668	27	08:30:00
April	0.459	1	19:30:00
May	0.582	18	15:00:00
June	0.584	20	17:15:00
July	0.474	9	08:30:00
August	0.254	31	02:00:00
September	0.734	21	23:30:00
October	0.64	25	23:45:00
November	1.105	19	21:00:00
December	1.205	3	07:30:00

Surge minima	Value	Day	Time
February	-0.383	24	22:30:00
March	-0.29	16	20:00:00
April	-0.249	28	10:30:00
May	-0.25	29	23:30:00
June	-0.225	2	00:00:00
July	-0.204	14	16:30:00
August	-0.219	12	18:30:00
September	-0.186	7	12:30:00
October	-0.408	31	23:45:00
November	-0.412	1	00:00:00
December	-0.38	18	16:00:00

Extreme Maxima	Value	Day	Time
February	4.358	16	13:30:00
March	4.608	30	12:00:00
April	4.393	1	13:30:00
May	4.006	26	10:45:00
June	3.93	13	00:15:00
July	3.977	30	02:15:00
August	4.028	13	01:45:00
September	4.499	21	23:00:00
October	4.654	9	00:15:00
November	4.655	19	22:15:00
December	4.789	3	09:30:00

Extreme minima	Value	Day	Time
February	-0.279	28	18:00:00
March	-0.169	1	18:45:00
April	-0.08	28	18:00:00
May	0.278	30	07:15:00
June	0.352	14	07:00:00
July	-0.004	14	07:45:00
August	-0.145	12	07:30:00
September	-0.076	8	05:30:00
October	0.112	7	05:00:00
November	0.257	5	04:45:00
December	0.235	23	19:30:00

Mean sea level	No days	MSL
February	26	2.108
March	29	2.185
April	20	2.13
May	31	2.171
June	30	2.114
July	31	2.155
August	18	2.129
September	30	2.33
October	31	2.423
November	30	2.474
December	31	2.386
	Sum	Avg
	307	2.237

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 2006.

T.G.I. visits to site:

Day 049	Divers on site to unblock channel 1 pressure point.
Day 164	On site. The battery terminals on the data logger had corroded. New connectors fitted along with new software.
Day 326	On site to carry out general maintenance on gauge. Compressor changed.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
79	15 minutes	088-164	048

Statistics:

Surge maxima	Value	Day	Time
January	0.427	10	19:45:00
February	0.491	15	00:30:00
March	0.497	27	09:45:00
June	0.561	21	01:45:00
July	0.359	9	07:30:00
August	0.212	1	02:45:00
September	0.516	28	02:00:00
October	0.539	31	02:45:00
November	0.779	19	21:15:00
December	0.924	31	19:30:00

Surge minima	Value	Day	Time
January	-0.536	1	18:00:00
February	-0.446	24	15:30:00
March	-0.363	17	05:15:00
June	-0.172	26	06:00:00
July	-0.288	14	07:30:00
August	-0.264	7	16:30:00
September	-0.231	7	14:15:00
October	-0.347	31	23:45:00
November	-0.354	1	00:15:00
December	-0.435	23	18:30:00

Extreme Maxima	Value	Day	Time
January	2.402	31	07:30:00
February	2.553	15	07:45:00
March	2.761	28	05:30:00
June	2.353	21	02:45:00
July	2.195	29	21:15:00
August	2.344	11	19:45:00
September	2.672	9	19:30:00
October	2.926	6	17:30:00
November	2.763	30	15:00:00
December	3.094	3	17:15:00

Extreme minima	Value	Day	Time
January	0.093	31	01:00:00
February	-0.057	28	12:45:00
March	-0.09	1	00:45:00
June	0.398	14	14:15:00
July	0.179	14	14:30:00
August	-0.009	12	14:00:00
September	0.06	8	12:30:00
October	0.236	7	12:00:00
November	0.35	5	11:45:00
December	0.317	23	01:45:00

Mean sea level	No days	MSL
January	31	1.23
February	28	1.209
March	27	1.214
June	17	1.261
July	31	1.244
August	31	1.234
September	30	1.409
October	31	1.497
November	30	1.531
December	31	1.443
	Sum	Avg
	287	1.327

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 2006.

T.G.I. visits to site:

Day 096	On site to fit new software patch.
Day 327	On site to carry out general maintenance and change compressor.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
94	15 minutes	032-036,046,063-065,067-074,075-076,081-086,095-096	None

Statistics:

Surge maxima	Value	Day	Time
January	0.424	11	21:15:00
February	0.47	17	01:00:00
March	0.432	30	01:45:00
April	0.33	1	01:00:00
May	0.493	22	06:00:00
June	0.224	14	02:30:00
July	0.277	9	08:45:00
August	0.283	18	12:30:00
September	0.475	29	08:15:00
October	0.624	24	00:00:00
November	0.691	1	02:15:00
December	0.853	3	07:00:00

Surge minima	Value	Day	Time
January	-0.457	28	23:15:00
February	-0.42	26	21:00:00
March	-0.436	18	06:45:00
April	-0.238	28	04:00:00
May	-0.226	1	14:45:00
June	-0.302	2	07:45:00
July	-0.329	15	06:45:00
August	-0.215	31	11:00:00
September	-0.225	8	11:00:00
October	-0.247	27	04:45:00
November	-0.611	20	11:45:00
December	-0.452	22	04:45:00

Extreme Maxima	Value	Day	Time
January	4.883	1	00:00:00
February	4.928	28	11:30:00
March	5.26	31	00:15:00
April	5.135	1	01:00:00
May	4.77	24	21:15:00
June	4.644	14	00:30:00
July	4.605	13	13:00:00
August	4.843	13	14:15:00
September	4.974	11	13:45:00
October	5.219	7	11:15:00
November	5.092	20	23:00:00
December	5.247	5	10:45:00

Extreme minima	Value	Day	Time
January	0.165	30	17:15:00
February	0.351	28	17:00:00
March	0.158	1	17:45:00
April	0.311	28	04:30:00
May	0.765	28	05:00:00
June	0.784	15	06:45:00
July	0.368	15	07:30:00
August	0.317	12	06:30:00
September	0.197	9	05:30:00
October	0.387	8	05:00:00
November	0.55	5	03:45:00
December	0.614	22	17:45:00

Mean sea level	No days	MSL
January	30	2.743
February	23	2.819
March	10	2.853
April	26	2.783
May	31	2.83
June	30	2.779
July	31	2.816
August	31	2.886
September	30	2.968
October	31	3.067
November	30	3.061
December	31	2.917
	Sum	Avg
	334	2.877

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 2006.

T.G.I. visits to site:		
	Day 080	On site to fit new software patch to data logger. General maintenance.
	Day 278	TGI visit to carry out general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	040,061,070-072,075,080	None

Statistics:

Surge maxima	Value	Day	Time
January	1.288	11	18:45:00
February	1.134	8	17:45:00
March	0.575	6	13:00:00
April	0.508	9	18:15:00
May	0.557	29	22:00:00
June	0.579	13	22:00:00
July	0.473	13	22:30:00
August	0.612	3	14:15:00
September	0.776	7	20:15:00
October	1.839	31	23:00:00
November	1.614	1	00:00:00
December	0.921	31	04:15:00

Surge minima	Value	Day	Time
January	-0.942	11	06:15:00
February	-0.759	15	09:45:00
March	-0.814	13	20:15:00
April	-0.598	11	18:30:00
May	-0.497	24	05:45:00
June	-0.576	21	04:30:00
July	-0.44	9	14:45:00
August	-0.322	19	17:00:00
September	-0.744	2	20:30:00
October	-0.556	6	19:15:00
November	-1.749	20	08:00:00
December	-1.644	11	00:00:00

Extreme Maxima	Value	Day	Time
January	6.126	1	13:00:00
February	6.356	28	13:00:00
March	6.303	29	12:30:00
April	6.223	1	02:00:00
May	5.868	25	10:45:00
June	5.937	14	02:00:00
July	6.033	14	02:45:00
August	6.203	12	02:15:00
September	6.255	8	00:30:00
October	6.442	7	12:15:00
November	6.251	6	12:30:00
December	6.286	8	14:30:00

Extreme minima	Value	Day	Time
January	0.267	3	09:00:00
February	0.141	1	08:45:00
March	0.089	30	07:30:00
April	0.199	1	08:45:00
May	0.427	24	04:00:00
June	0.511	21	02:30:00
July	0.403	16	23:00:00
August	0.282	11	20:30:00
September	0.186	10	20:45:00
October	0.098	6	18:30:00
November	0.173	20	06:45:00
December	-0.032	3	17:30:00

Mean sea level	No days	MSL
January	31	2.966
February	25	3.068
March	25	2.985
April	30	3.021
May	31	2.994
June	30	3
July	31	3.04
August	31	3.131
September	30	3.146
October	31	3.168
November	30	3.186
December	31	2.968
	Sum	Avg
	356	3.056

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 2006.

T.G.I. visits to site: Day 321 On site to fit new software patch to data logger. General maintenance carried out and compressor changed.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	321	185,341,356-365

Statistics:

Surge maxima	Value	Day	Time
January	0.199	15	05:15:00
February	0.371	18	04:30:00
March	0.489	27	02:00:00
April	0.262	1	01:00:00
May	0.523	21	23:00:00
June	0.211	18	20:45:00
July	0.231	29	05:45:00
August	0.302	17	16:30:01
September	0.54	21	16:15:00
October	0.539	23	15:30:00
November	0.512	25	04:45:00
December	0.64	3	02:00:00

Surge minima	Value	Day	Time
January	-0.251	11	13:30:00
February	-0.242	5	23:00:00
March	-0.193	6	10:30:00
April	-0.227	27	18:15:00
May	-0.198	31	12:45:00
June	-0.269	2	15:30:00
July	-0.17	11	21:00:00
August	-0.153	8	19:15:00
September	-0.089	7	22:00:01
October	-0.121	12	22:45:00
November	-0.208	12	02:15:00
December	-0.375	21	21:45:00

Extreme Maxima	Value	Day	Time
January	5.949	31	06:00:00
February	6.015	1	06:30:00
March	6.453	30	05:15:00
April	6.071	1	06:30:00
May	5.477	26	03:30:00
June	5.44	13	17:45:00
July	5.602	13	18:30:00
August	5.958	11	18:15:00
September	6.262	9	17:45:01
October	6.415	8	17:15:02
November	5.955	6	17:00:00
December	6.03	5	04:15:00

Extreme minima	Value	Day	Time
January	0.217	31	12:15:00
February	0.153	28	11:15:00
March	0.095	1	12:00:00
April	0.271	27	22:45:00
May	0.775	26	22:30:00
June	0.89	14	00:15:00
July	0.534	14	00:45:00
August	0.268	12	00:30:00
September	0.184	10	00:15:01
October	0.304	7	23:00:02
November	0.469	5	22:45:00
December	0.787	22	12:00:00

Mean sea level	No days	MSL
January	31	3.111
February	28	3.145
March	31	3.207
April	30	3.104
May	31	3.167
June	30	3.12
July	30	3.143
August	31	3.151
September	30	3.279
October	31	3.376
November	30	3.351
December	19	3.26
	Sum	Avg
	352	3.201

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 2006.

T.G.I. visits to site: There were no visits to site in 2006.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	107-109	None

Statistics:

Surge maxima	Value	Day	Time
January	0.572	11	00:00:00
February	0.507	15	00:00:00
March	0.354	13	14:00:00
April	0.447	25	01:30:00
May	0.502	3	00:00:00
June	0.572	21	05:00:00
July	0.343	30	04:45:00
August	0.242	1	03:15:00
September	0.497	28	10:45:00
October	0.513	31	00:30:00
November	0.756	20	18:45:00
December	0.853	3	20:30:00

Surge minima	Value	Day	Time
January	-0.394	1	15:30:00
February	-0.392	24	17:15:00
March	-0.366	17	10:00:00
April	-0.272	28	21:15:00
May	-0.22	30	10:30:00
June	-0.169	3	19:00:00
July	-0.211	13	23:00:00
August	-0.234	13	11:15:00
September	-0.216	8	07:30:00
October	-0.215	31	22:30:00
November	-0.252	1	05:15:00
December	-0.292	19	07:30:00

Extreme Maxima	Value	Day	Time
January	5.277	31	08:00:00
February	5.317	1	08:30:00
March	5.617	30	07:00:00
April	5.235	1	08:30:00
May	4.737	26	06:00:00
June	4.905	12	19:15:00
July	4.951	12	19:45:00
August	5.181	11	20:15:00
September	5.53	9	19:45:00
October	5.748	8	19:15:00
November	5.435	5	18:30:00
December	5.516	3	17:15:00

Extreme minima	Value	Day	Time
January	0.207	31	14:45:00
February	-0.014	28	13:30:00
March	-0.124	1	14:15:00
April	0.175	28	13:15:00
May	0.784	13	13:00:00
June	0.829	14	02:30:00
July	0.391	14	03:15:00
August	0.07	12	02:45:00
September	0.057	9	01:45:00
October	0.265	8	01:15:00
November	0.623	6	00:45:00
December	0.828	23	15:00:00

Mean sea level	No days	MSL
January	31	2.917
February	28	2.849
March	31	2.846
April	27	2.858
May	31	2.845
June	30	2.834
July	31	2.883
August	31	2.869
September	30	3.042
October	31	3.088
November	30	3.194
December	31	3.102
	Sum	Avg
	362	2.944

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 2006.

