National Tidal and Sea Level Facility

Annual Report for 2003 for the UK National Tide Gauge Network and Related Sea Level Science

Edited by Elizabeth Bradshaw

Proudman Oceanographic Laboratory
NATURAL ENVIRONMENT RESEARCH COUNCIL

British Oceanographic Data Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

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ENVIRONMENT AGENCY

National Tidal and Sea Level Facility

Annual Report for 2003 for the UK National Tide Gauge Network and Related Sea Level Science

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

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Dave Smith, POL	- Leader Tide Gauge Inspectorate
Philip Woodworth, POL	- Director of the Permanent Service for Mean Sea Level

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

Foreword

The UK National Tidal & Sea Level Facility (NTSLF) was established in 2002 to reflect the importance of national sea level monitoring to the public and to government, as well as to the academic community. It brings together various sea level activities within the Proudman Oceanographic Laboratory (POL) and the British Oceanographic Data Centre (BODC) in collaboration with other groups having scientific interest in sea level and geodesy (in particular, the University of Nottingham). The launch of the NTSLF was celebrated with a scientific conference at the Royal Society on 16-17 February 2003 and the papers presented there will be published in a special volume of Philosophical Transactions Series A during 2005.

The NTSLF satisfies an important strategic need for the UK, where tidal processes, coastal water levels and mean sea level have implications for coastal protection, sustainable housing development, management of the littoral environment, marine industry and leisure. The NTSLF comprises the UK National Tide Gauge network, geodetic networks for monitoring vertical land movements, and gauges in the British Dependent Territories of the South Atlantic and Gibraltar; it is supported by the skills of BODC in data processing, quality control and dissemination. It is this unique skills base that qualifies the NTSLF to provide technical expertise to a wide community, and supply data with a range of practical and scientific applications. These include tidal prediction, flood warning, navigation, the determination of extreme sea levels for coastal engineering design, and climate change studies.

All data are readily accessible, free of charge, via our web pages. We are keen to promote maximum knowledge transfer in order to demonstrate value for public money channelled through the Natural Environment Research Council (NERC). This report contains a summary of the activities of NTSLF for the period January-December 2003.

Quality checked tide gauge data from January 1980 onwards are now freely available for download via the NTSLF web site. Work to make available data prior to 1980 will be complete by the summer of 2005. Data requests to BODC have increased almost four-fold (800 requests in 2003) since the creation of NTSLF and the web interface. The volume of data requested has also increased. The same web site provides up-to-date information on the status of key networks, recent technological developments and scientific contributions, products for tidal analysis and prediction, and real-time numerical model forecasts and tide gauge data.

Over the next two years, the tide-surge models that are used to forecast storm surges for the Environment Agency will be considerably enhanced. These models are run in real-time as part of the suite of models at the Met Office, producing four forecasts per day up to two days ahead. Developments include a high-resolution (3.5 km) model of the Celtic Sea, Irish Sea, North Sea and English Channel with improved surge boundary conditions, and data assimilation from strategic tide gauges.

We would like to acknowledge the support of all those who contribute scientifically towards, make use of, and fund the NTSLF. The Department for Environment, Food and Rural Affairs (Defra) has for many years funded the UK National Tide Gauge network: as of 1 January 2005 funding for the network will come from the Environment Agency to reflect the critical importance of real-time monitoring to operational flood warning.

Dr Kevin Horsburgh
Chair of NTSLF

Tide gauge instrument information, data processing procedures and gauge location

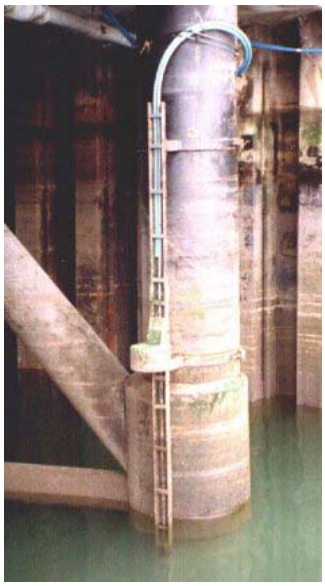
Instrument documentation

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. That 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

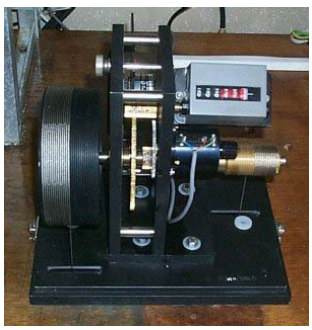
These are differential transducers contained in a watertight housing. The reference port is vented to atmosphere via the power supply and signal cable tube, while the measuring port of the transducer is connected to a copper outlet nozzle on the top of the transducer housing. The copper nozzle, transducer 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 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 the 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 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, and 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.

The last stage is where 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”) and 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. Shortish 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

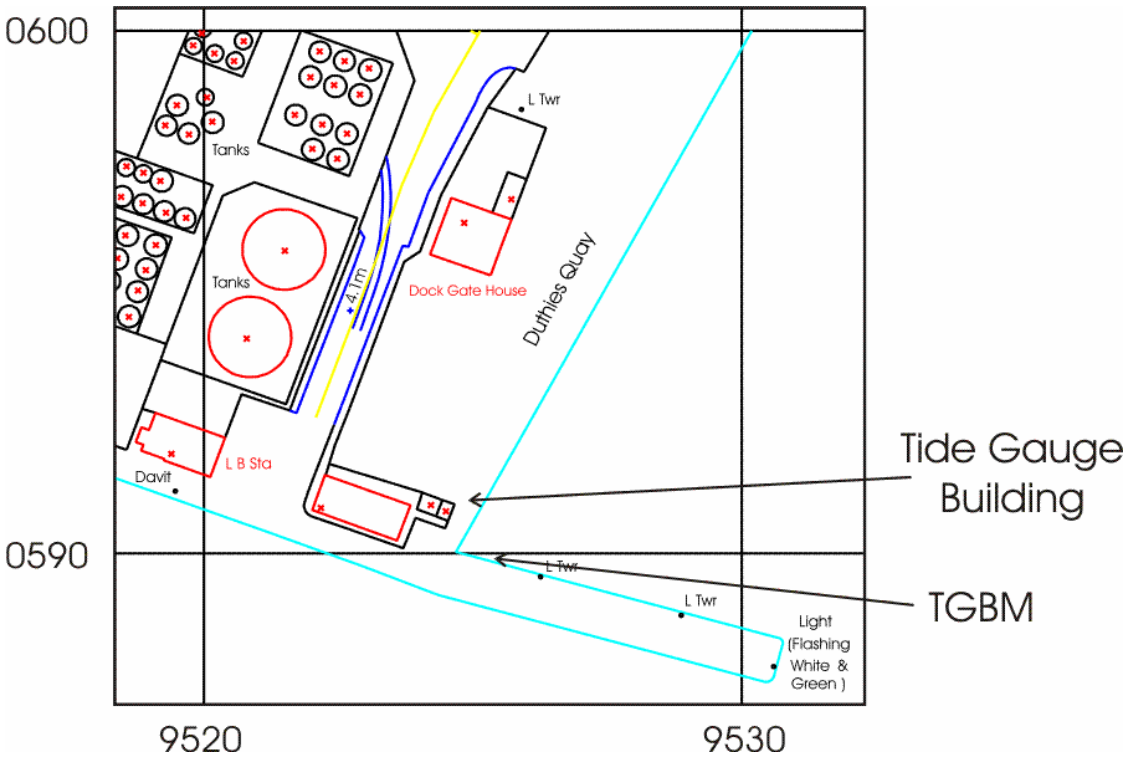
Latitude: 57° 08' 38.5" N Longitude: 02° 04' 49.1" W

Grid Reference: NJ 9524 0591

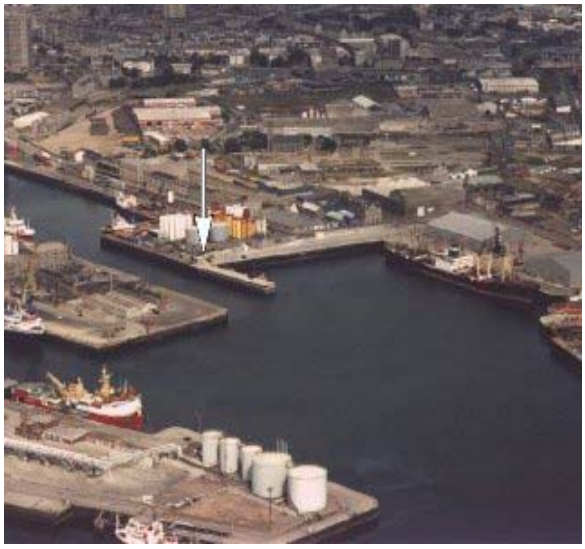
Instrument type: Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge is located on the South East corner of Waterloo Quay, Aberdeen Harbour.



Tide gauge location



Aerial view of site

Avonmouth Tide Gauge

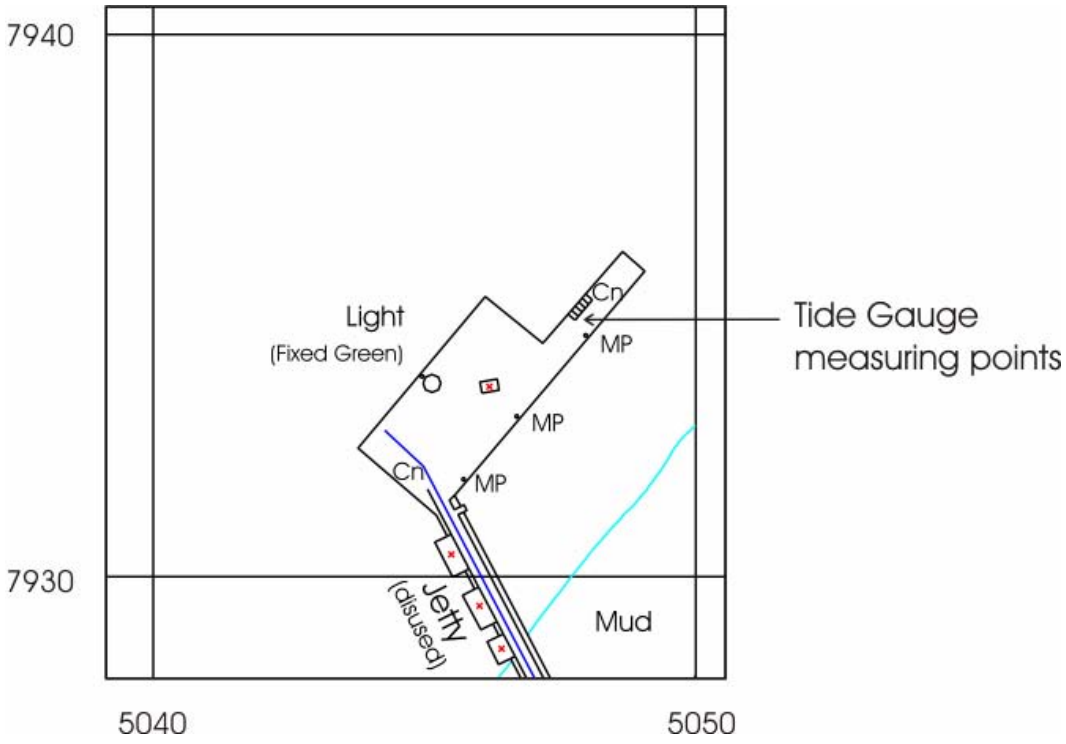
Latitude: 51° 30' 27.9" N Longitude: 02° 42' 45.9" W

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 wartime jetty and the fuel storage depot, with the measuring points being located on the superstructure of the wartime jetty.