T.G.I. visits to site: There were no visits to site in 2006.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
95	15 minutes	009-011,071-075,095-102,214-219,221,249	None

Statistics:

Surge maxima	Value	Day	Time
January	0.438	12	16:00:00
February	0.559	15	00:30:00
March	0.55	27	11:15:00
April	0.371	25	03:00:00
May	0.554	18	06:45:00
June	0.626	21	01:45:00
July	0.435	9	04:30:00
August	0.221	1	01:00:00
September	0.634	27	21:00:00
October	0.627	31	01:30:00
November	0.849	27	16:00:00
December	1.231	3	19:30:00

Surge minima	Value	Day	Time
January	-0.433	1	13:00:00
February	-0.382	26	06:00:00
March	-0.373	16	20:30:00
April	-0.301	28	19:45:00
May	-0.251	30	09:00:00
June	-0.193	2	00:00:00
July	-0.257	14	08:00:00
August	-0.256	12	08:00:00
September	-0.22	8	06:00:00
October	-0.335	31	21:30:00
November	-0.348	1	02:30:00
December	-0.345	18	22:15:00

Extreme Maxima	Value	Day	Time
January	4.871	31	07:15:00
February	4.939	1	07:45:00
March	5.346	31	07:00:00
April	5.037	1	07:30:00
May	4.538	24	03:30:00
June	4.687	12	18:15:00
July	4.531	12	19:00:00
August	4.82	11	19:15:00
September	5.25	9	19:00:00
October	5.458	8	18:30:00
November	5.028	5	17:30:00
December	5.437	3	16:30:00

Extreme minima	Value	Day	Time
January	0.387	31	01:00:00
February	0.116	28	12:30:00
March	0.095	1	00:45:00
April	0.262	28	00:00:00
May	0.819	29	13:30:00
June	0.87	14	13:45:00
July	0.547	14	14:30:00
August	0.219	12	14:00:00
September	0.259	9	13:00:00
October	0.485	7	12:00:00
November	0.685	6	00:00:00
December	0.856	23	01:30:00

Mean sea level	No days	MSL
January	28	2.687
February	28	2.658
March	25	2.709
April	21	2.666
May	31	2.693
June	30	2.664
July	31	2.699
August	21	2.701
September	28	2.878
October	31	2.955
November	30	3.021
December	31	2.949
	Sum	Avg
	335	2.773

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 2006.

T.G.I. visits to site: Day 169 TGI on site to fit new software patch on data logger. However the software was not correct so 'old' cards re-used. General maintenance and compressor changed.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	081-088,169-170	None

Statistics:

Surge maxima	Value	Day	Time
January	0.644	11	00:15:00
February	0.458	15	16:00:00
March	0.384	13	13:45:00
April	0.462	25	02:00:00
May	0.471	18	19:15:00
June	0.652	21	04:45:00
July	0.35	30	05:15:00
August	0.231	1	05:15:00
September	0.534	28	06:30:00
October	0.53	31	02:00:00
November	0.807	20	02:00:00
December	0.903	4	02:30:00

Surge minima	Value	Day	Time
January	-0.562	1	21:45:00
February	-0.472	24	17:00:00
March	-0.47	17	11:30:00
April	-0.313	28	20:45:00
May	-0.277	30	11:00:00
June	-0.202	3	19:45:00
July	-0.28	14	10:30:00
August	-0.301	12	10:00:00
September	-0.283	8	08:00:00
October	-0.336	31	23:30:00
November	-0.367	1	04:30:00
December	-0.382	19	07:30:00

Extreme Maxima	Value	Day	Time
January	5.588	31	08:00:00
February	5.585	1	08:45:00
March	5.93	30	07:15:00
April	5.578	1	08:45:00
May	5.098	27	19:00:00
June	5.246	12	19:15:00
July	5.229	12	20:00:00
August	5.458	11	20:15:00
September	5.864	9	19:45:00
October	6.09	8	19:15:00
November	5.809	5	18:30:00
December	5.901	3	17:45:00

Extreme minima	Value	Day	Time
January	0.232	31	14:45:00
February	-0.045	28	13:30:00
March	-0.139	1	14:15:00
April	0.179	28	13:15:00
May	0.847	30	03:00:00
June	0.867	14	02:45:00
July	0.4	14	03:15:00
August	0.061	12	02:45:00
September	0.057	9	01:45:00
October	0.276	8	01:30:00
November	0.656	6	00:45:00
December	0.862	23	15:15:00

Mean sea level	No days	MSL
January	31	3.089
February	28	3.016
March	22	2.97
April	30	3.042
May	31	3.017
June	28	3.009
July	31	3.05
August	31	3.033
September	30	3.208
October	31	3.267
November	30	3.388
December	31	3.309
	Sum	Avg
	354	3.117

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 2006.

T.G.I. visits to site:		
	Day 030	On site to change compressor and general maintenance.
	Day 222	On site to replace compressor.
	Day 327	On site to carry out general maintenance on gauge and change compressor.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
90	15 minutes	032-038,060,067-074,075-081,083-087,225-228,235-242,327	207-221

Statistics:

Surge maxima	Value	Day	Time
January	0.319	1	00:30:00
February	0.466	17	02:45:00
March	0.464	30	00:45:00
April	0.339	1	02:00:00
May	0.496	22	07:30:00
June	0.193	19	06:15:00
July	0.226	9	01:45:00
August	0.311	17	18:00:00
September	0.413	21	21:45:00
October	0.627	24	01:00:00
November	0.596	23	03:00:00
December	0.882	3	05:45:00

Surge minima	Value	Day	Time
January	-0.416	29	23:45:00
February	-0.362	26	21:00:00
March	-0.176	16	00:15:00
April	-0.254	27	23:00:00
May	-0.173	31	14:00:00
June	-0.283	2	15:15:00
July	-0.3	15	06:45:00
August	-0.132	10	19:15:00
September	-0.17	3	01:30:00
October	-0.151	14	01:30:00
November	-0.338	20	12:30:00
December	-0.416	23	00:45:00

Extreme Maxima	Value	Day	Time
January	2.389	31	08:15:00
February	2.464	16	08:30:00
March	2.807	30	07:30:00
April	2.496	1	08:45:00
May	2.164	27	18:45:00
June	2.194	13	19:45:00
July	2.303	13	20:45:00
August	2.482	12	21:15:00
September	2.65	9	20:15:00
October	2.82	8	19:45:00
November	2.592	23	07:45:00
December	2.904	3	05:45:00

Extreme minima	Value	Day	Time
January	-0.237	31	16:30:00
February	-0.179	28	15:15:00
March	-0.244	1	16:00:00
April	-0.08	28	11:45:00
May	0.245	27	11:15:00
June	0.278	15	05:00:00
July	-0.074	15	05:45:00
August	-0.169	12	04:30:00
September	-0.261	9	03:30:00
October	-0.039	8	03:00:00
November	0.075	5	02:00:00
December	0.101	23	00:45:00

Mean sea level	No days	MSL
January	30	1.059
February	20	1.129
March	8	1.172
April	30	1.076
May	31	1.133
June	30	1.083
July	24	1.099
August	7	1.16
September	30	1.252
October	31	1.358
November	30	1.343
December	31	1.215
	Sum	Avg
	302	1.173

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: Surveying and levelling for a new site was carried out in 2006.

T.G.I. visits to site:		
	Day 061	TGI on site to repair a faulty data logger.
	Day 074	On site to fit new software patch on data logger, change compressor and general maintenance.
	Day 278	On site to carry out general maintenance on gauge, and change compressor.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
96	15 minutes	038-039,054-061,067-074	079

Statistics:

Surge maxima	Value	Day	Time
January	0.938	11	10:00:00
February	0.796	9	06:15:00
March	0.453	5	01:30:00
April	0.546	8	15:15:00
May	0.764	22	16:30:00
June	0.567	13	14:15:00
July	0.397	30	16:15:00
August	0.512	3	00:45:00
September	0.591	28	18:45:00
October	1.219	31	15:15:00
November	1.199	1	03:45:00
December	0.897	30	19:00:00

Surge minima	Value	Day	Time
January	-0.343	12	11:00:00
February	-0.146	21	20:45:00
March	-0.188	7	07:30:00
April	-0.182	25	00:15:00
May	-0.107	5	08:00:00
June	-0.097	5	17:30:00
July	-0.14	15	00:30:00
August	-0.054	8	19:45:00
September	-0.154	8	12:15:00
October	-0.473	26	18:45:00
November	-0.572	20	02:00:00
December	-0.713	31	21:15:00

Extreme Maxima	Value	Day	Time
January	5.894	31	17:15:00
February	5.984	1	18:00:00
March	6.333	30	16:30:00
April	5.989	1	17:45:00
May	5.611	25	14:15:00
June	5.667	13	17:00:00
July	5.753	13	05:15:00
August	6.235	13	06:15:00
September	6.206	11	06:00:00
October	6.417	7	03:15:00
November	6.346	6	03:45:00
December	6.054	5	03:15:00

Extreme minima	Value	Day	Time
January	0.373	31	23:45:00
February	0.399	1	00:00:00
March	0.467	3	00:15:00
April	0.569	27	22:00:00
May	1.074	25	20:45:00
June	1.041	14	11:30:00
July	0.565	14	12:30:00
August	0.683	12	12:15:00
September	0.212	9	11:00:00
October	0.453	8	10:30:00
November	1.013	4	08:30:00
December	0.965	3	08:15:00

Mean sea level	No days	MSL
January	31	3.369
February	18	3.457
March	18	3.411
April	30	3.422
May	31	3.408
June	30	3.368
July	31	3.401
August	31	3.507
September	30	3.552
October	31	3.603
November	30	3.653
December	31	3.522
	Sum	Avg
	342	3.473

Wick (Scotland) Tide Gauge

Latitude: 58° 26' 27.5" N
Longitude: 03° 05' 11.0" W
Grid Reference: ND 3667 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: Geodetic levelling performed on day 171.

T.G.I. visits to site:		
	Day 171	TGI on site to fit new software patch on data logger. General maintenance and compressor changed.
	Day 311	Site visit. Pneumatic panel stripped down and damaged valves replaced. Blown fuse also replaced.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
93	15 minutes	109,118-123,152-159,171,311-312	010-011,013-015,030,032-041,111-113,284-285,295-296,298-311

Statistics:

Surge maxima	Value	Day	Time
January	0.822	11	04:45:00
February	0.487	15	16:30:00
March	0.345	28	08:30:00
April	0.394	25	16:30:00
May	0.408	18	23:00:00
June	0.48	21	07:15:00
July	0.313	30	14:30:00
August	0.265	1	14:00:00
September	0.454	28	14:15:00
October	0.354	6	14:30:00
November	0.69	20	10:45:00
December	0.773	3	21:45:00

Surge minima	Value	Day	Time
January	-0.361	2	01:30:00
February	-0.451	24	23:30:00
March	-0.376	17	16:00:00
April	-0.176	28	00:15:00
May	-0.193	30	17:45:00
June	-0.16	9	12:45:00
July	-0.213	14	13:00:00
August	-0.216	13	13:00:00
September	-0.172	8	03:30:00
October	-0.145	15	14:00:00
November	-0.289	9	17:00:00
December	-0.309	24	19:45:00

Extreme Maxima	Value	Day	Time
January	3.732	31	12:30:00
February	3.82	15	12:45:00
March	4.031	30	11:45:00
April	3.857	1	13:15:00
May	3.477	27	11:00:00
June	3.495	13	12:15:00
July	3.563	13	00:15:00
August	3.685	12	00:45:00
September	3.963	11	01:15:00
October	4.149	9	00:00:00
November	4.034	20	10:45:00
December	4.31	3	21:45:00

Extreme minima	Value	Day	Time
January	0.065	31	18:45:00
February	-0.045	28	17:45:00
March	-0.098	1	18:15:00
April	0.194	27	16:45:00
May	0.565	13	17:15:00
June	0.493	14	06:30:00
July	0.14	14	07:15:00
August	0.01	12	07:00:00
September	0.012	9	05:45:00
October	0.339	7	05:00:00
November	0.672	9	19:30:00
December	0.468	24	19:45:00

Mean sea level	No days	MSL
January	24	2.038
February	18	1.996
March	30	1.966
April	22	2.061
May	28	1.963
June	22	2.028
July	31	2.028
August	31	2.039
September	30	2.177
October	19	2.203
November	21	2.422
December	31	2.259
	Sum	Avg
	307	2.098

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 2006.

T.G.I. visits to site: Day 166 On site for general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
93	15 minutes	060-063,072-074,081-083,102-108,215-221,228,235-241	321

Statistics:

Surge maxima	Value	Day	Time
January	0.561	20	03:00:00
February	0.551	15	04:45:00
March	0.75	30	08:45:00
April	0.534	1	21:45:00
May	0.57	2	20:00:00
June	0.504	20	17:45:00
July	0.469	9	06:45:00
August	0.193	19	11:30:00
September	0.985	22	00:15:00
October	0.79	26	10:45:00
November	1.148	19	20:15:00
December	1.346	3	06:15:00

Surge minima	Value	Day	Time
January	-0.653	29	03:15:00
February	-0.667	25	00:30:00
March	-0.605	17	16:15:00
April	-0.469	4	06:00:00
May	-0.386	29	23:15:00
June	-0.403	2	23:15:00
July	-0.416	15	17:15:00
August	-0.42	13	16:45:00
September	-0.39	7	13:00:00
October	-0.773	31	22:00:00
November	-0.561	1	00:00:00
December	-0.606	22	19:45:00

Extreme Maxima	Value	Day	Time
January	8.74	31	12:30:00
February	8.841	1	13:15:00
March	9.465	30	11:45:00
April	9.017	1	13:15:00
May	8.325	26	10:30:00
June	8.152	13	00:00:00
July	8.231	15	02:00:00
August	8.722	12	01:00:00
September	9.19	10	00:30:00
October	9.533	9	00:15:00
November	8.849	5	23:00:00
December	8.986	3	22:00:00

Extreme minima	Value	Day	Time
January	0.189	31	19:15:00
February	0.01	28	18:15:00
March	0.4	29	17:45:00
April	0.259	28	18:00:00
May	1.055	28	06:15:00
June	0.985	14	07:15:00
July	0.502	14	08:00:00
August	0.083	12	07:45:00
September	0.096	10	07:15:00
October	0.405	8	06:15:00
November	0.612	6	05:45:00
December	0.883	23	19:45:00

Mean sea level	No days	MSL
January	31	4.441
February	27	4.404
March	16	4.514
April	21	4.408
May	31	4.472
June	30	4.42
July	31	4.454
August	12	4.46
September	30	4.635
October	31	4.738
November	29	4.797
December	31	4.707
	Sum	Avg
	320	4.538

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.

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 absolute gravity 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 2006, BIGF contained data for a total of 120 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 seven of the CGPS stations at, or close to, tide gauges (namely Aberdeen, Liverpool, Lowestoft, Newlyn, North Shields, Portsmouth and Sheerness) are contributed to European initiatives, notably the European Sea Level Service (ESEAS); data from four of the CGPS stations at, or close to, tide gauges (namely Newlyn, Sheerness, North Shields and Aberdeen) are contributed to 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 a summary of their daily data availability and quality, based on the TEQC program available through the IGS. The 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 absolute gravity 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, using both in-house and third party scientific GPS software. The resultant time series are then analysed by POL and IESSG using in-house software.

The trends in the CGPS and absolute gravity time series so far appear to support the idea that GIA is the main contribution to current vertical land movements in the British Isles, with stations in Scotland rising with respect to stations in Southern England.

In 2006, results from the research carried out were published in the Philosophical Transactions of the Royal Society (Teferle et. al. 2006) and presented at the 41st Defra Flood and Coastal Management conference (Bingley et. al. 2006). A full, formal scientific report on the results for the period up to the end of 2005 is currently in preparation. It will be 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 (www.defra.gov.uk/environ/fcd/research).

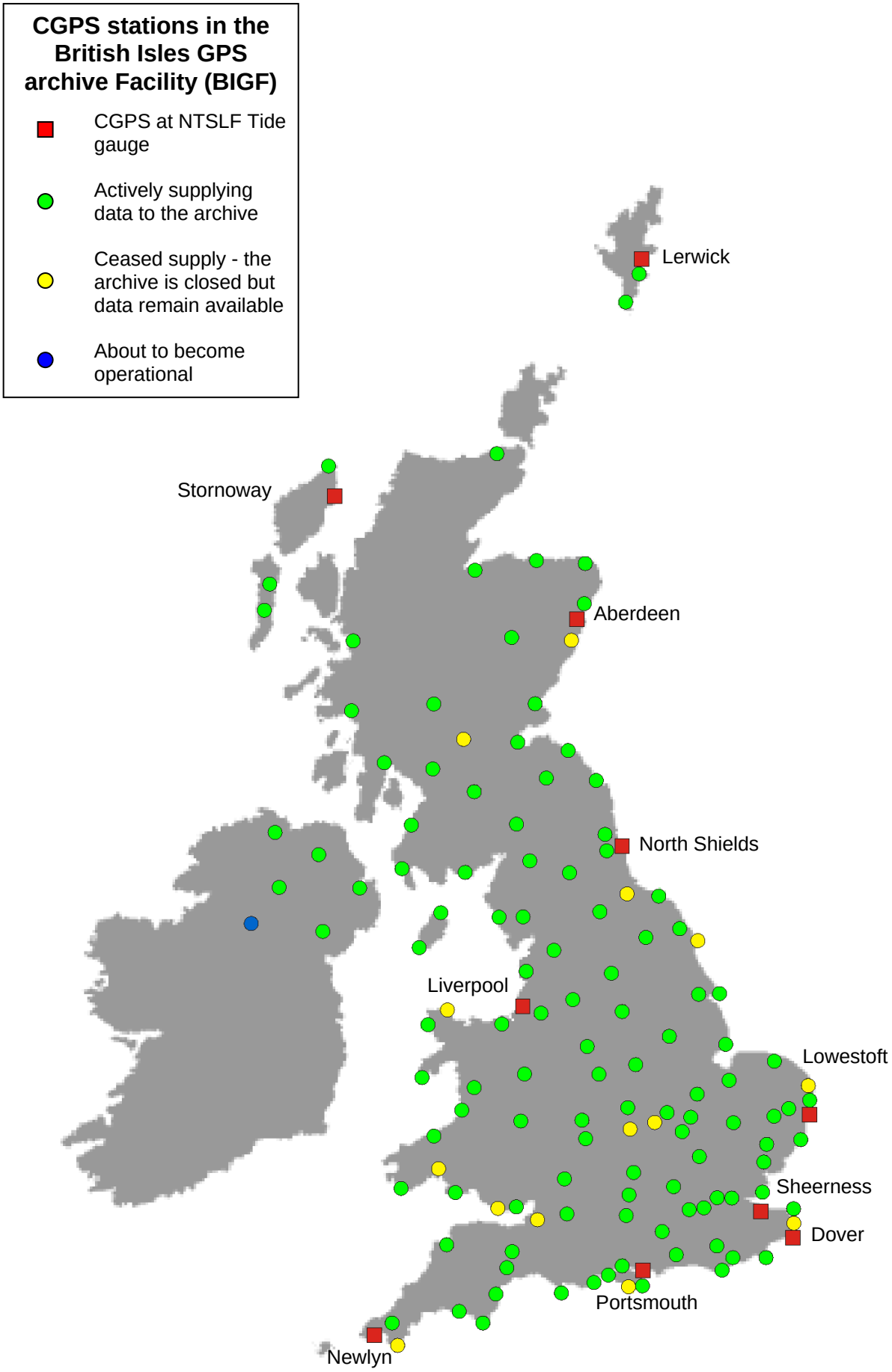
The results are still preliminary; more reliable estimates of vertical land movements will be obtained after an extended monitoring period. However, it is clear that such estimates of vertical land movements should enable 'true sea level variations' around the British Isles to be measured, to allow comparisons with predictions and observations of global sea levels and to enable a better understanding of the space- and time- variations.

References

Bingley, R. M., Teferle, F. N., Dodson, A. H., Williams, S. D. P. and Baker, T. F., 2006. Measuring changes in ground level at tide gauges using continuous GPS and absolute gravimetry, to improve estimates of changes in sea level around Britain. Proceedings of the 41st Defra Flood and Coastal Management conference, York, UK, July 2006, 09.4.1 to 09.4.5.

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, May 2007.

Teferle, F. N., Bingley, R. M., Williams, S. D. P., Baker, T. F. and Dodson, A. H., 2006. Using continuous GPS and absolute gravity to separate vertical land movements and changes in sea level at tide gauges in the UK. Philosophical Transactions of the Royal Society Series A: Mathematical, Physical, and Engineering Sciences, **364**, 10.1098/rsta.2006.1746, 971-930.


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
About to become operational
Lerwick
Stornoway
Aberdeen
North Shields
Liverpool
Lowestoft
Sheerness
Dover
Portsmouth
Newlyn