Bangor Tide Gauge

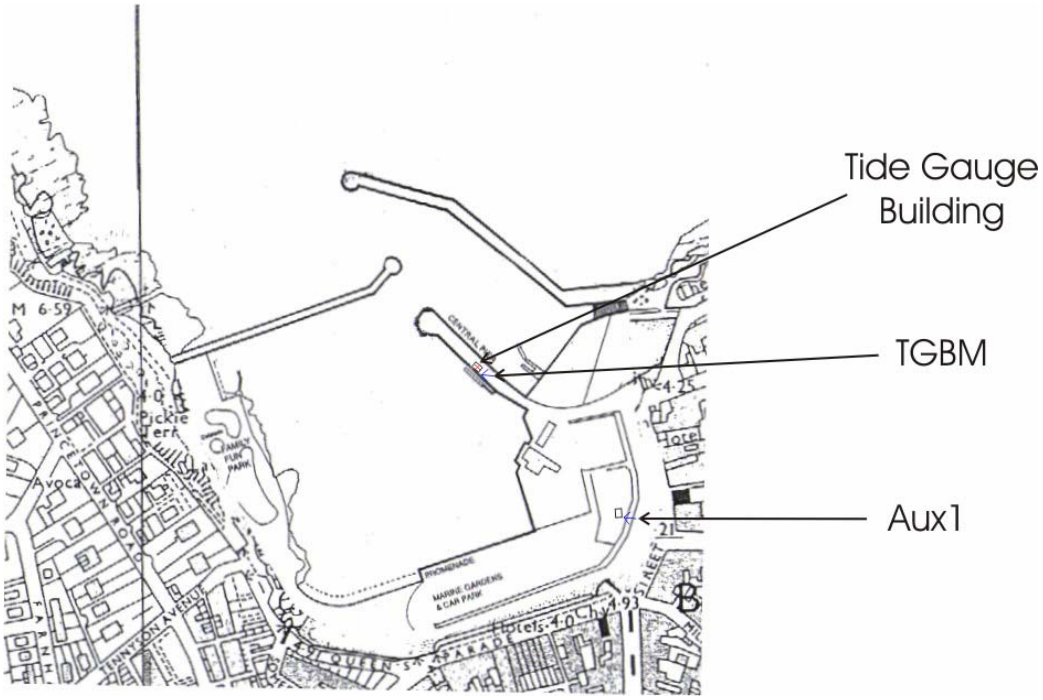
Latitude: 54° 39' 53.1" N Longitude: 05° 40' 10.1" W

Grid Reference: NW 6340 3620

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

Site of Gauge:

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



Barmouth Tide Gauge

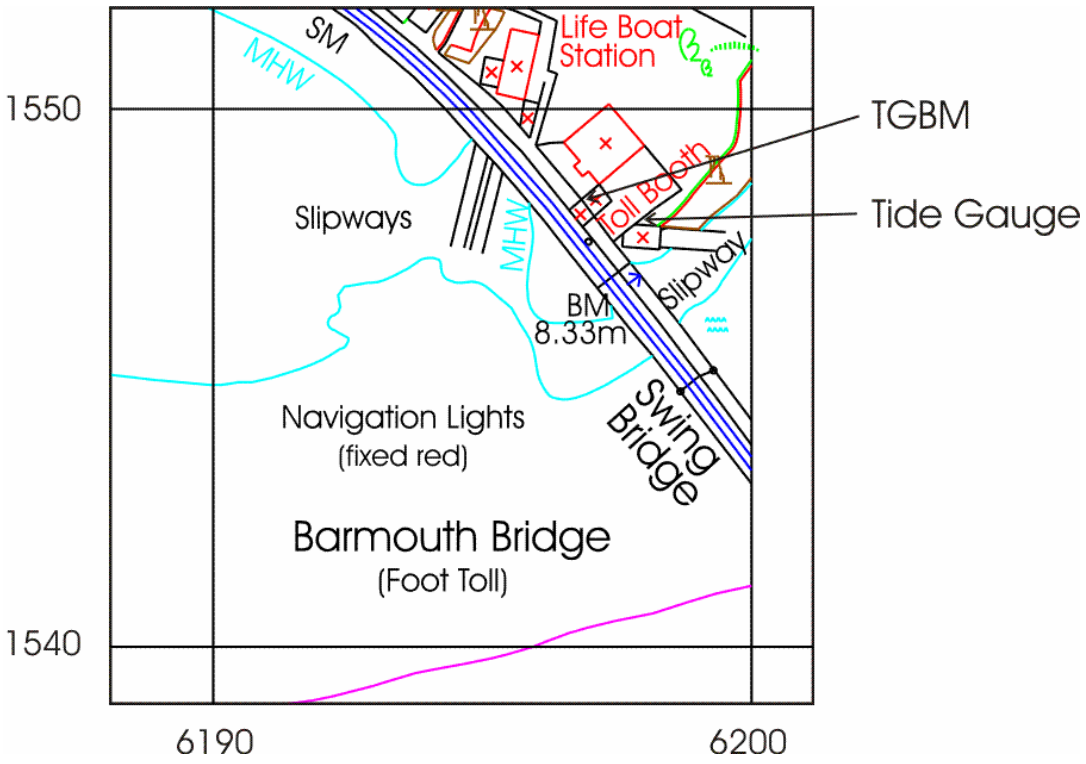
Latitude: 52° 43' 09.6" N Longitude: 04° 02' 42.1" W

Grid Reference: SH 6197 1548

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

Site of Gauge:

The Tide Gauge is located in the toll booth on the North end of Barmouth railway bridge which crosses river Mawddach. The measuring points are attached to the first leg of the railway bridge in the deep channel.



Bournemouth Tide Gauge

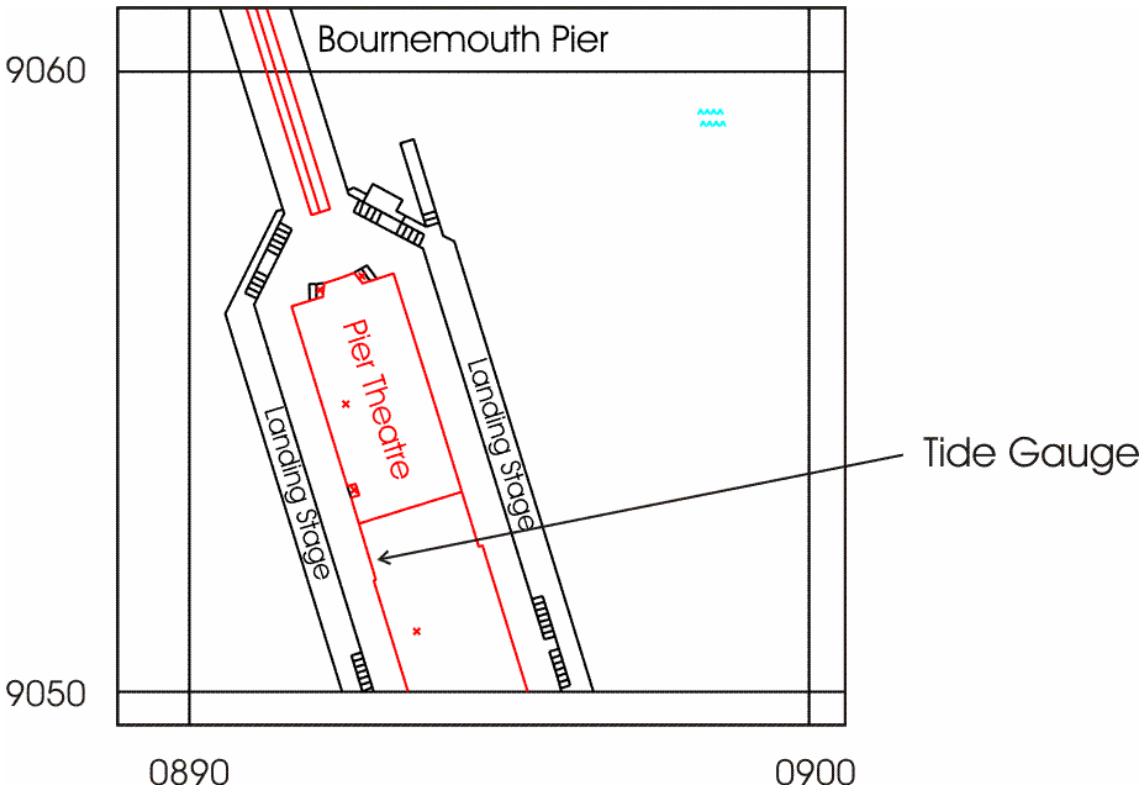
Latitude: 50° 42' 51.6" N Longitude: 01° 52' 29.5" W

Grid Reference: SZ 0893 9053

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

Site of Gauge:

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



Cromer Tide Gauge

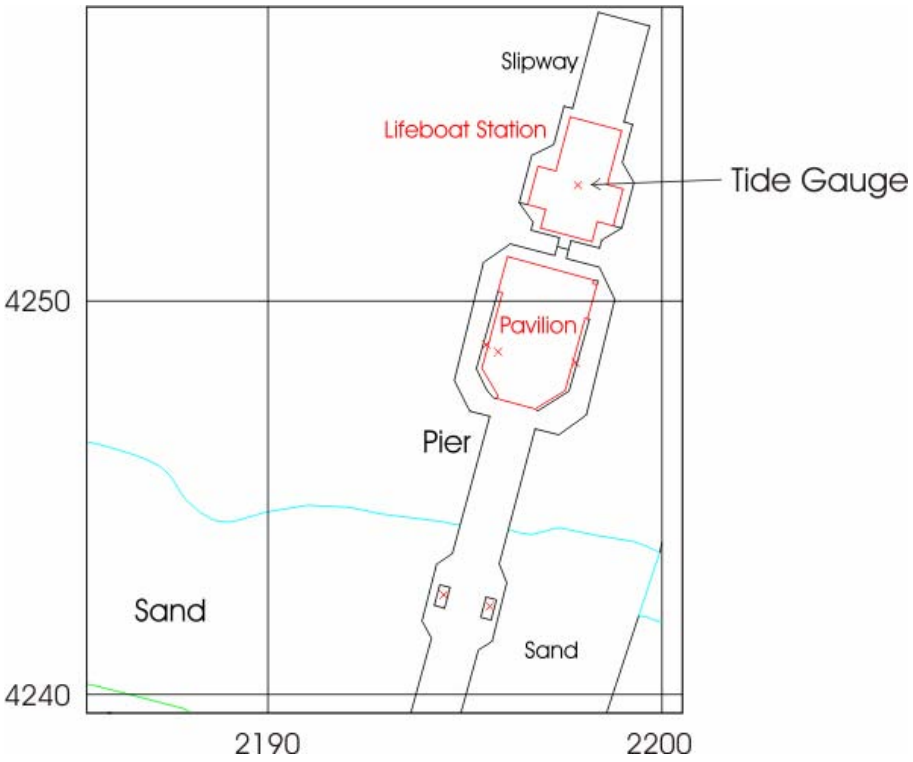
Latitude: 52° 56' 03.4" N Longitude: 01° 18' 05.9" E

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 equipment is located within Cromer lifeboat station, with the measuring points attached to a leg of the pier.



Devonport Tide Gauge

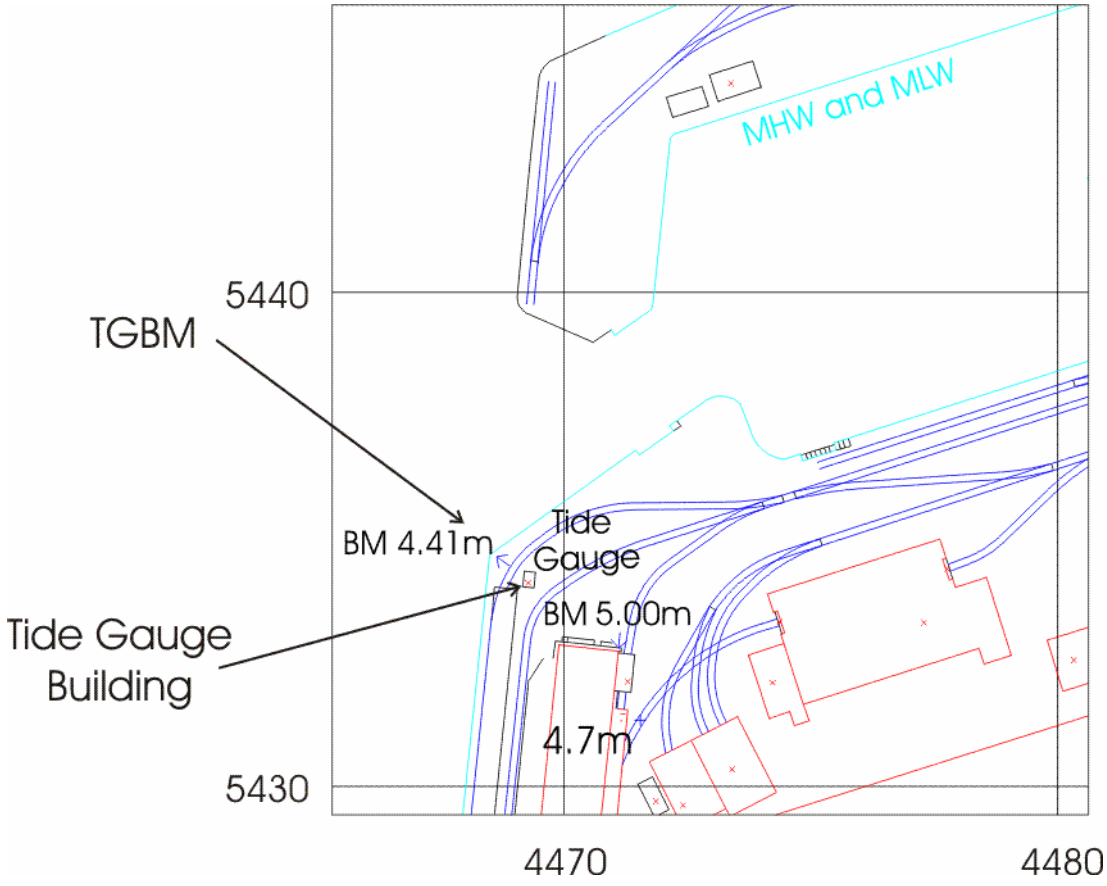
Latitude: 50° 22' 06.2" N Longitude: 04° 11' 06.9" W

Grid Reference: SX 4469 5434

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

Site of Gauge:

The gauge is situated on No. 1 Jetty in Devonport Royal Naval base.