Aberdeen

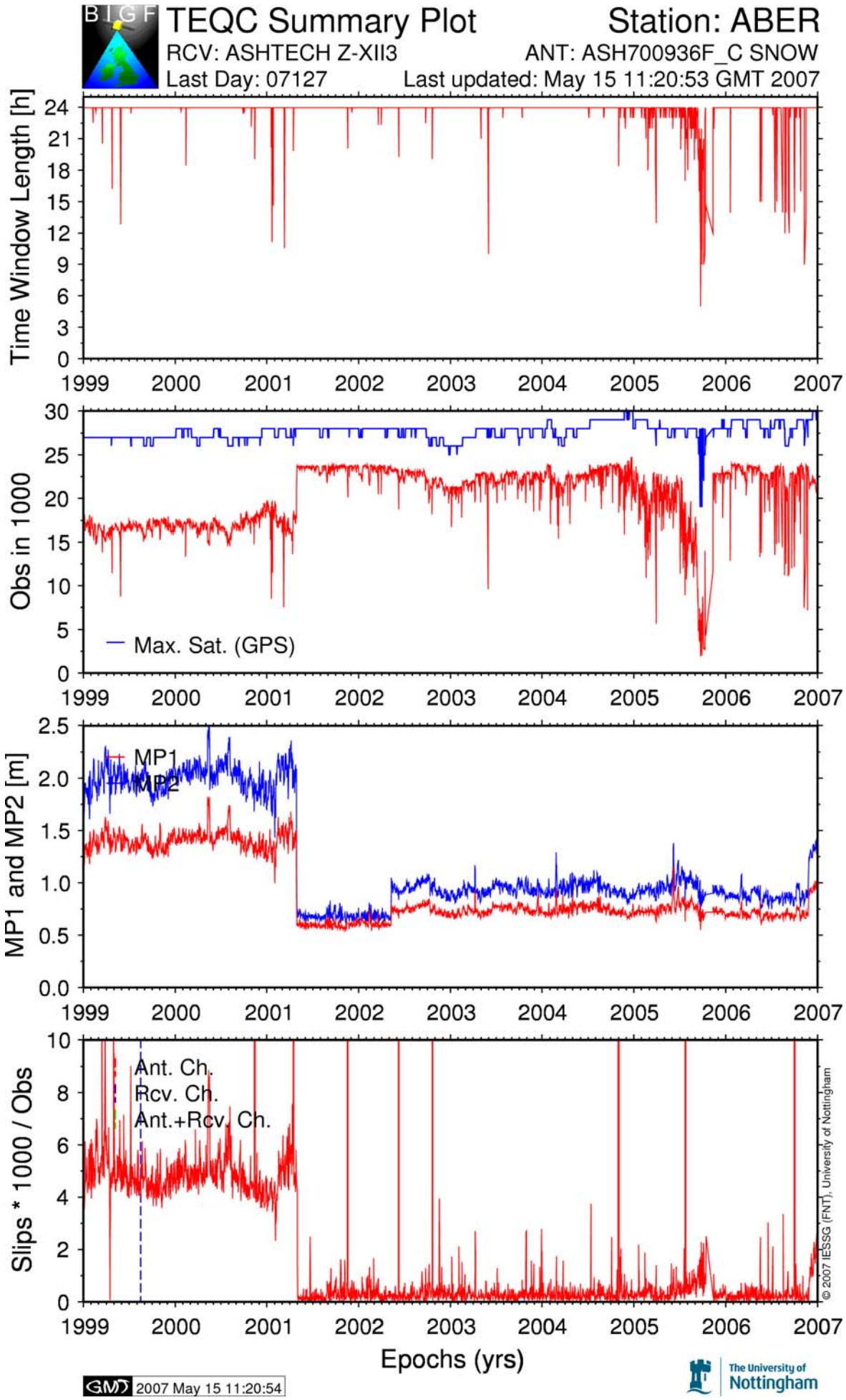
```
     ABER Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

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 the 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: ASHTECH Z-XII3
ANT: ASH700936F_C SNOW
Last Day: 07127
Last updated: May 15 11:20:53 GMT 2007
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
1999
2000
2001
2002
2003
2004
2005
2006
2007
Epochs (yrs)
GMT 2007 May 15 11:20:54
© 2007 IESSG (FNT), University of Nottingham
The University of Nottingham

Dover

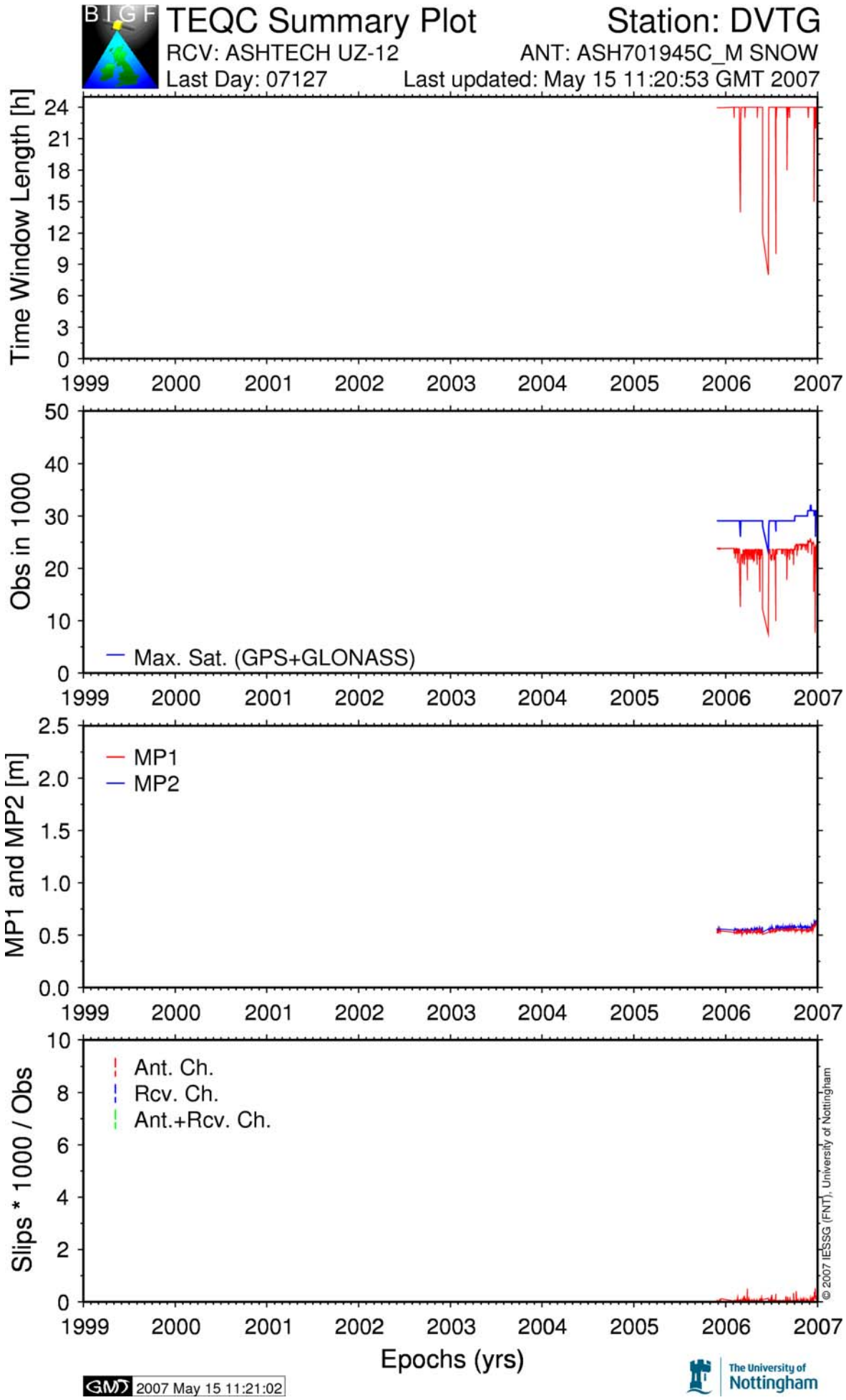
```
     DVTG Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Richard Bingley
     Date Prepared            : 2005-11-24
     Report Type              : NEW
     If Update:
      Previous Site Log       :
      Modified/Added Sections :


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             : CCYY-MM-DDThh:mmZ
     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.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             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is CR5 2001 0215.

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 the 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: ASHTECH UZ-12
ANT: ASH701945C_M SNOW
Last Day: 07127
Last updated: May 15 11:20:53 GMT 2007
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.
1999
2000
2001
2002
2003
2004
2005
2006
2007
Epochs (yrs)
GMT 2007 May 15 11:21:02
© 2007 IESSG (FNT), University of Nottingham
The University of Nottingham

Liverpool

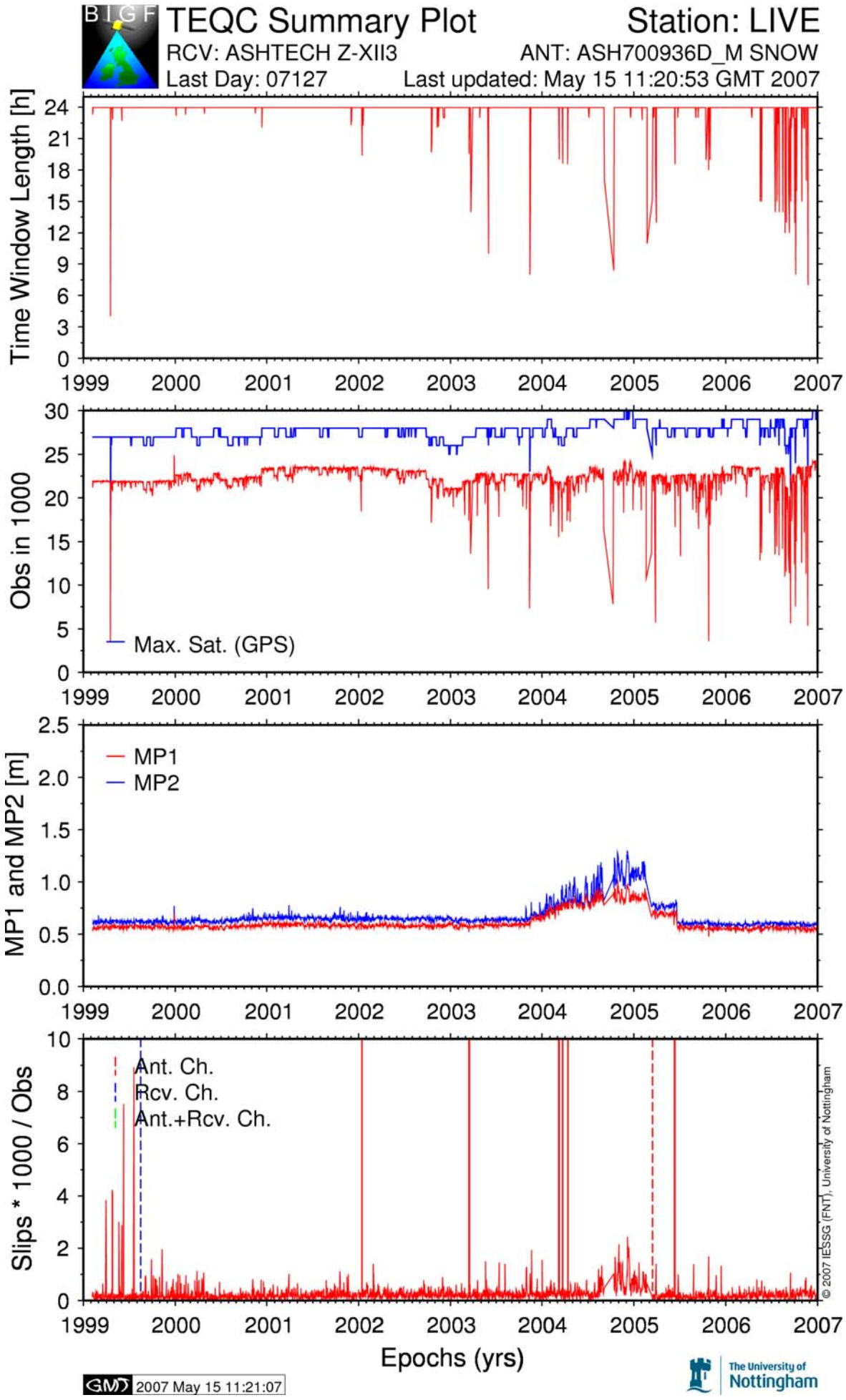
```
     LIVE Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

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 the 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: ASHTECH Z-XII3
ANT: ASH700936D_M SNOW
Last Day: 07127
Last updated: May 15 11:20:53 GMT 2007
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
Epochs (yrs)
GMT 2007 May 15 11:21:07
© 2007 IESSG (FNT), University of Nottingham
The University of Nottingham

Lowestoft

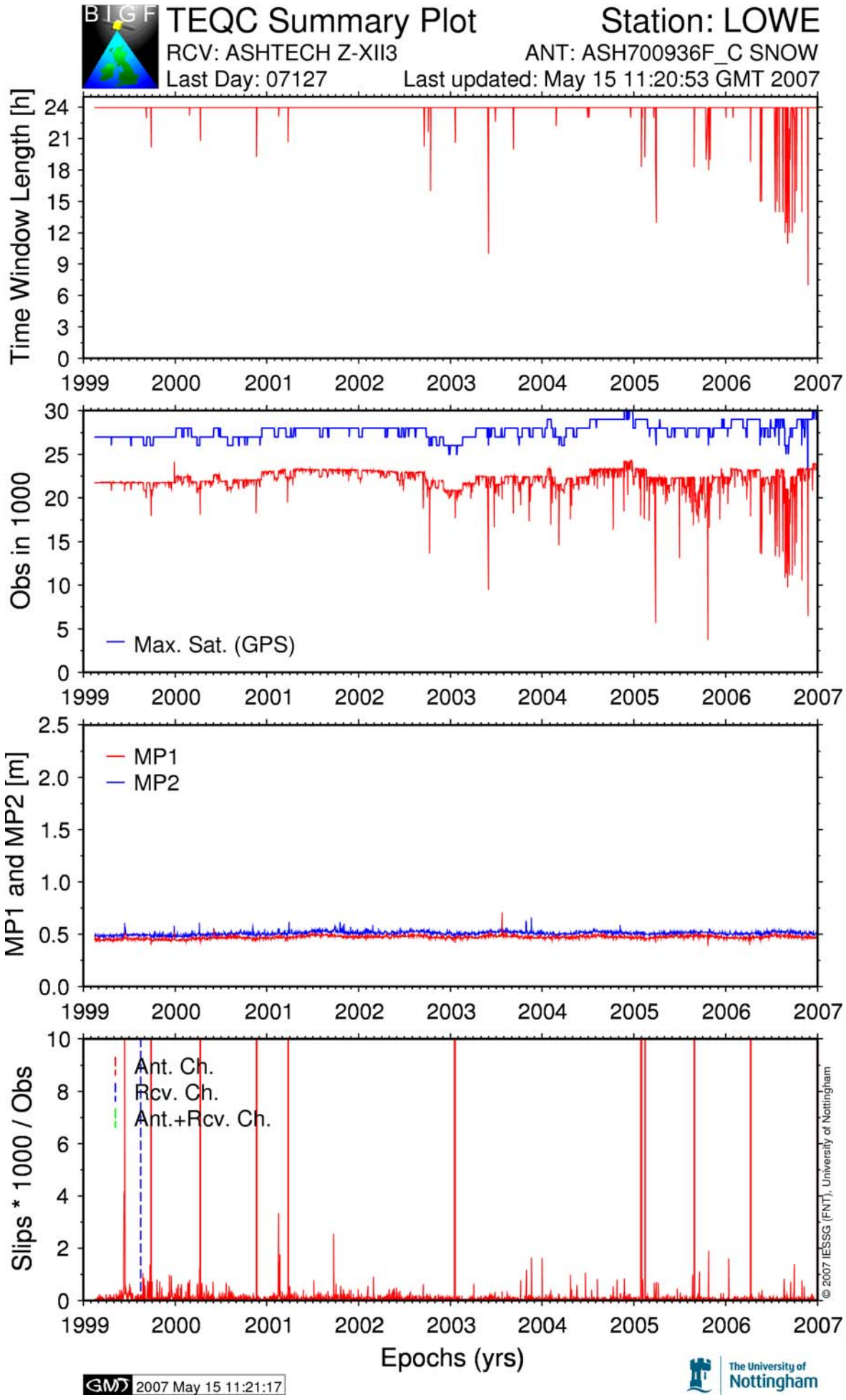
```
     LOWE Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

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 the 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: ASHTECH Z-XII3
ANT: ASH700936F_C SNOW
Last Day: 07127
Last updated: May 15 11:20:53 GMT 2007
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
Epochs (yrs)
GMT 2007 May 15 11:21:17
© 2007 IESSG (FNT), University of Nottingham
The University of Nottingham

Lerwick

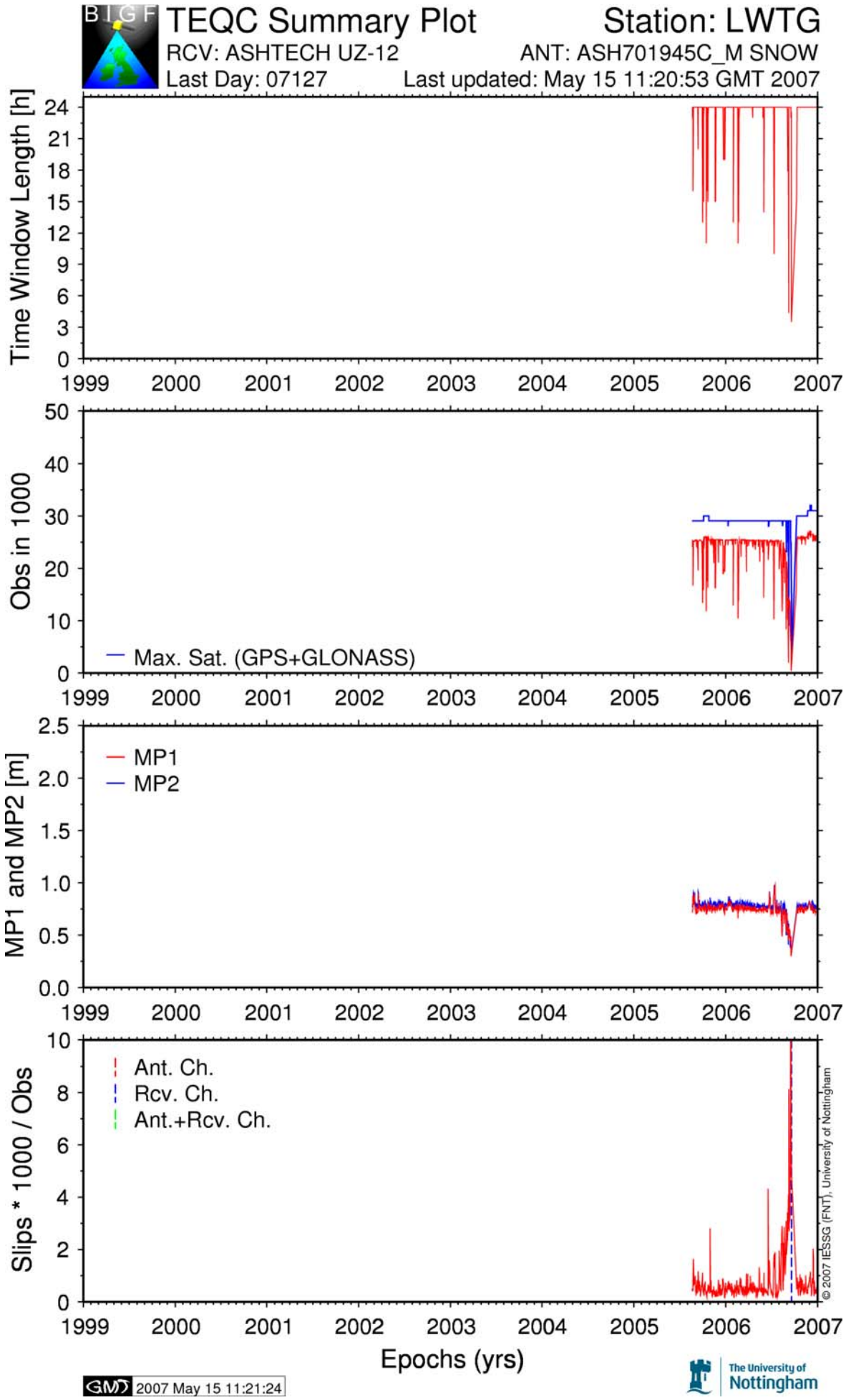
```
     LWTG Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

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 the 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: ASHTECH UZ-12
ANT: ASH701945C_M SNOW
Last Day: 07127
Last updated: May 15 11:20:53 GMT 2007
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.
1999
2000
2001
2002
2003
2004
2005
2006
2007
Epochs (yrs)
GMT 2007 May 15 11:21:24
© 2007 IESSG (FNT), University of Nottingham
The University of Nottingham

Newlyn

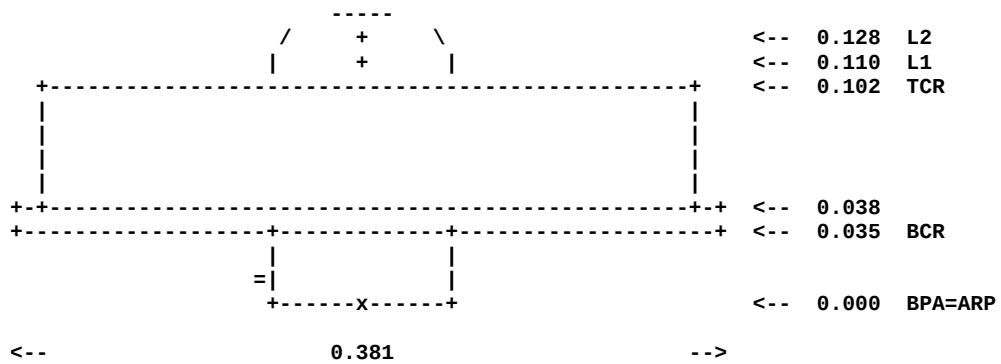
```
     NEWL Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

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     :
```

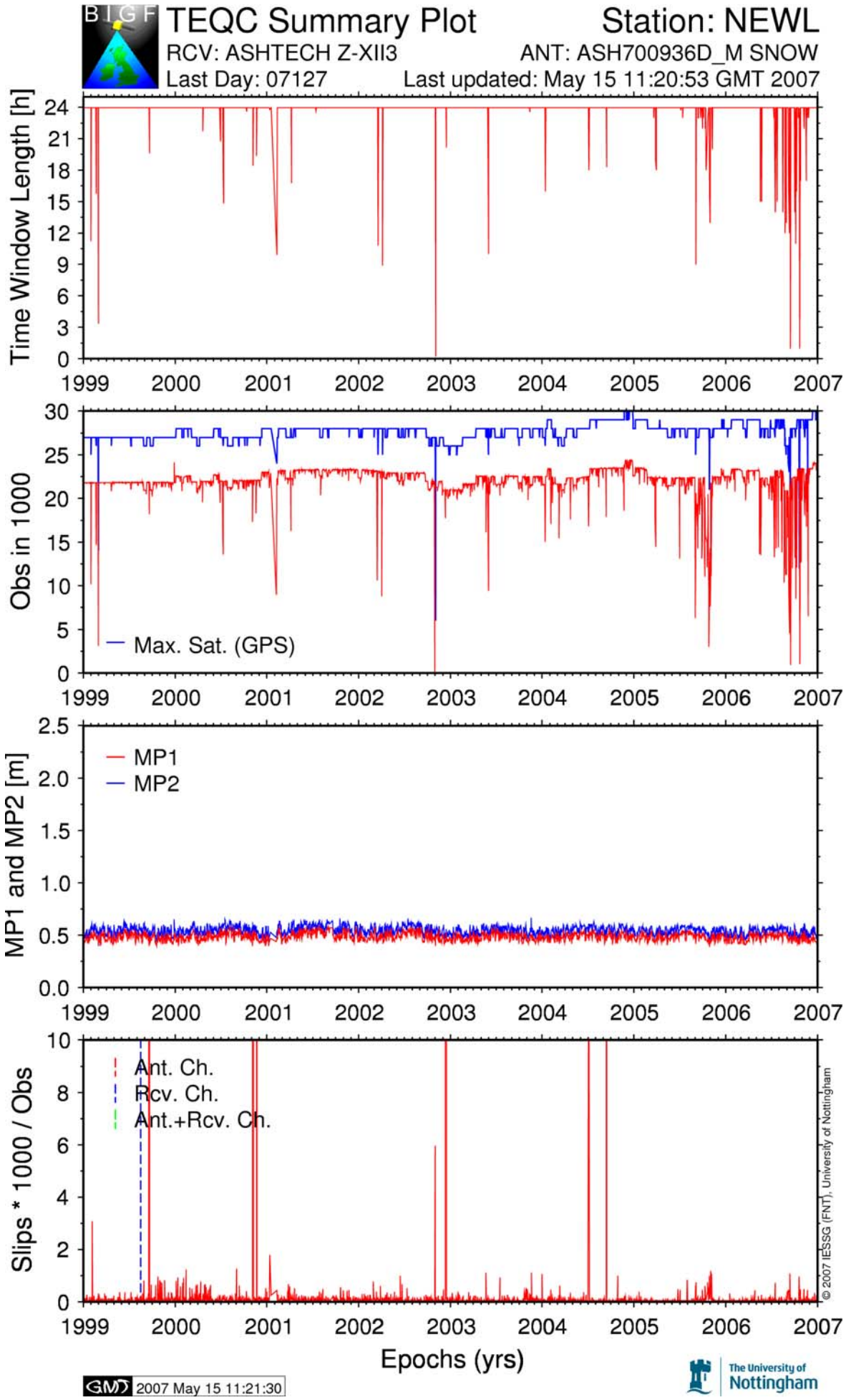
```
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)


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 of Environment, Flooding
                              : 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
```




```
   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: ASHTECH Z-XII3
ANT: ASH700936D_M SNOW
Last Day: 07127
Last updated: May 15 11:20:53 GMT 2007
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
Epochs (yrs)
GMT 2007 May 15 11:21:30
© 2007 IESSG (FNT), University of Nottingham
The 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
```

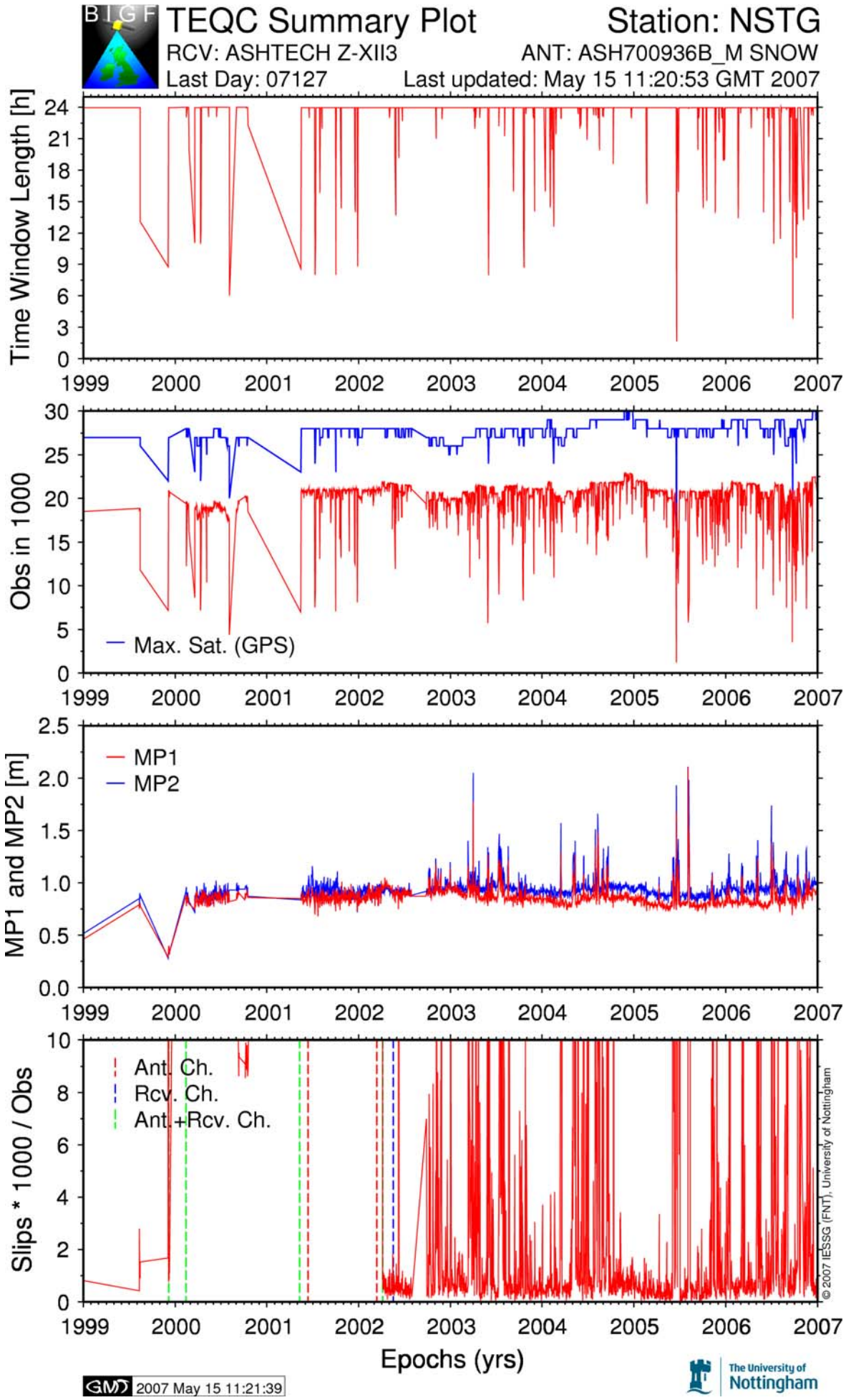
```
     Additional Information   : Full antenna serial number is CR 13570.