Dover Tide Gauge

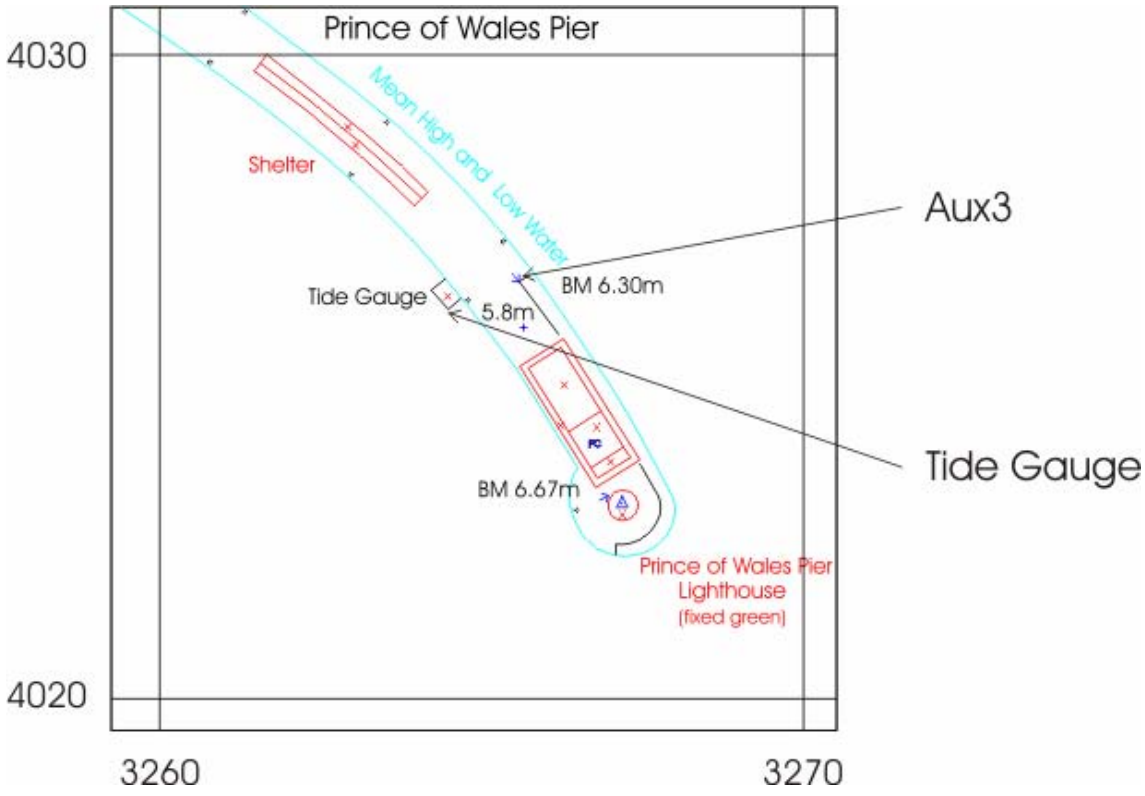
Latitude: 51° 06' 51.8" N Longitude: 01° 19' 21.1" E

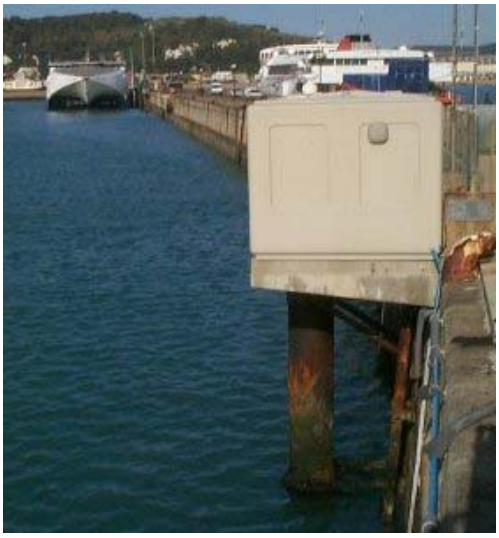
Grid Reference: TR 3264 4026

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

Site of Gauge:

The tide gauge is located just before the lighthouse at the end of Prince of Wales Pier, Western Dock.





Felixstowe Tide Gauge

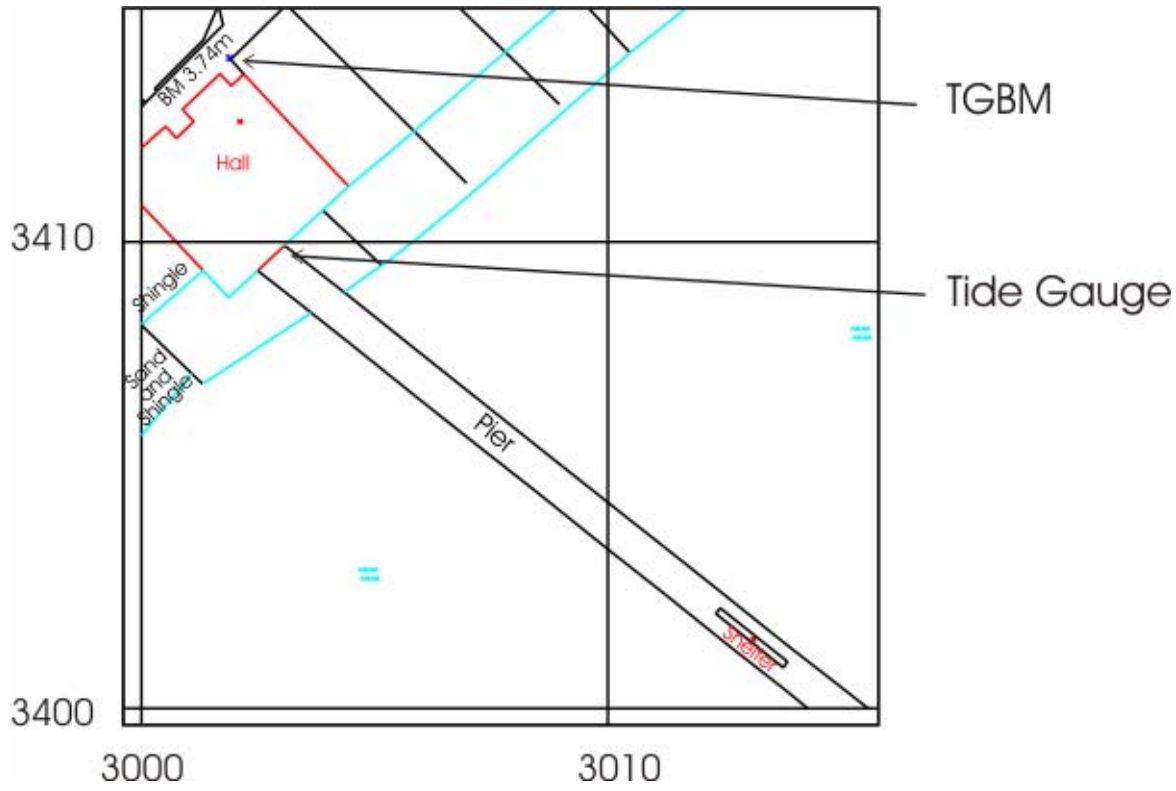
Latitude: 51° 57' 27.7" N Longitude: 01° 20' 47.6" E

Grid Reference: TM 3003 3409

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

Site of Gauge:

The Tide Gauge and measuring points are located on Felixstowe pier, the equipment being located on the landward end and the measuring points located in deep water at the seaward end.



Fishguard Tide Gauge

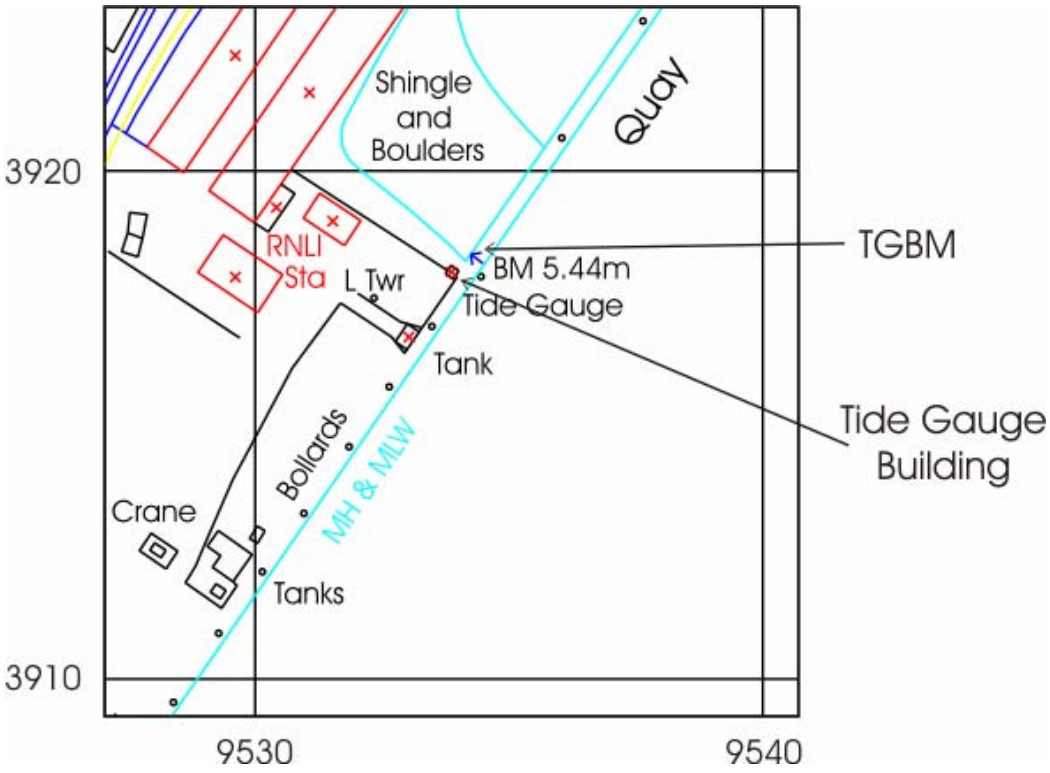
Latitude: 52° 00' 47.6" N Longitude: 04° 59' 01.5" W

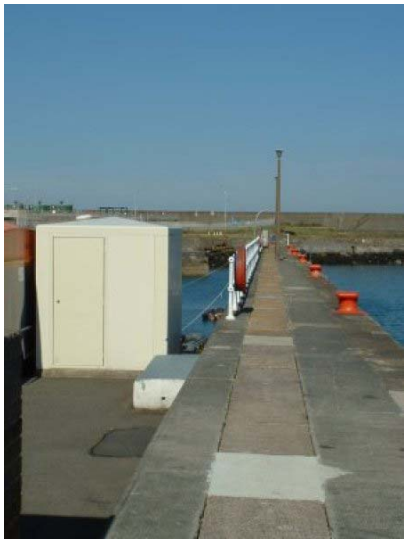
Grid Reference: SM 9534 3918

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 measuring points are located approx 10m from the end of the quay.





Heysham Tide Gauge

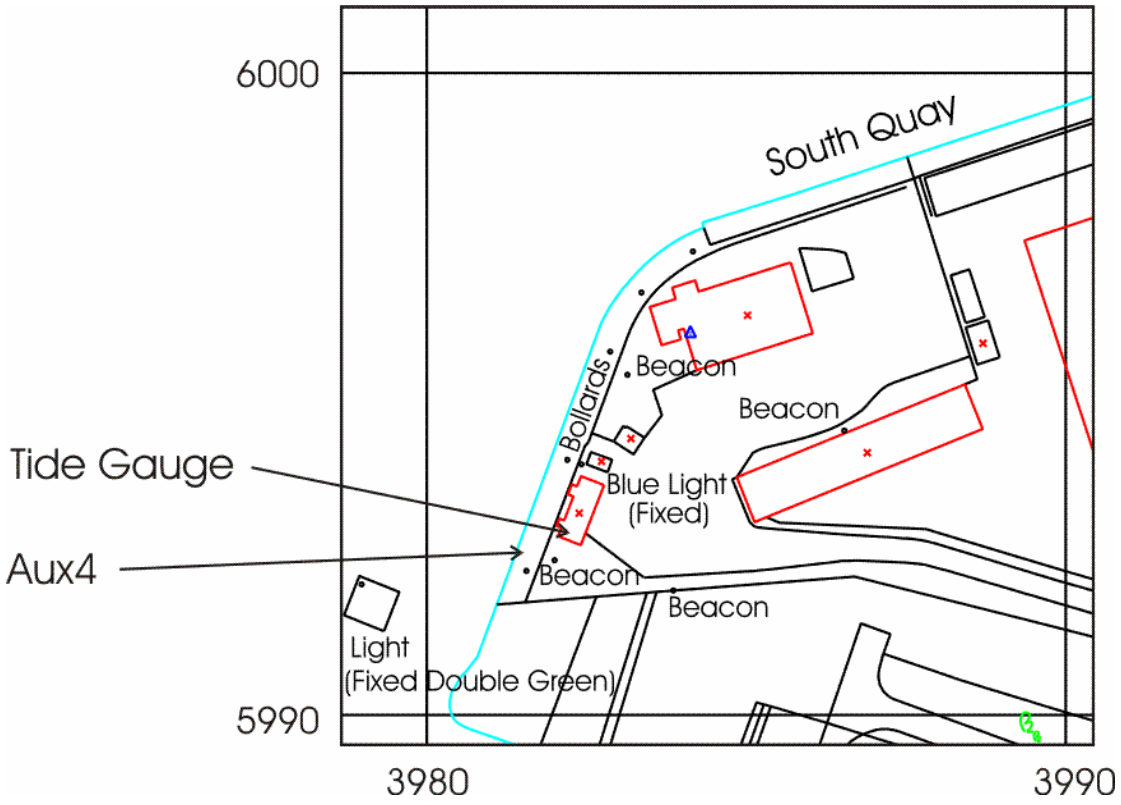
Latitude: 54° 01' 54.6" N Longitude: 02° 55' 12.9" W

Grid Reference: SD 3982 5993

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

Site of Gauge:

The tide gauge is located in the tide gauge building, at the south entrance to Heysham Port.