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 the 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: ASHTECH Z-XII3
ANT: ASH700936B_M SNOW
Last Day: 07127
Last updated: May 15 11:20:53 GMT 2007
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
Epochs (yrs)
2007 May 15 11:21:39
© 2007 IESSG (FNT), University of Nottingham
The University of Nottingham

Portsmouth

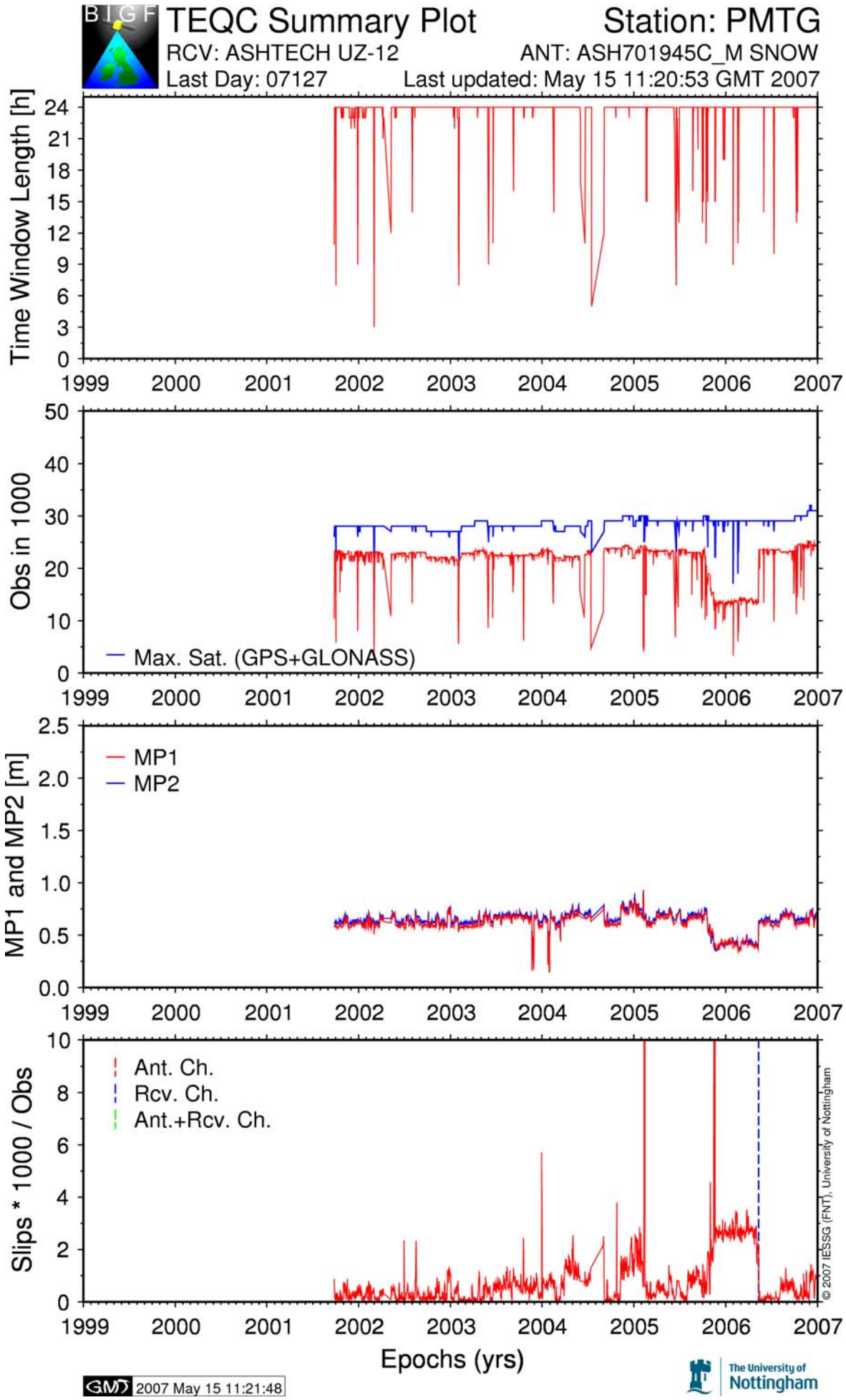
```
     PMTG Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

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 the 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: ASHTECH UZ-12
ANT: ASH701945C_M SNOW
Last Day: 07127
Last updated: May 15 11:20:53 GMT 2007
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.
© 2007 IESSG (FNT), University of Nottingham
Epochs (yrs)
GMT 2007 May 15 11:21:48
The University of Nottingham

Sheerness

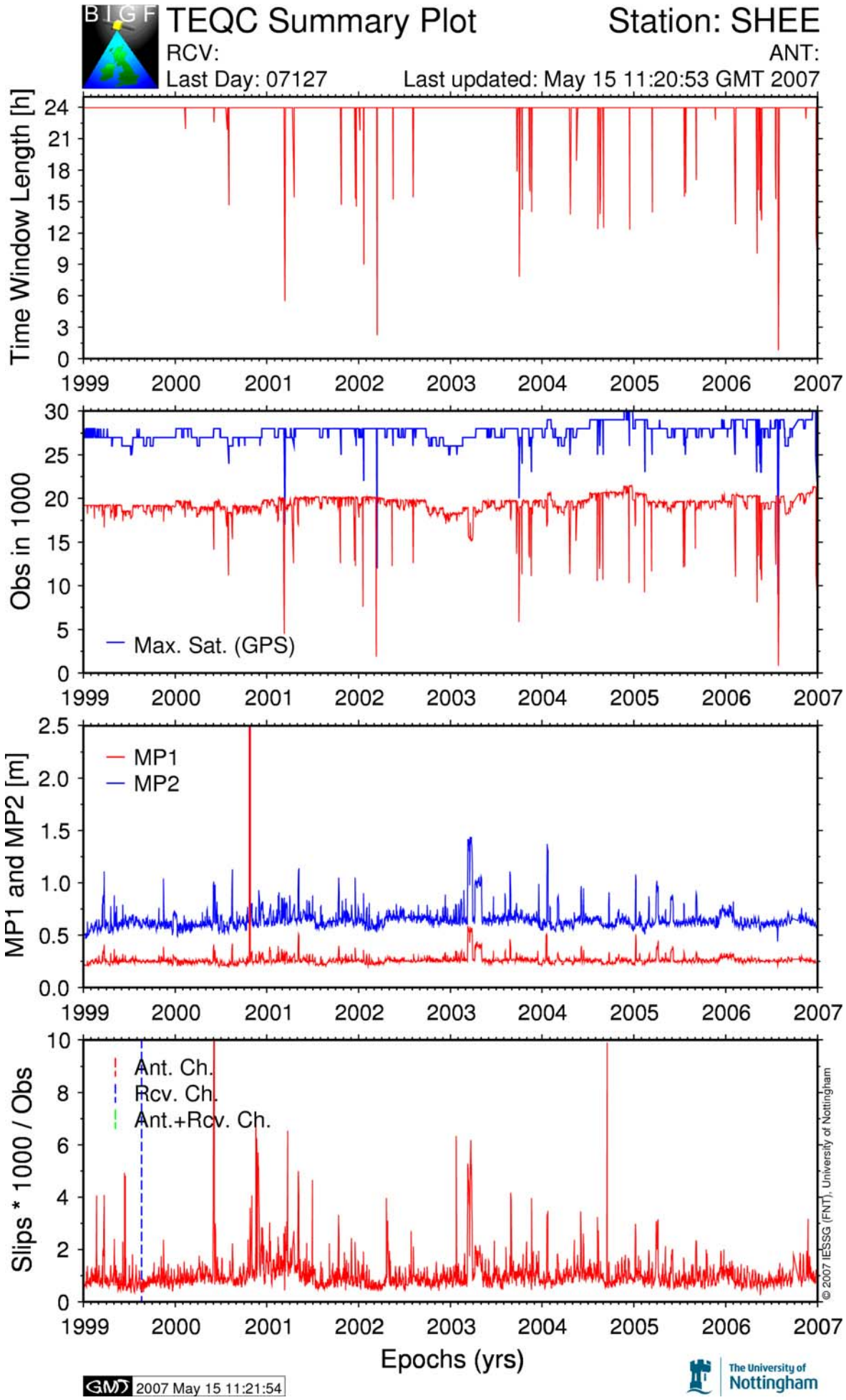
```
     SHEE Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

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: 07127
Last updated: May 15 11:20:53 GMT 2007
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
1999
2000
2001
2002
2003
2004
2005
2006
2007
Epochs (yrs)
GMT 2007 May 15 11:21:54
© 2007 IESSG (FNT), University of Nottingham
The University of Nottingham