Hinkley Point Tide Gauge

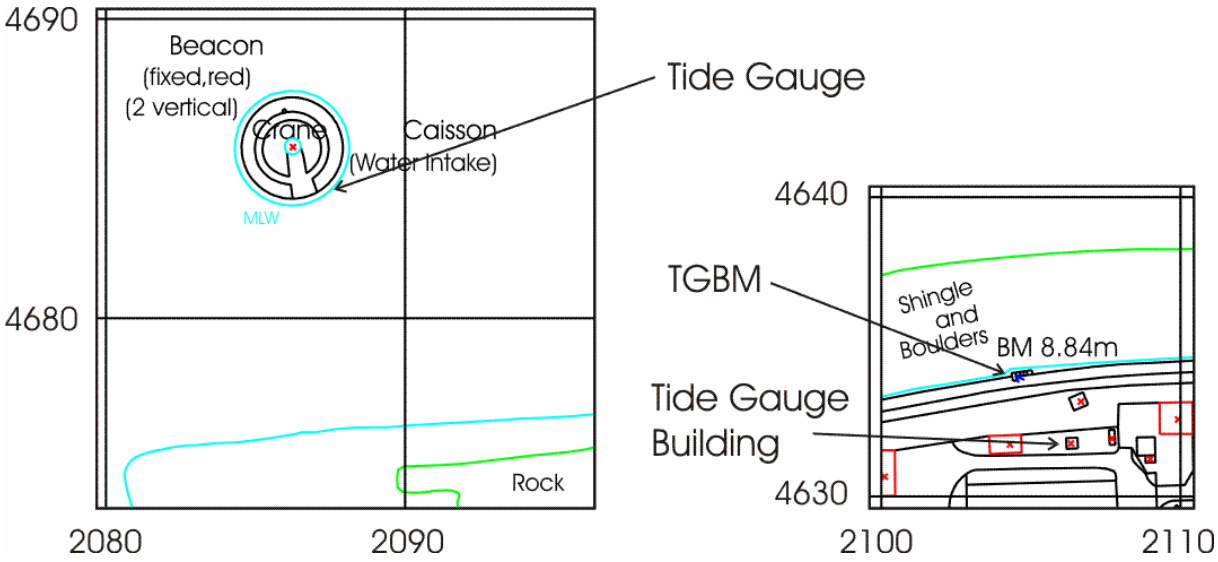
Latitude: 51° 12' 54.9" N Longitude: 03° 08' 04.1" W

Grid Reference: ST 2086 4684

Instrument type: Dataring system with dual underwater pressure transducers.

Site of Gauge:

The transducers are located in underwater vented chambers, suspended from a steel pole connected to the structure of the power station cooling water intake tower, some 400m offshore.



Holyhead Tide Gauge

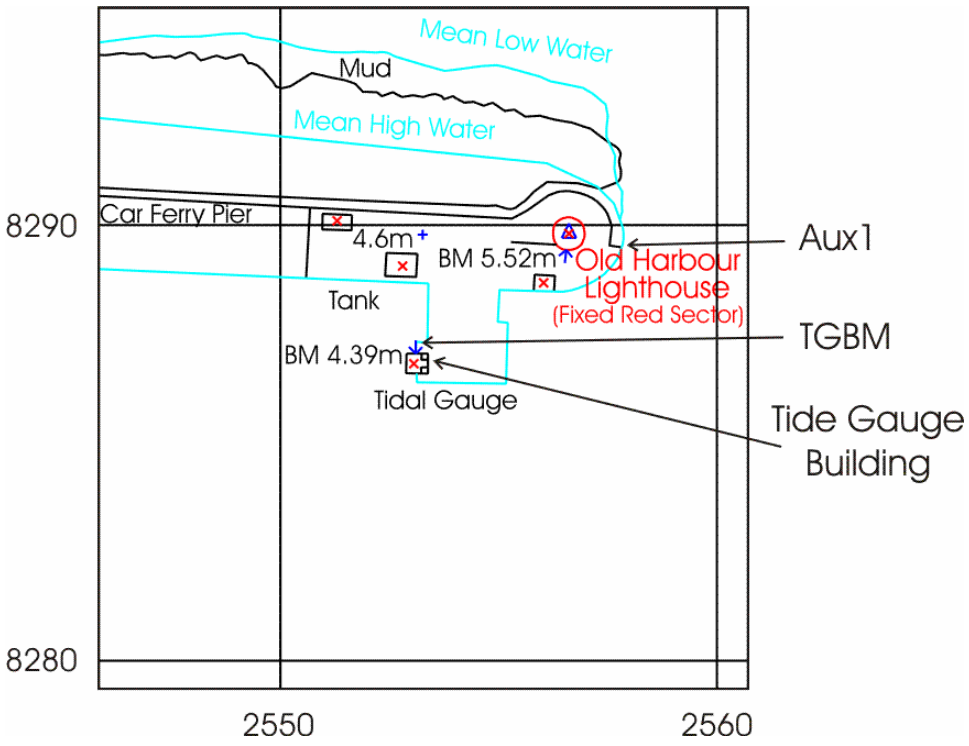
Latitude: 53° 18' 50.2" N Longitude: 04° 37' 14.1" W

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 and measuring points are situated on the south side of car ferry pier, close to the old harbour lighthouse.



Ilfracombe Tide Gauge

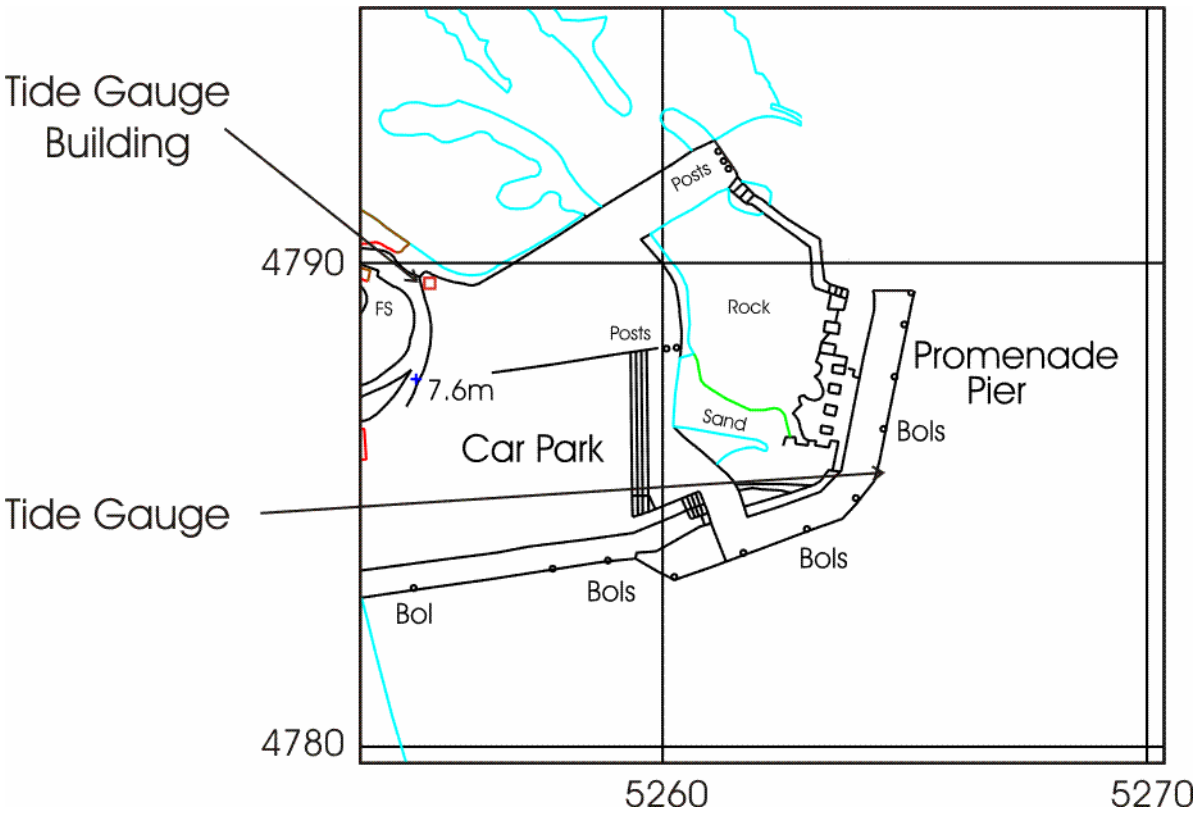
Latitude: 51° 12' 40.1" N Longitude: 04° 06' 44.6" W

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 and measuring points are located on the seaward side of Ilfracombe pier at the harbour entrance.



Immingham Tide Gauge

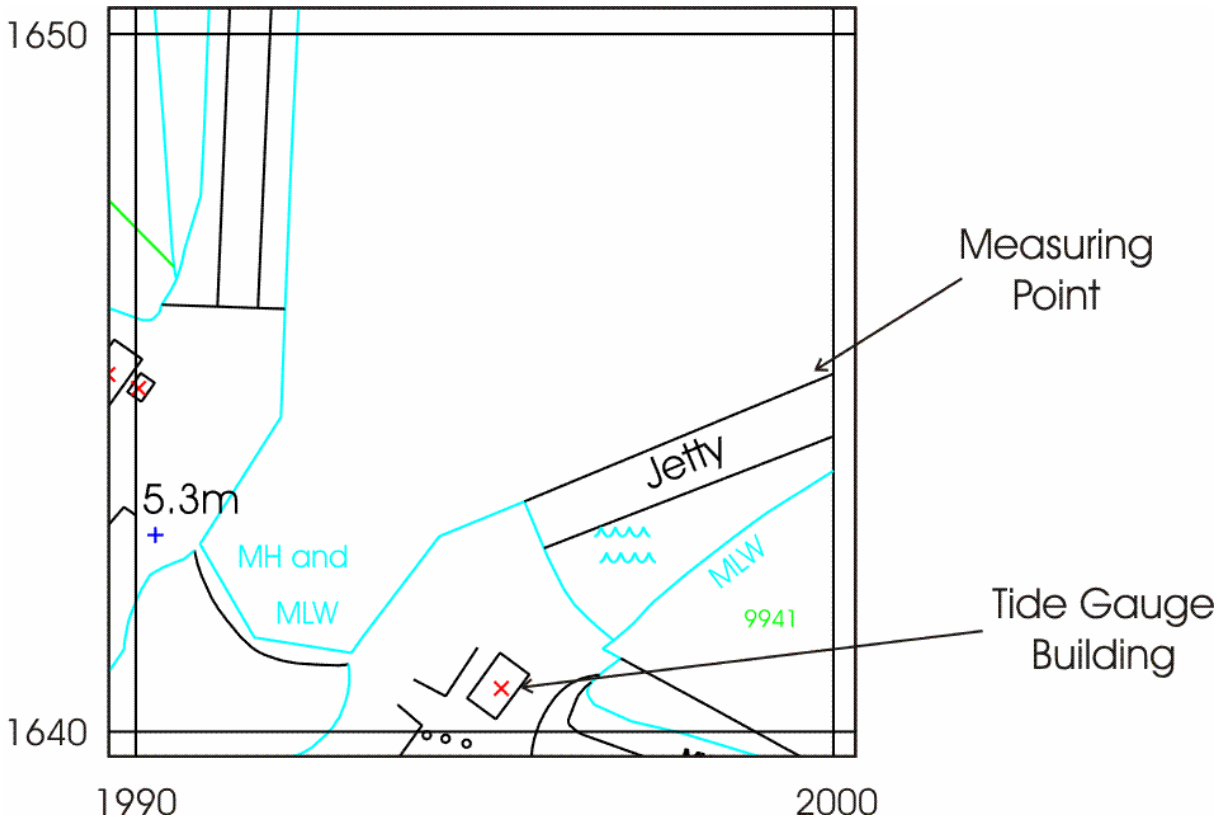
Latitude: 53° 37' 49.5" N Longitude: 00° 11' 14.2" W

Grid Reference: TA 1995 1640

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

Site of Gauge:

The gauge is situated at the east entrance to Immingham Docks.



Port Erin (Isle of Man) Tide Gauge

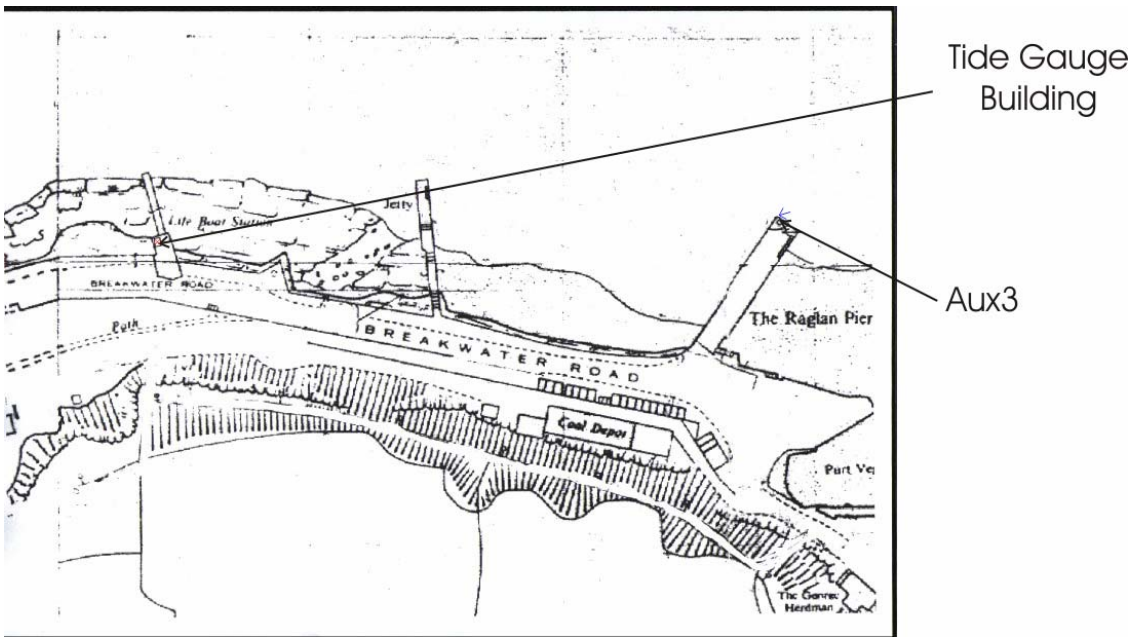
Latitude: 54° 05' 06.8" N Longitude: 04° 46' 05.0" W

Grid Reference: SC 1904 6902

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

Site of Gauge:

The tide gauge equipment is situated in Port Erin lifeboat station and the measuring points are mounted close to the end of the lifeboat slipway. The equipment is housed in a heated Glasdon cabinet within the lifeboat station with the full tide and mid tide measuring point being mounted on steelwork attached to a concrete leg of the slipway.