Stornoway

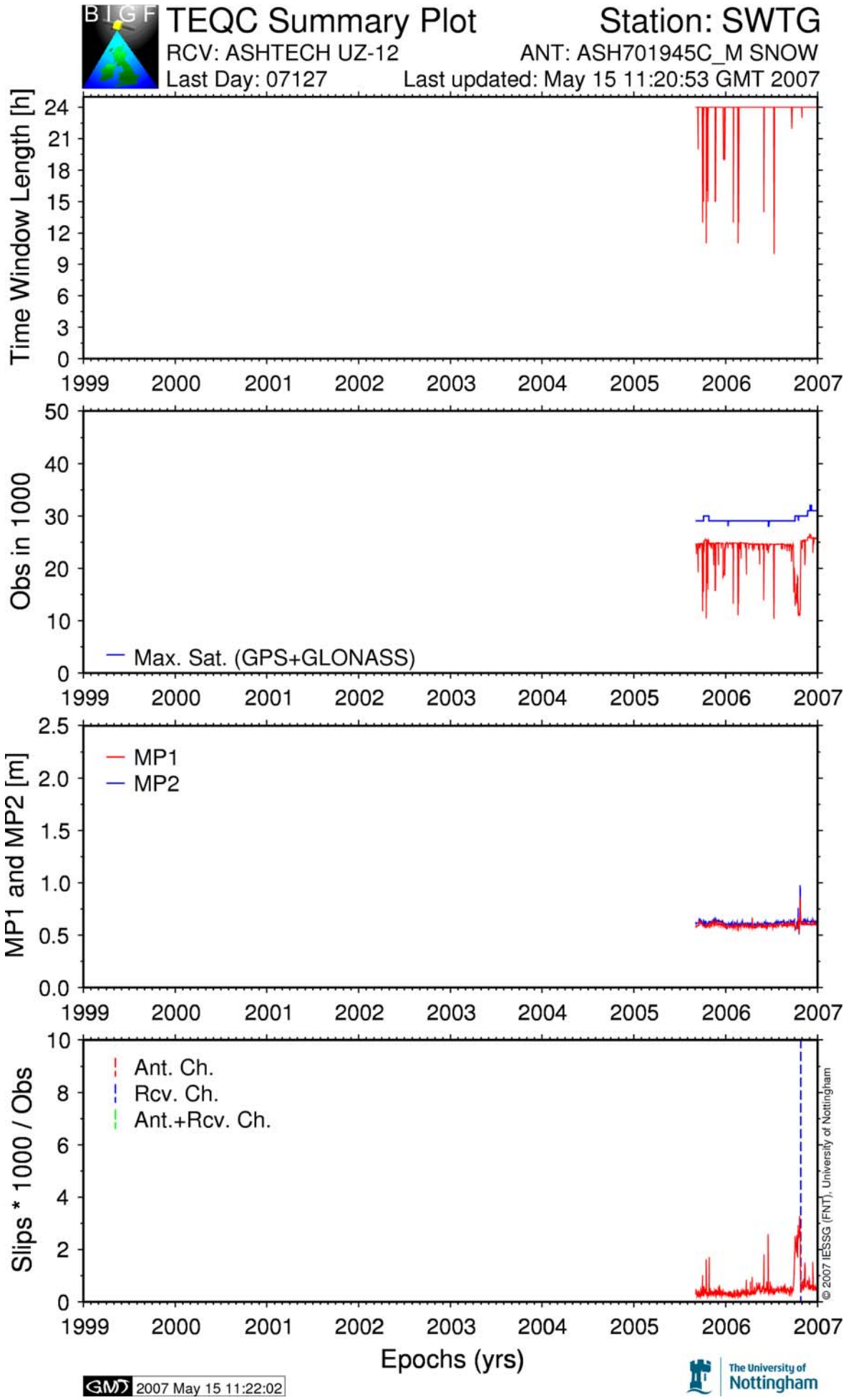
```
     SWTG Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

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 the 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: ASHTECH UZ-12
ANT: ASH701945C_M SNOW
Last Day: 07127
Last updated: May 15 11:20:53 GMT 2007
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.
1999
2000
2001
2002
2003
2004
2005
2006
2007
Epochs (yrs)
GMT 2007 May 15 11:22:02
© 2007 IESSG (FNT), University of Nottingham
The University of Nottingham

Report on gauges in the South Atlantic

Gauges in the South Atlantic

The ACCLAIM (Antarctic Circumpolar Current Levels by Altimetry and Island Measurements) programme in the South Atlantic and Southern Oceans consists of measurements from coastal tide gauges and bottom pressure stations.

Phase 1 of ACCLAIM Coastal Gauges

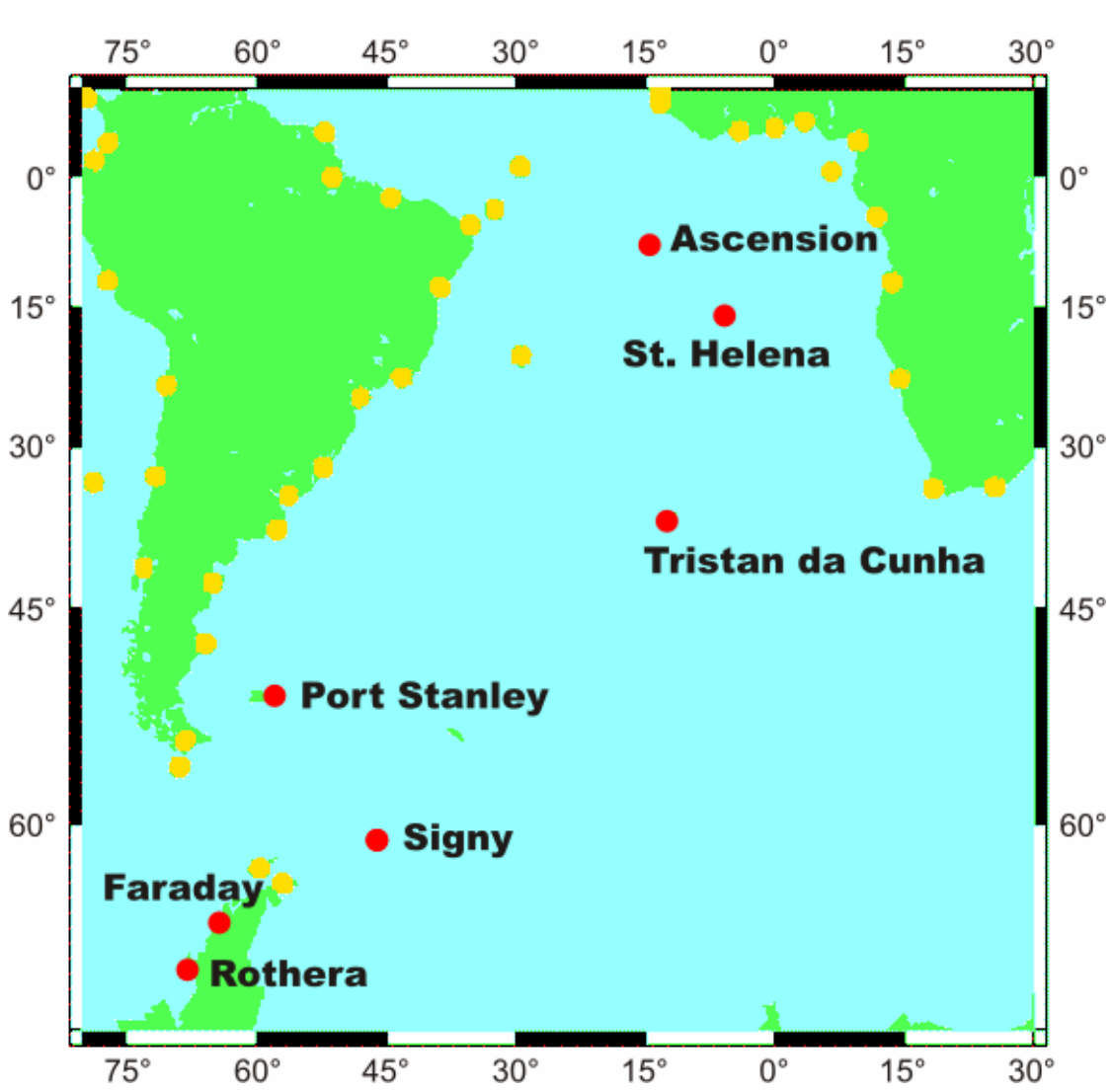
Phase 1 of ACCLAIM began in 1983, and measurements at coastal tide gauge sites took the form of sub-surface pressure (SSP) measurements (units of pressure, e.g. mbar) rather than sea level (units of length, e.g. centimetres). SSP is defined here as the total measured pressure recorded by a sub-surface pressure transducer, a measurement that includes the pressure load from the atmosphere as well as from the water column. It is 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, in general the drifts 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.



Red dots on the above map indicate sites of POL's South Atlantic coastal tide gauge network (ACCLAIM), 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 Rothera, Ascension, St. Helena and Port Stanley can be considered to be complete 'Phase 2' sites, while Tristan and Signy remain 'Phase 1' (i.e. simple pressure transducer sites). At Faraday (which is now called Vernadsky and owned by 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/psmslh

There are three directories: bprs, phase1 and phase2. Each has an inventory file, giving more information about the tide gauges.

Ascension

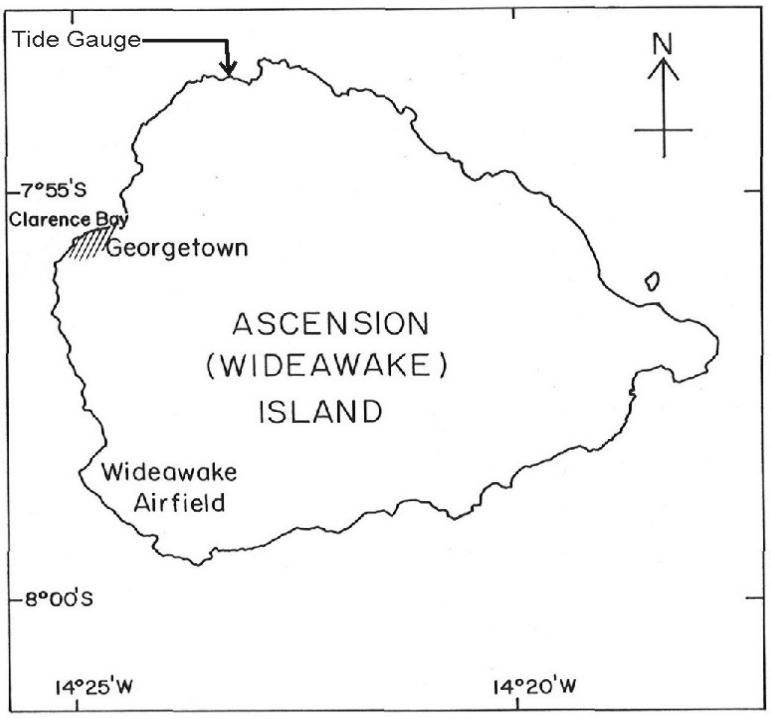
Latitude: 07° 54.0' S Longitude: 014° 23.0' W

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).

System totally refurbished in September 2005.



Port Stanley

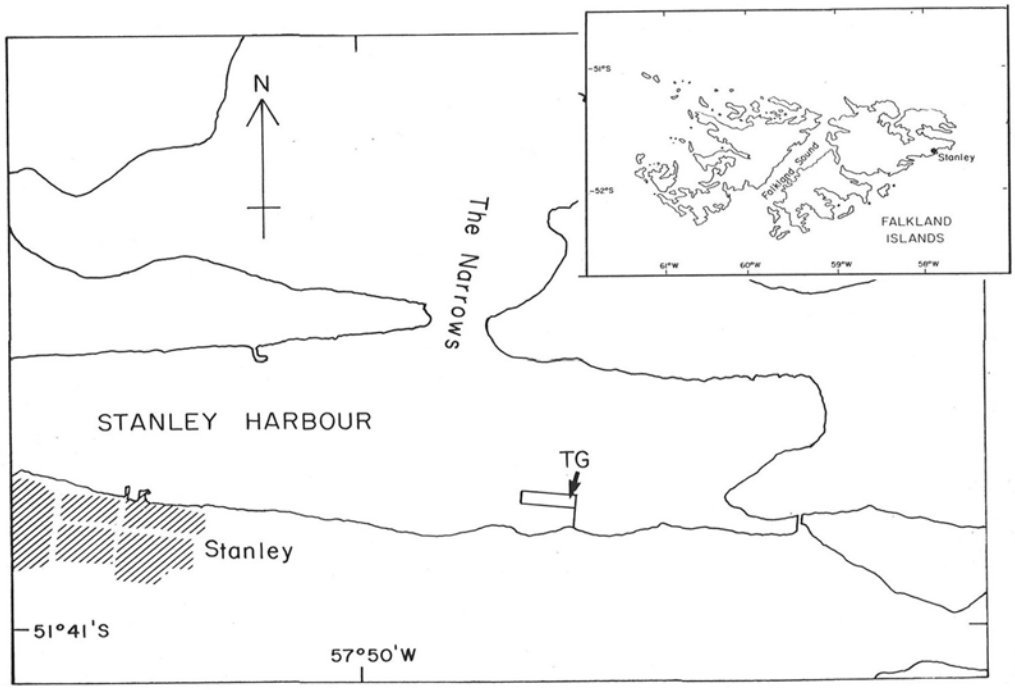
Latitude: 51° 41.0' S Longitude: 057° 49.0' W

Instrument type: Old style ‘B’ pressure gauge and new all-in-one ‘B’ gauge, Kalesto radar gauge with Orbcomm

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).

System totally refurbished in November 2005.

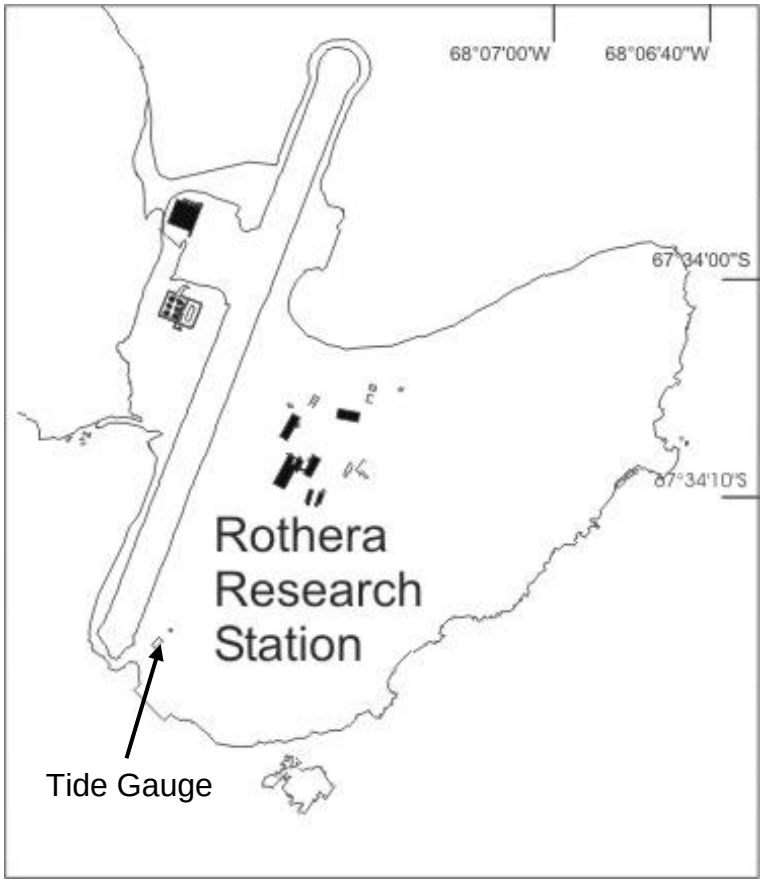


Rothera Tide Gauge

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 shoreward of the main jetty.



St. Helena

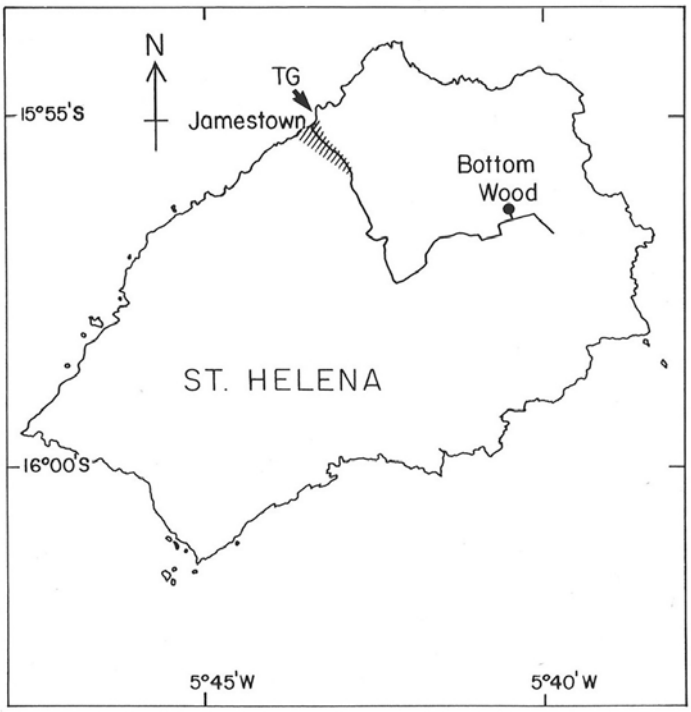
Latitude: 15° 55.0' S Longitude: 005° 43.0' W

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).