Port Ellen (Isle of Islay) Tide Gauge

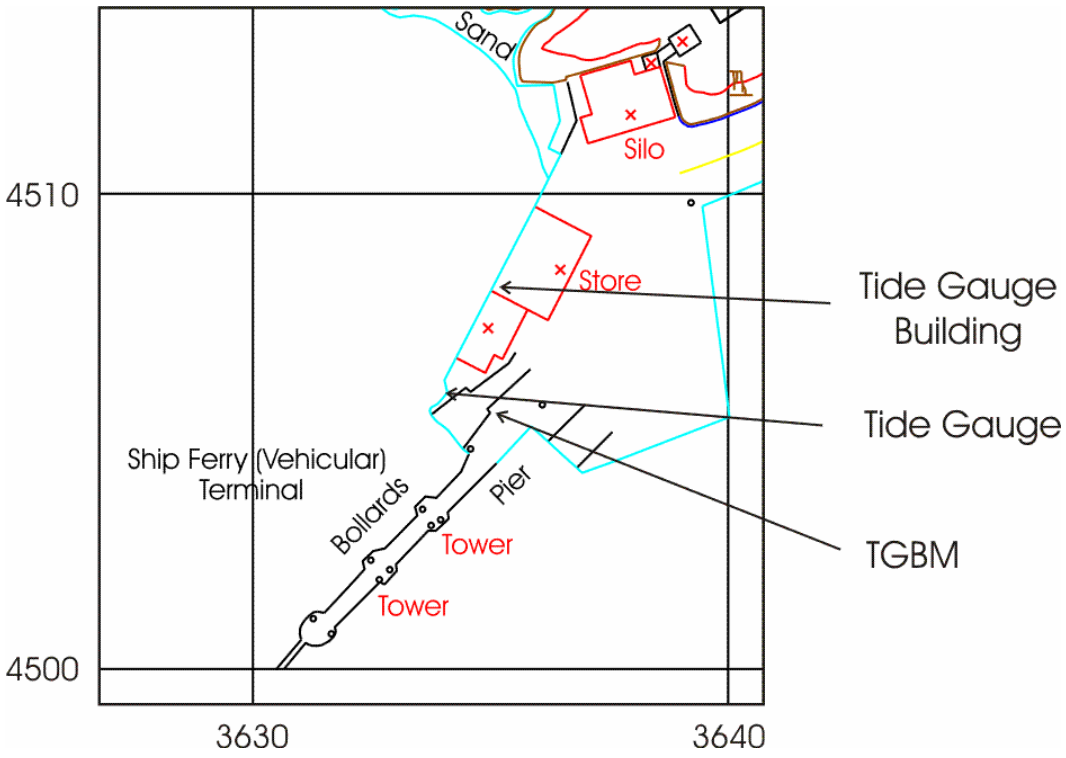
Latitude: 55° 37' 39.3" N Longitude: 06° 11' 23.7" W

Grid Reference: NR 3636 4508

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

Site of Gauge:

The tide gauge is located within the Caledonian MacBrayne storeroom next to Port Ellen ferry terminal. The measuring points are located on the opposite side of the pier to the ferry docking area.



St. Helier (Jersey) Tide Gauge

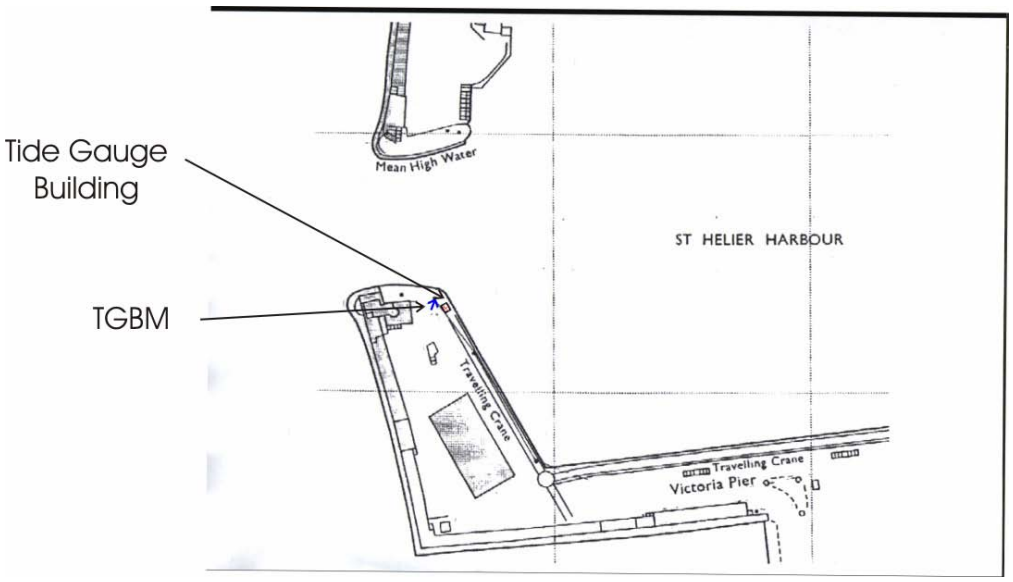
Latitude: 49° 11' 00" N Longitude: 02° 07' 00 " W

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



Kinlochbervie Tide Gauge

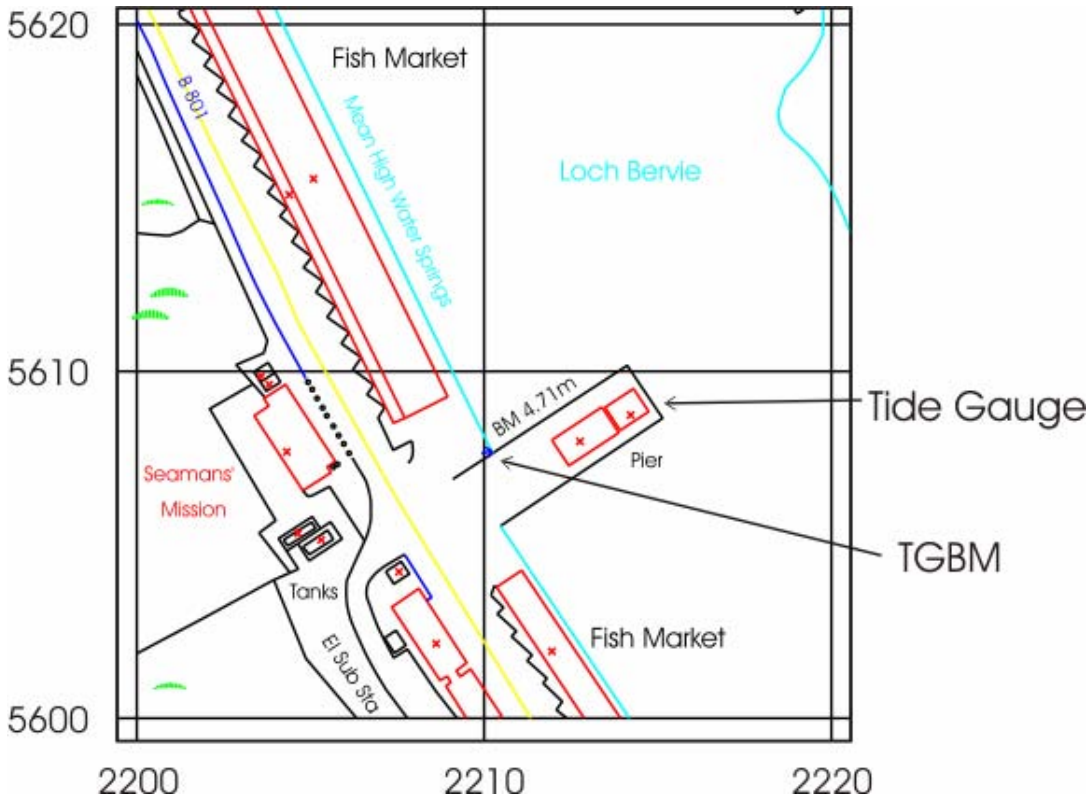
Latitude: 58° 27' 24.1" N Longitude: 05° 03' 01.3" W

Grid Reference: NC 2213 5609

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

Site of Gauge:

Inside the Ice Plant, on the pier.



Leith Tide Gauge

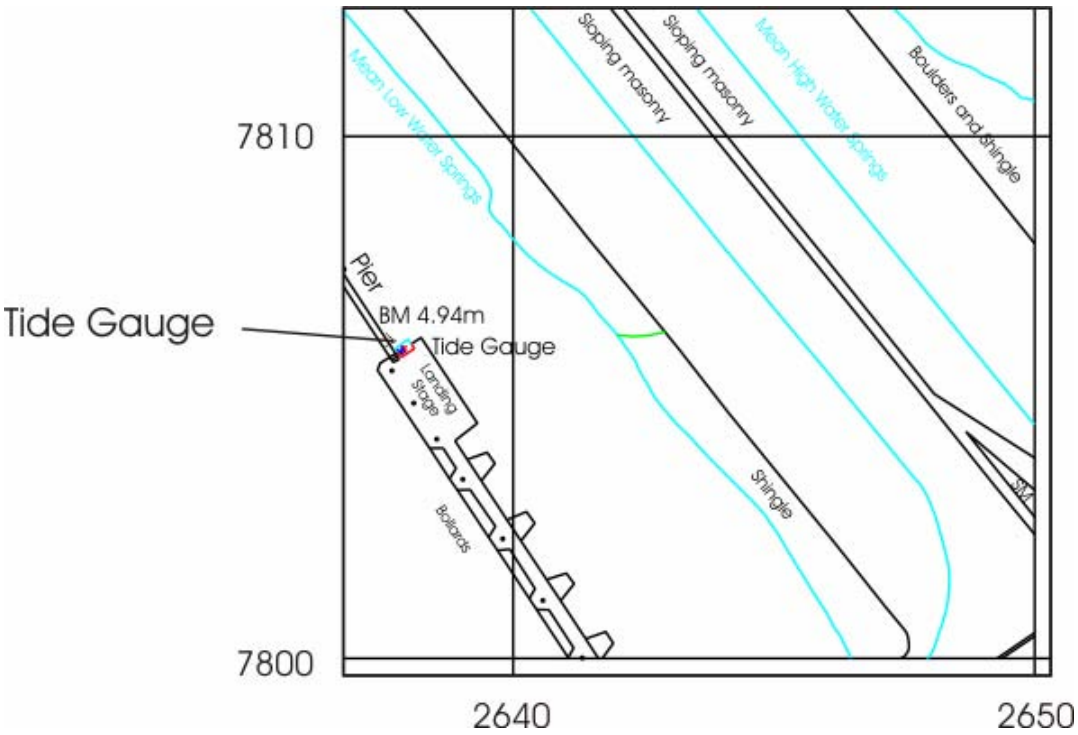
Latitude: 55° 59' 23.4"N Longitude: 03° 10' 54.1"E

Grid Reference: NT 2638 7806

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

Site of Gauge:

The tide gauge building and measuring points are located on the landing stage at Leith docks.



Lerwick Tide Gauge

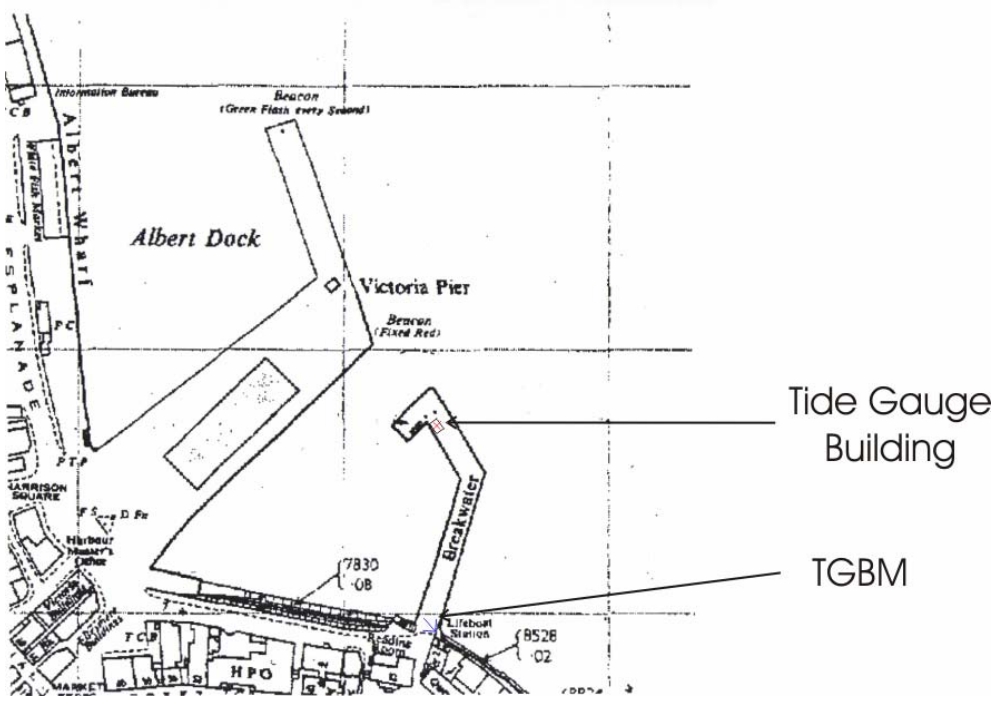
Latitude: 60° 09' 14.5" N Longitude: 01° 08' 25.1" W

Grid Reference: HU 4783 4137

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

Site of Gauge:

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



Liverpool Tide Gauge

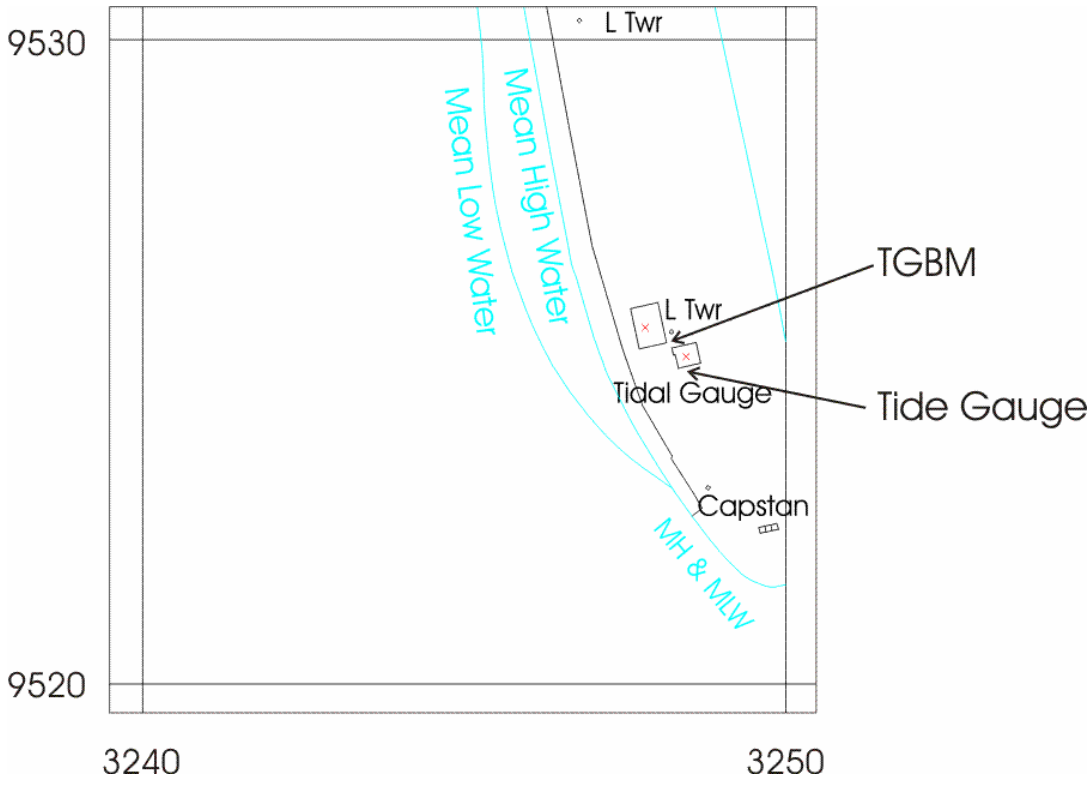
Latitude: 53° 26' 58.9" N Longitude: 03° 01' 05.3" W

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.

Site of Gauge:

The Tide Gauge is located within the Old Lock Keepers Office at the entrance to Gladstone Dock, the measuring points being located on the seaward side of Gladstone Dock. The wind speed and direction instruments are mounted at the top of the light tower located next to the Tide Gauge building.



Llandudno Tide Gauge

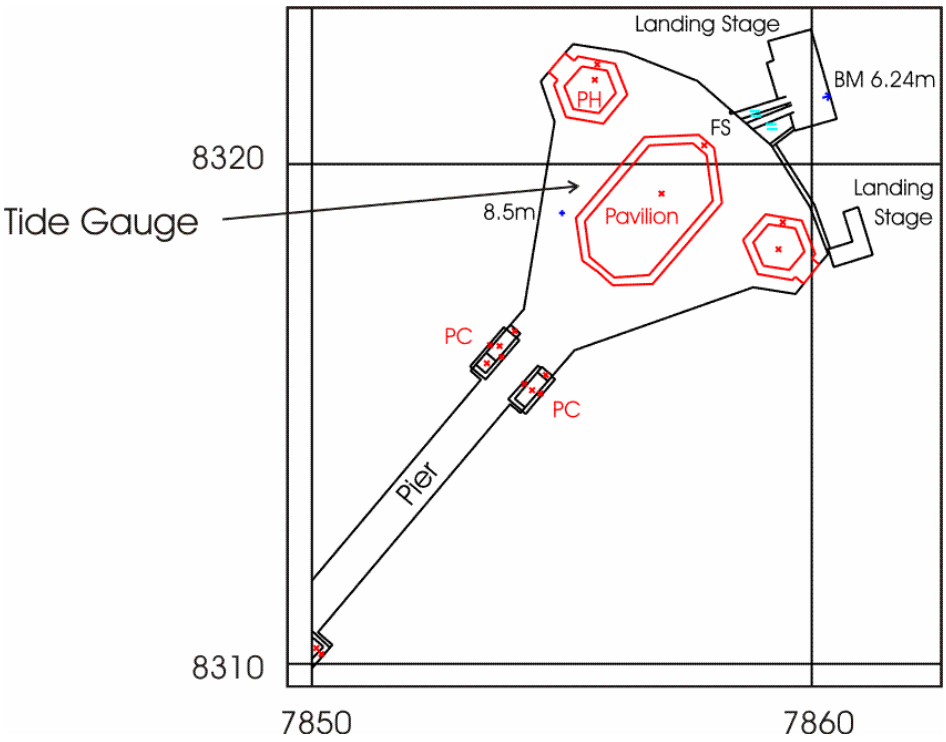
Latitude: 53° 19' 54.0" N Longitude: 03° 49' 30.8" W

Grid Reference: SH 7855 8319

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

Site of Gauge:

The tide gauge equipment and measuring points are located on the sub-platform under the pavilion at the seaward end of Llandudno pier.



Lowestoft Tide Gauge

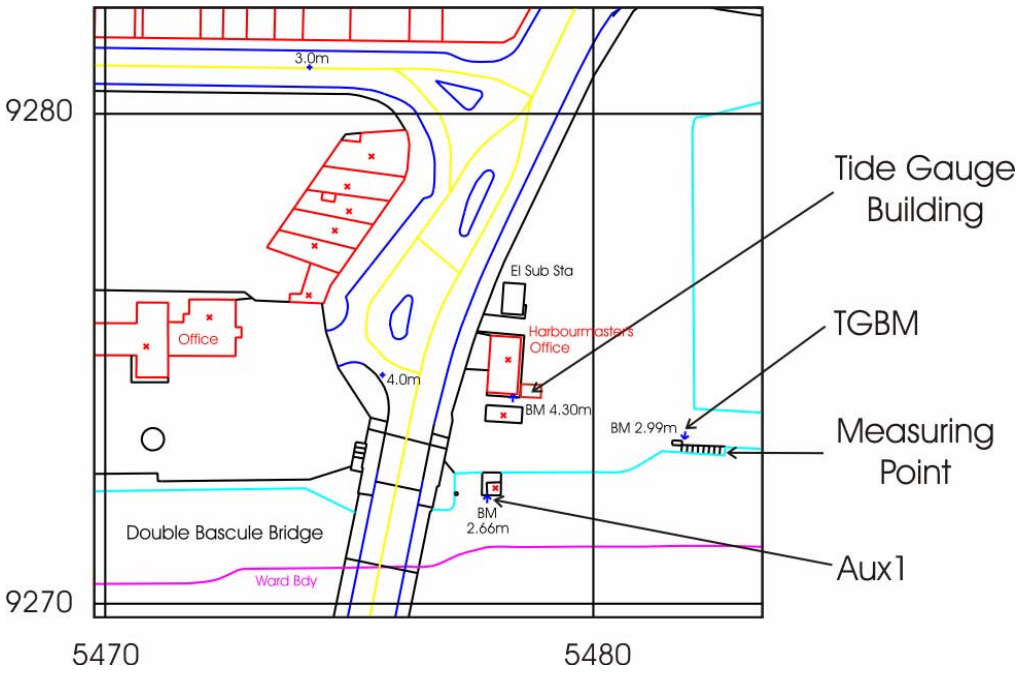
Latitude: 52° 28' 23.1" N Longitude: 01° 45' 00.9" E

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 disused tide gauge building (seen in the centre of the photograph) is mounted above the two stilling wells in front of the Harbour Master's office. The present tide gauge building is situated to the right of the Harbour Master's Office with the measuring points located on the quay wall approx 20m to the right of the old tide gauge building.



Milford Haven Tide Gauge

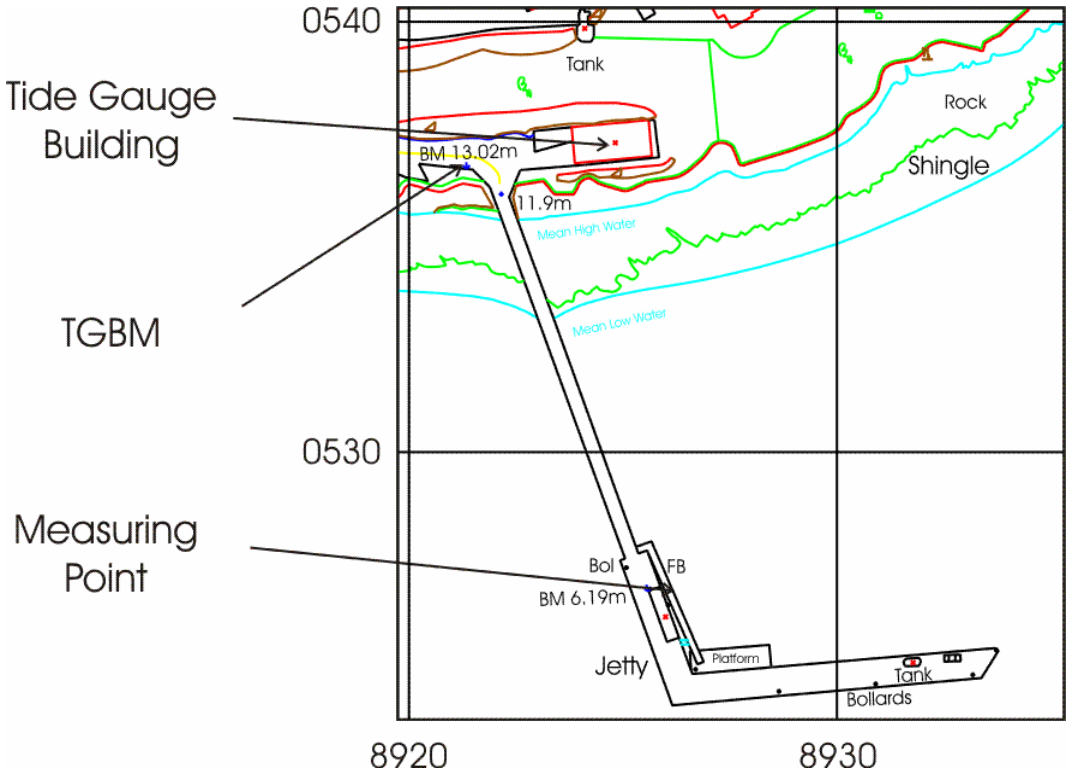
Latitude: 51° 42' 26.6" N Longitude: 05° 03' 06.7" W

Grid Reference: SM 8924 0537

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

Site of Gauge:

Milford Haven Port Authority jetty.