In October 2001 a rock fall destroyed power supplies to the gauge so that there will be a gap until August 2002. In addition, the gauge was taken out by the local people and reinstalled in the gap. Special attention must be paid to the reinstalled datum in the next batch of data.

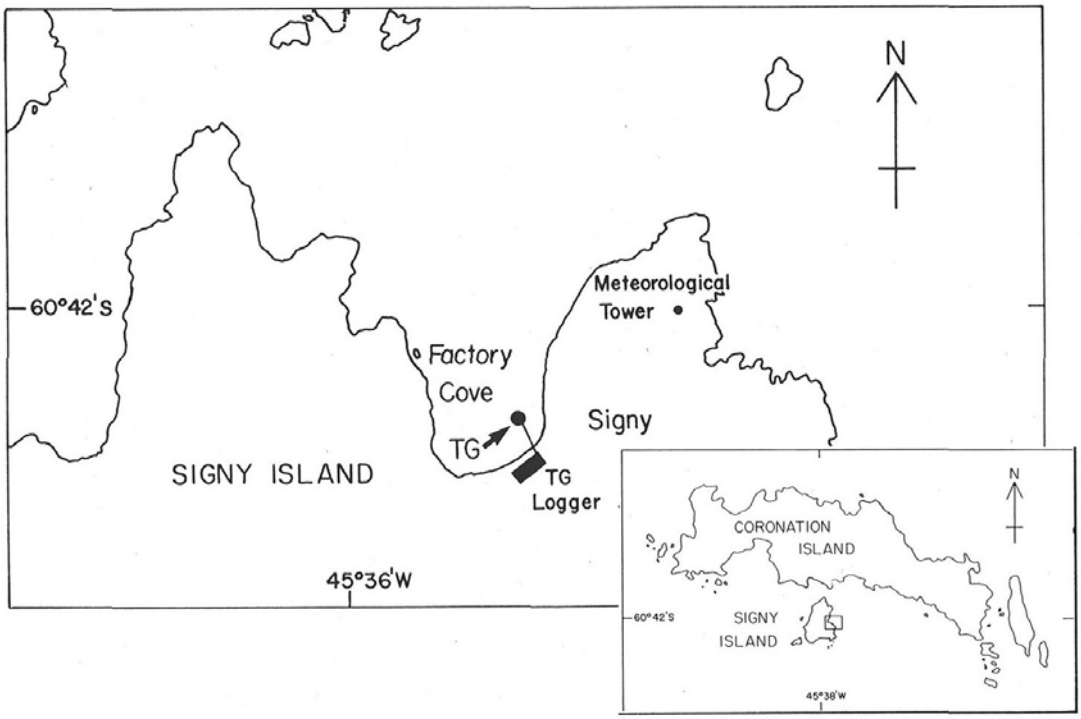


Signy (South Orkney Islands)

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.



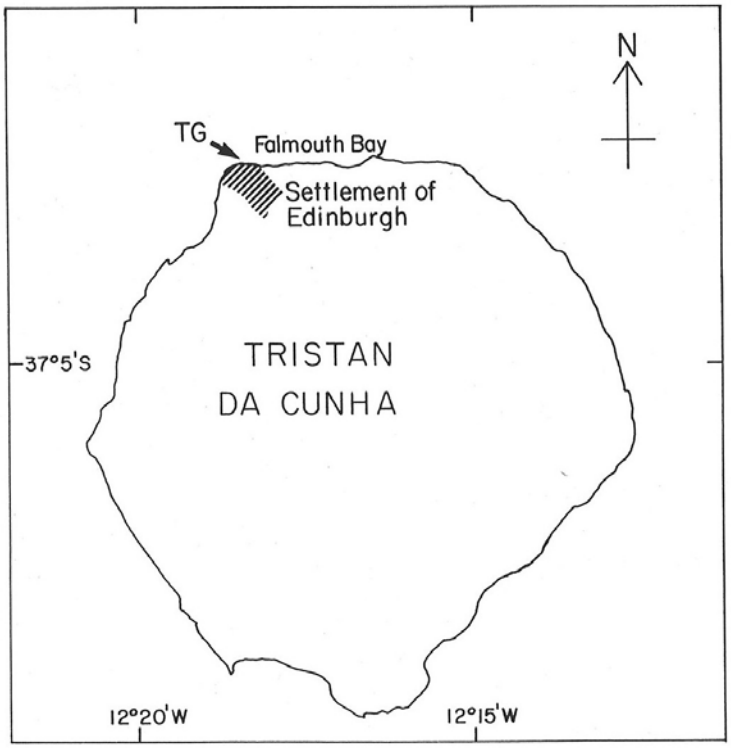
Tristan da Cunha

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 total new installation is required.



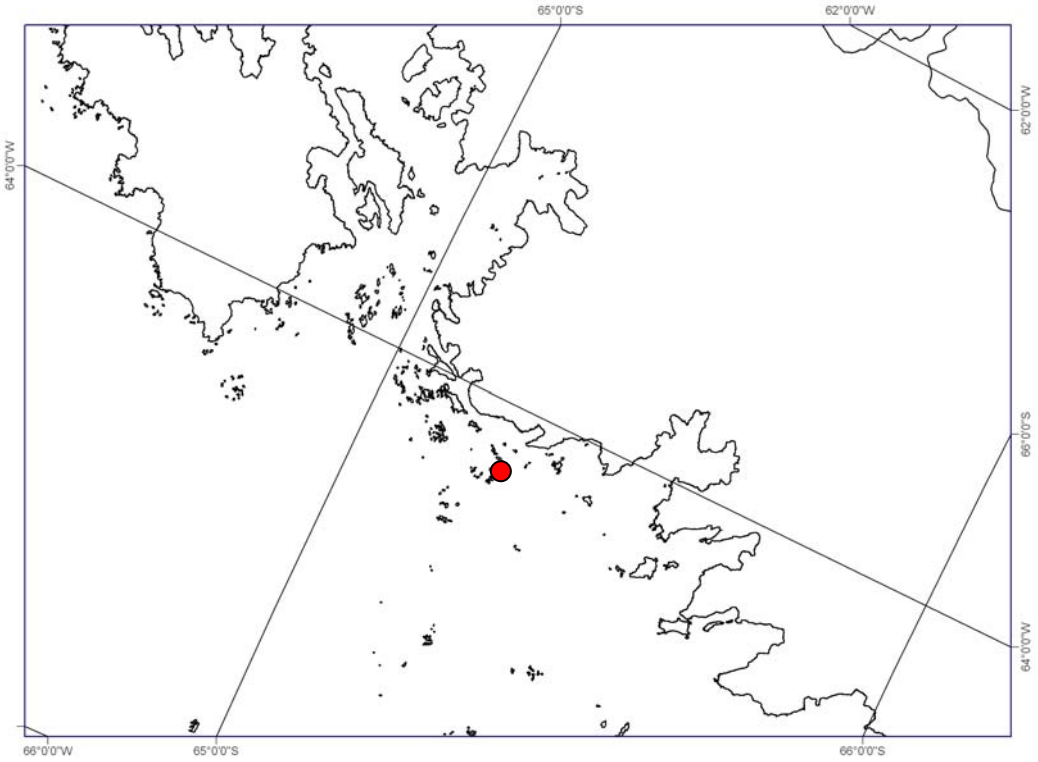
Faraday / Vernadsky

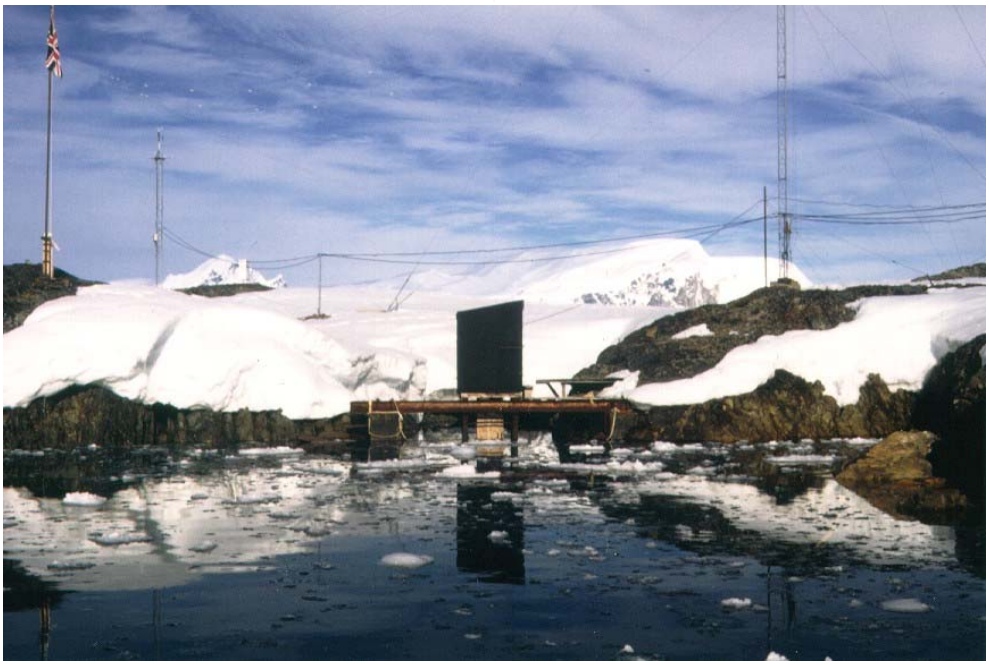
Latitude: 65° 15.0' S Longitude: 064° 16.0' W

Instrument type: Float gauge, single Digiquartz pressure sensor, OTT pressure sensors with DCP. Problems experienced with DCP transmissions, to be investigated next visit.

Site of Gauge: Located in tide gauge hut near to main base building.

Benchmarks and Benchmark relationships:
TGZ = 2.750m below benchmark C (BM C).





South Atlantic Activities in 2006

2006 was a quiet year for tide gauge maintenance.

Ascension
No visit was made to Ascension in 2006. Data flow was good from all sensors.

Port Stanley
The original pressure gauge data were downloaded. There was some data corruption on the card so the card was replaced.

A replacement Orbcomm system was installed to replace the defective one installed last year. Problems now appear to have been resolved.

The 'all-in-one' gauge logger had a firmware upgrade to change the units of measurement from mm to mb.

There are ongoing quality issues with the telephone line that have been investigated by Cable and Wireless. Despite a line upgrade to most of the system, the problems have still not been sorted out.

Rothera
Rothera also only received a very brief visit during 2006. All data were downloaded without any problems.

A serial link was installed from the tide gauge to the Gumstix system, which will eventually allow real time data to be sent back.

St. Helena
Data were downloaded by the local operator without any problems. There were power cuts during the year but gauge is up and running. A new radar gauge and DCP will be sent out and installed in the coming year.

Signy
The gauge lasted throughout the winter this year and was downloaded by the Base Commander. The data looks good even though the temperature record shows a drop to –20°C.

Tristan da Cunha
A brand new gauge has been bought. It is intended that it will be installed in 2007.

Vernadsky
All data were downloaded during a brief visit. Due to problems with the memory card that was installed in 2005, some data were lost. The card was repaired by the Ukrainian scientists and is now functioning correctly. To avoid a repeat of problems with the memory card, the system was kept running during the download - which meant that about 2 hours of scans were lost.