Millport Tide Gauge

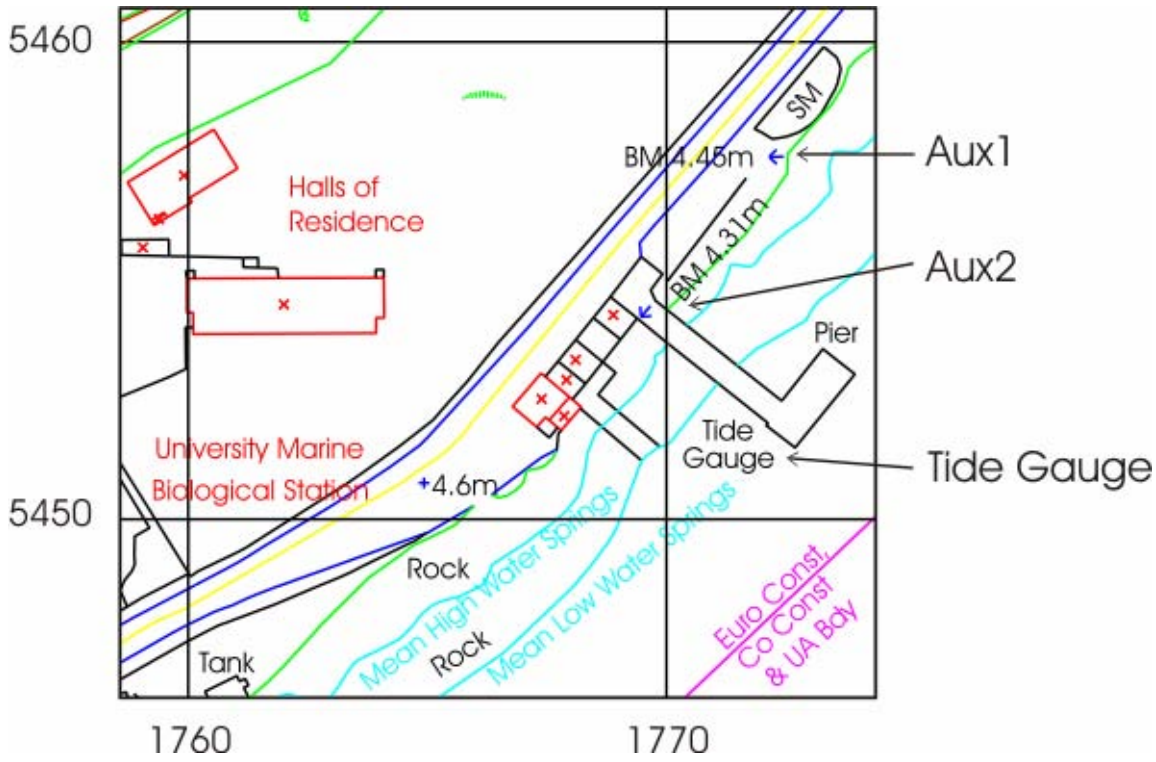
Latitude: 55° 44' 59.3" N Longitude: 04° 54' 22.8" W

Grid Reference: NS 1769 5454

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

Site of Gauge:

The pier, at the University Marine Biological Station.



Moray Firth Tide Gauge

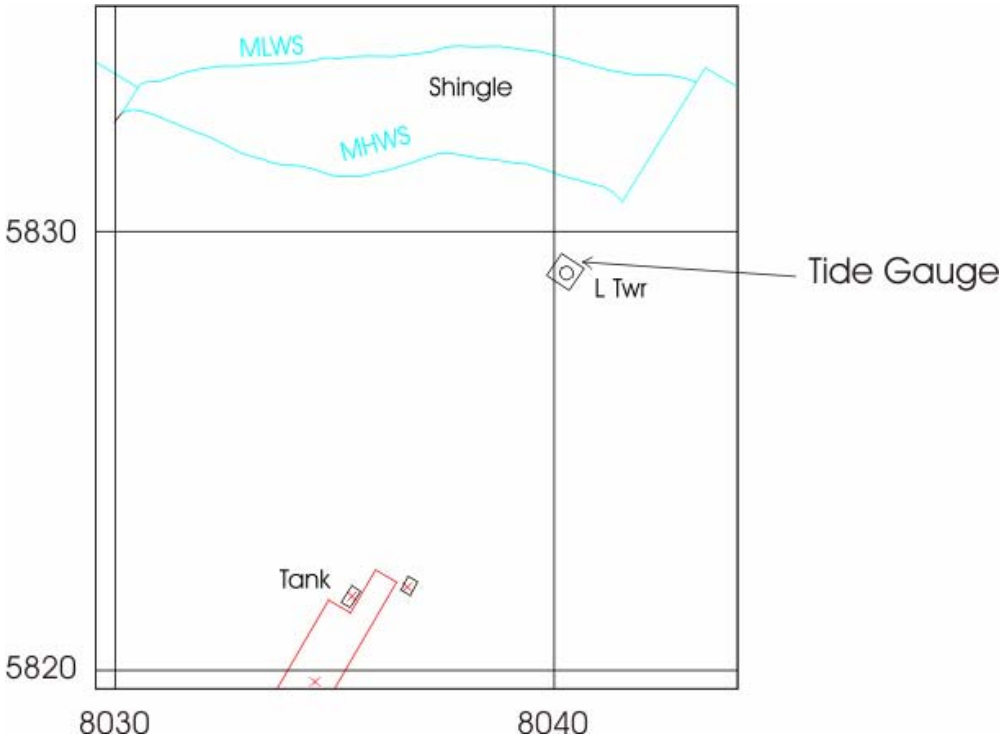
Latitude: 57° 35' 55.3" N Longitude: 04° 00' 10.1" W

Grid Reference: NH 8040 5829

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

Site of Gauge:

On the south side of the entrance to Whiteness Bay, McDermott Base, Ardesier.



Mumbles (West Glamorgan) Tide Gauge

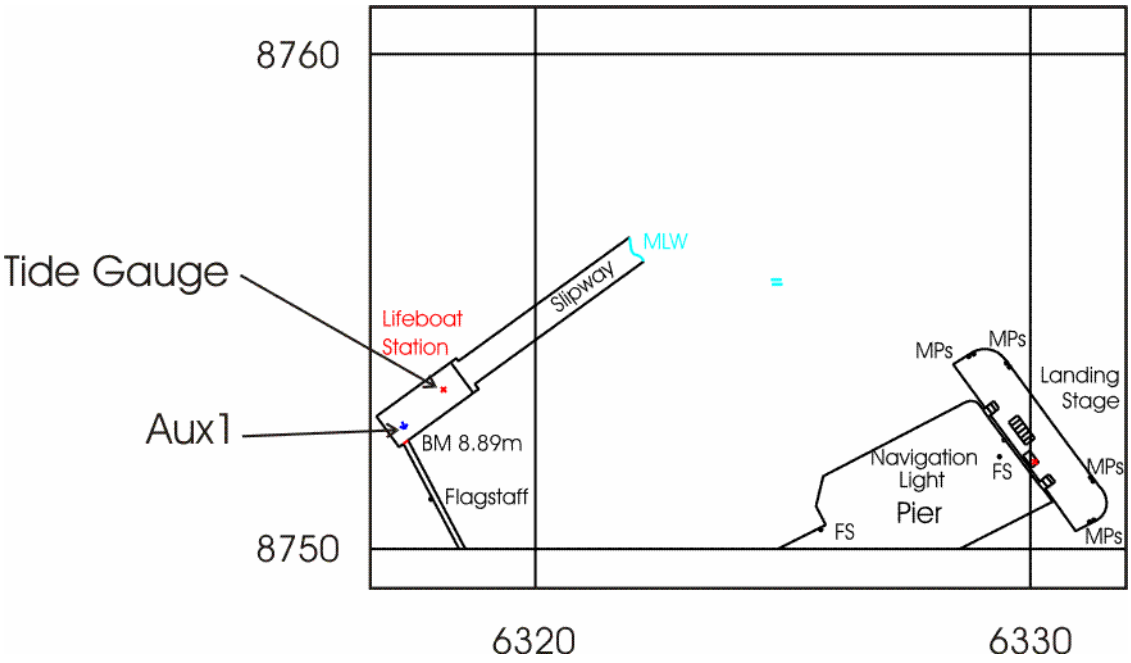
Latitude: 51° 34' 12.0" N Longitude: 03° 58' 31.6" W

Grid Reference: SS 6319 8753

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

Site of Gauge:

The tide gauge is located at Mumbles lifeboat station and the measuring points mounted close to the end of the lifeboat slipway.



Newlyn Tide Gauge

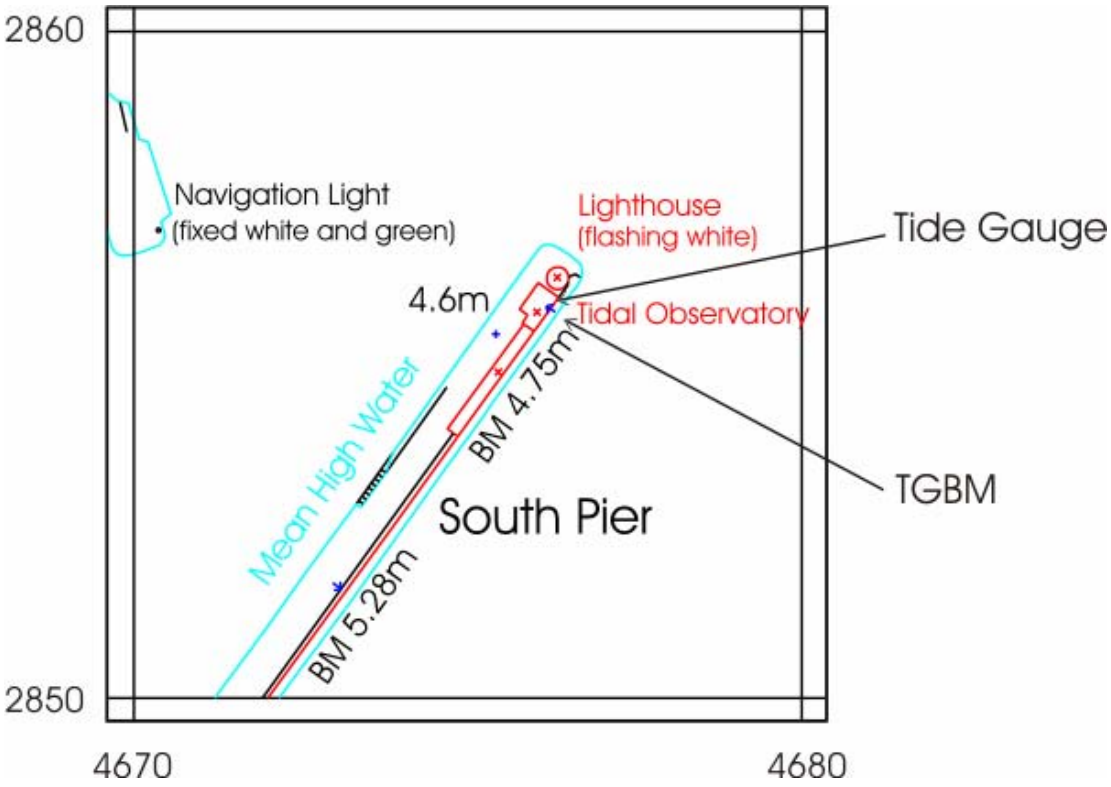
Latitude: 50° 06' 10.8" N Longitude: 05° 32' 34.2" W

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, Newlyn, next to the lighthouse, and the measuring points are located on the seaward side of the pier behind the lighthouse.



Newhaven (Sussex) Tide Gauge

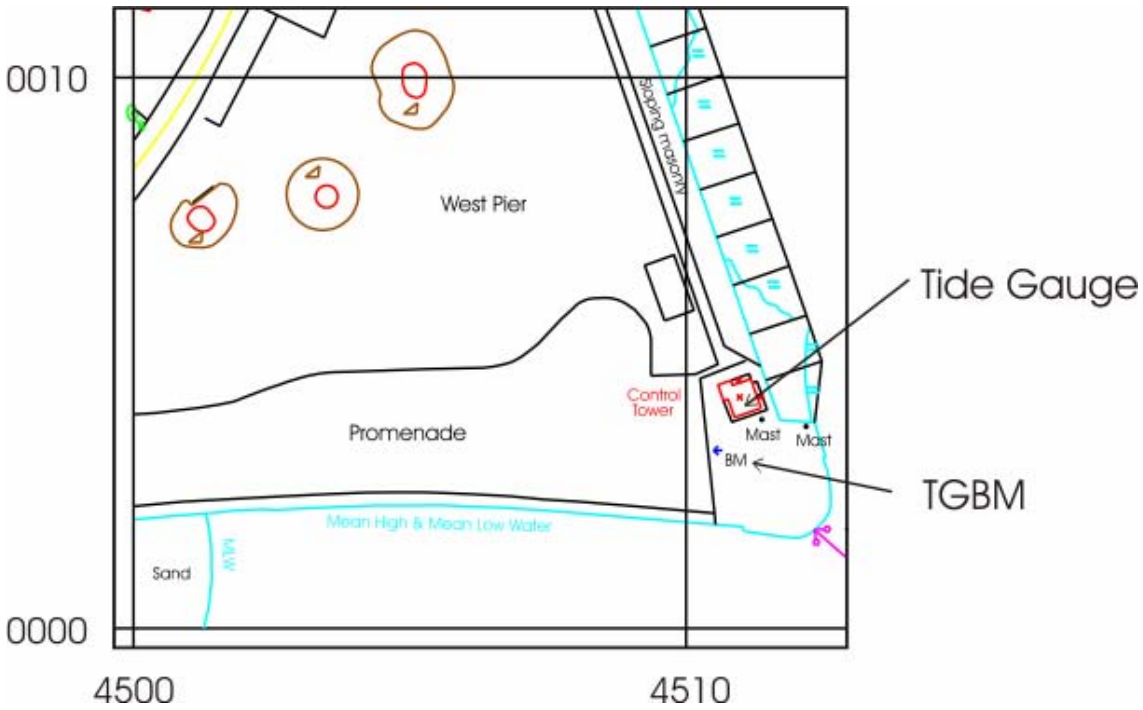
Latitude: 50° 46' 54.4" N Longitude: 00° 03' 25.3" E

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, Newhaven, and the measuring points are located on the pier wall, southwest of the Port Control building. The anemometer and wind vane are located on the signals mast.



Newport (Wales) Tide Gauge

Latitude: 51° 33' 00.0" N Longitude: 02° 59' 14.8" W

Grid Reference: ST 3163 8392

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

Site of Gauge:

Western entrance to Newport Docks.

North Shields (Tyne and Wear) Tide Gauge

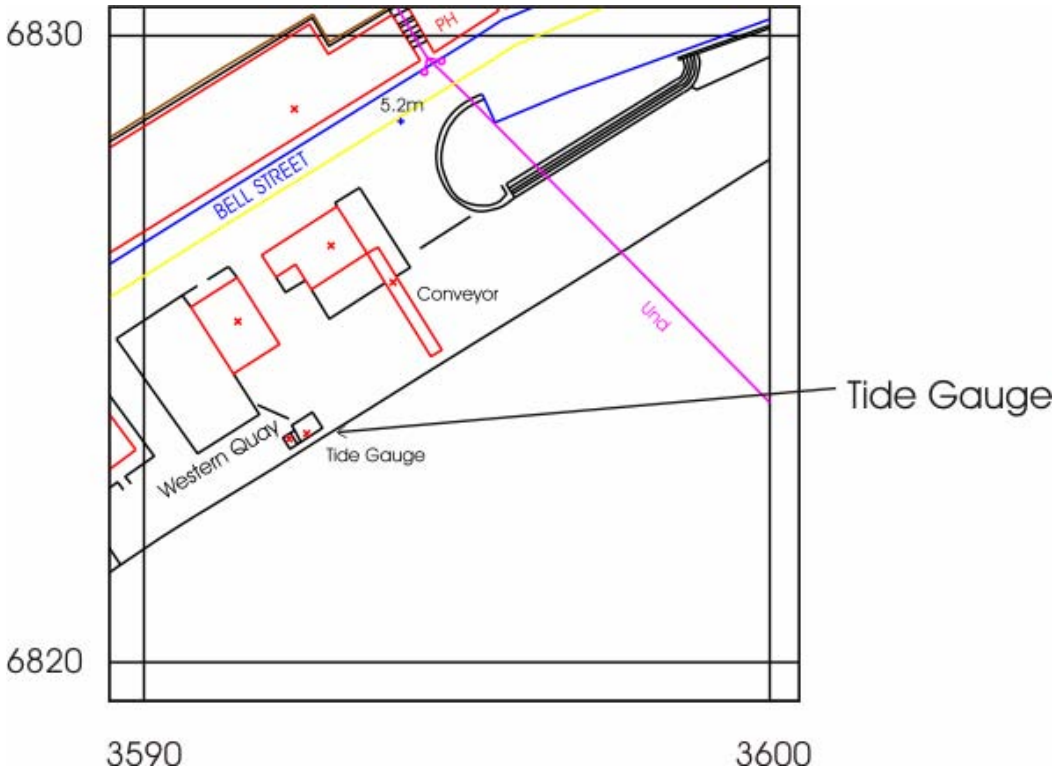
Latitude: 55° 00' 26.8" N Longitude: 01°26' 23.2" W

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 is located on the north side of River Tyne.



Portpatrick (Scotland) Tide Gauge

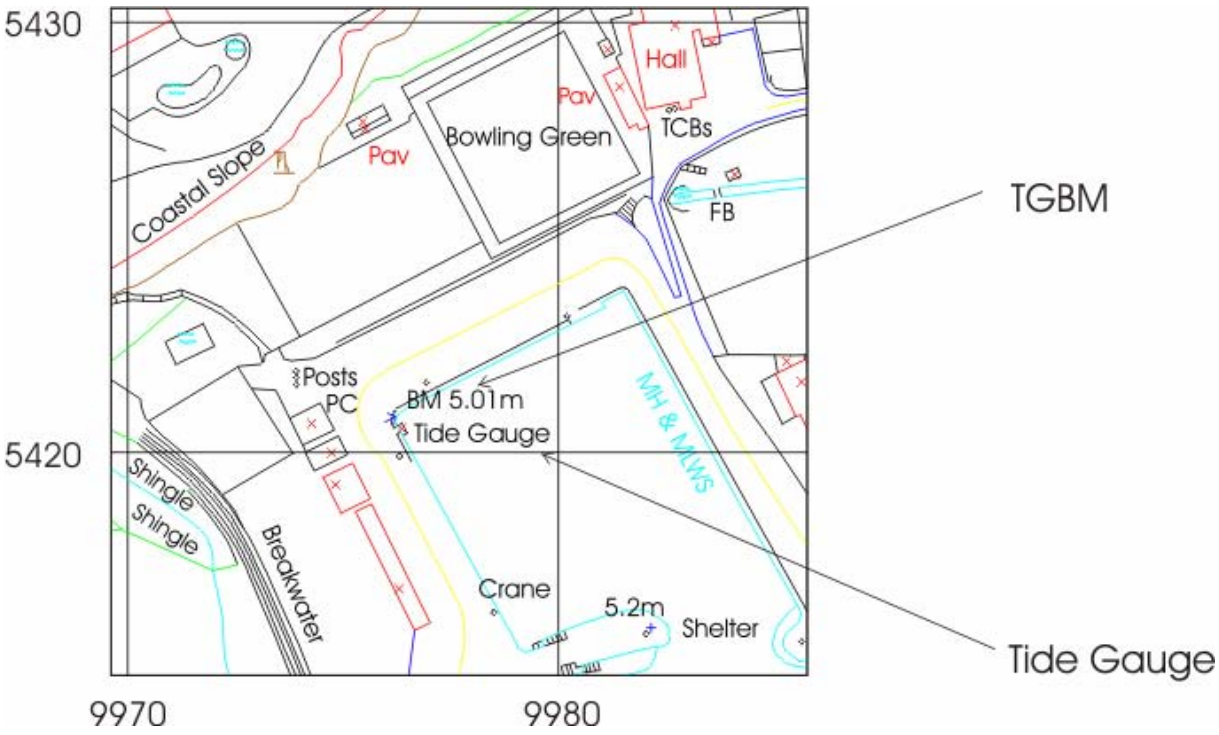
Latitude: 54° 50' 33.2" N Longitude: 05° 07' 12.1" W

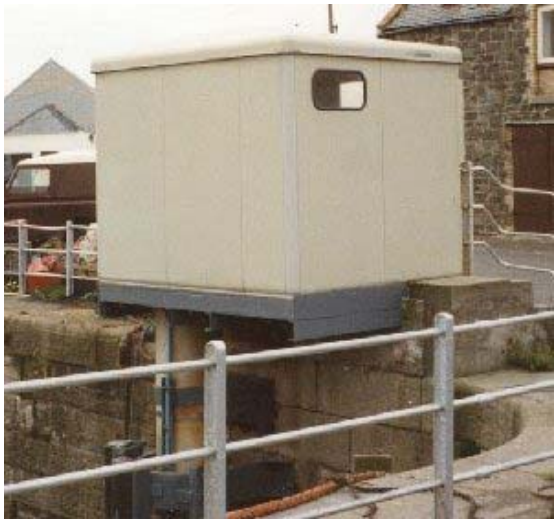
Grid Reference: NW 9976 5421

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

Site of Gauge:

The tide gauge building is mounted over the stilling well in the corner of Portpatrick harbour. The pneumatic measuring points are located directly beneath the building.





Portrush (Northern Ireland) Tide Gauge

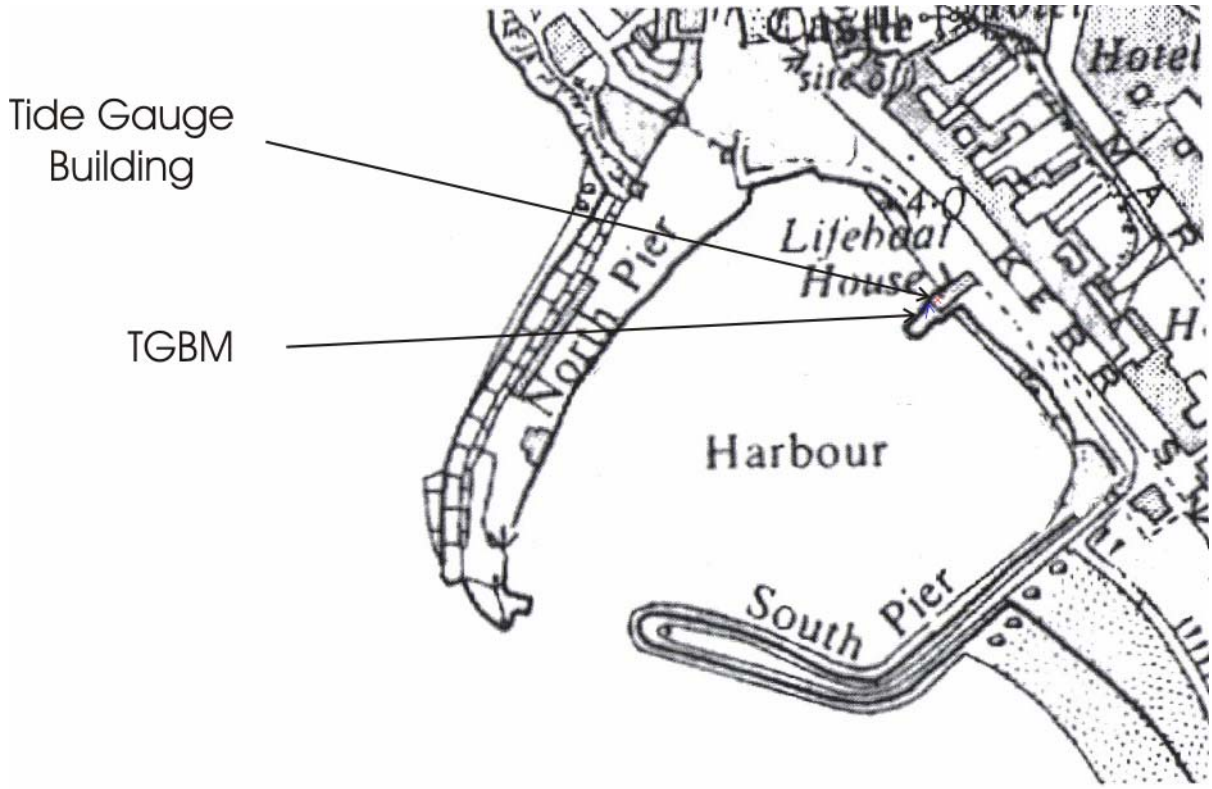
Latitude: 55° 12' 24.4" N Longitude: 06° 39' 24.6" W

Grid Reference: NW 0416 9952

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

Site of Gauge:

The gauge is located in the RNLI boathouse.



Portsmouth (Hampshire) Tide Gauge

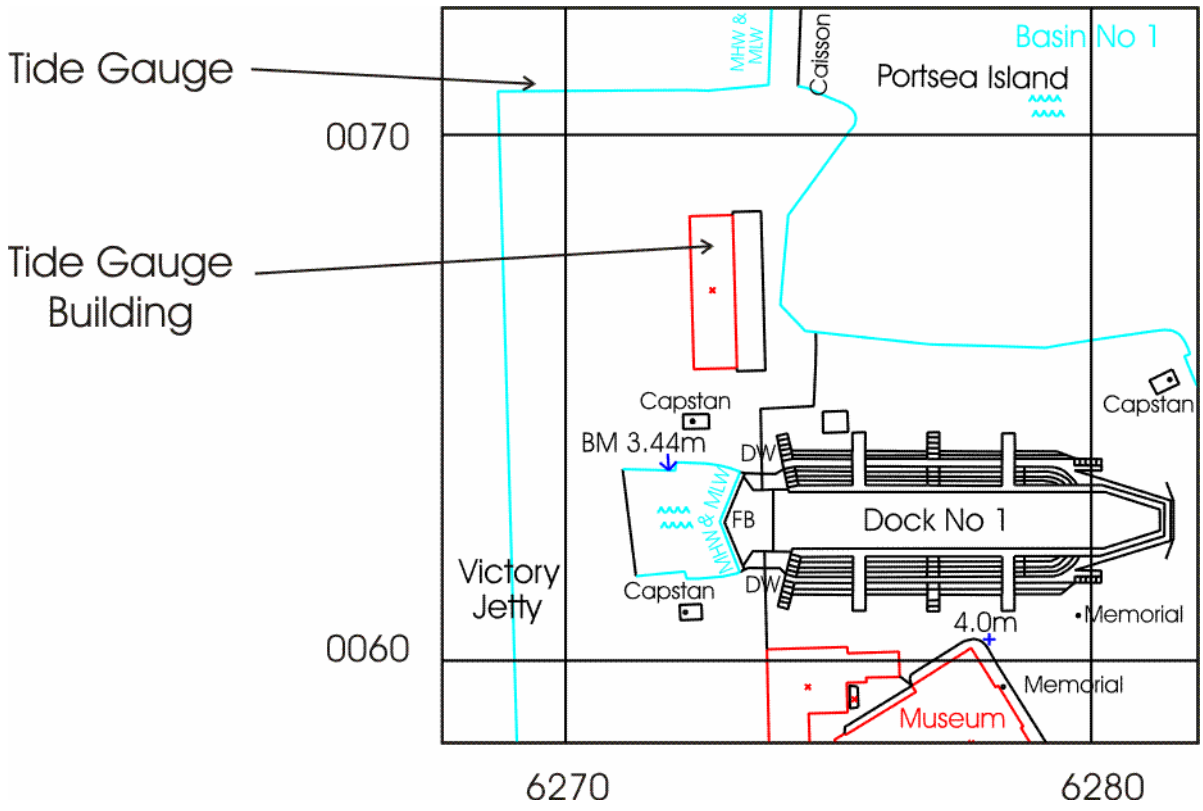
Latitude: 50° 48' 07.9" N Longitude: 01° 06' 40.2" W

Grid Reference: SU 6269 0067

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

Site of Gauge:

Victory Jetty.



Sheerness (Kent) Tide Gauge

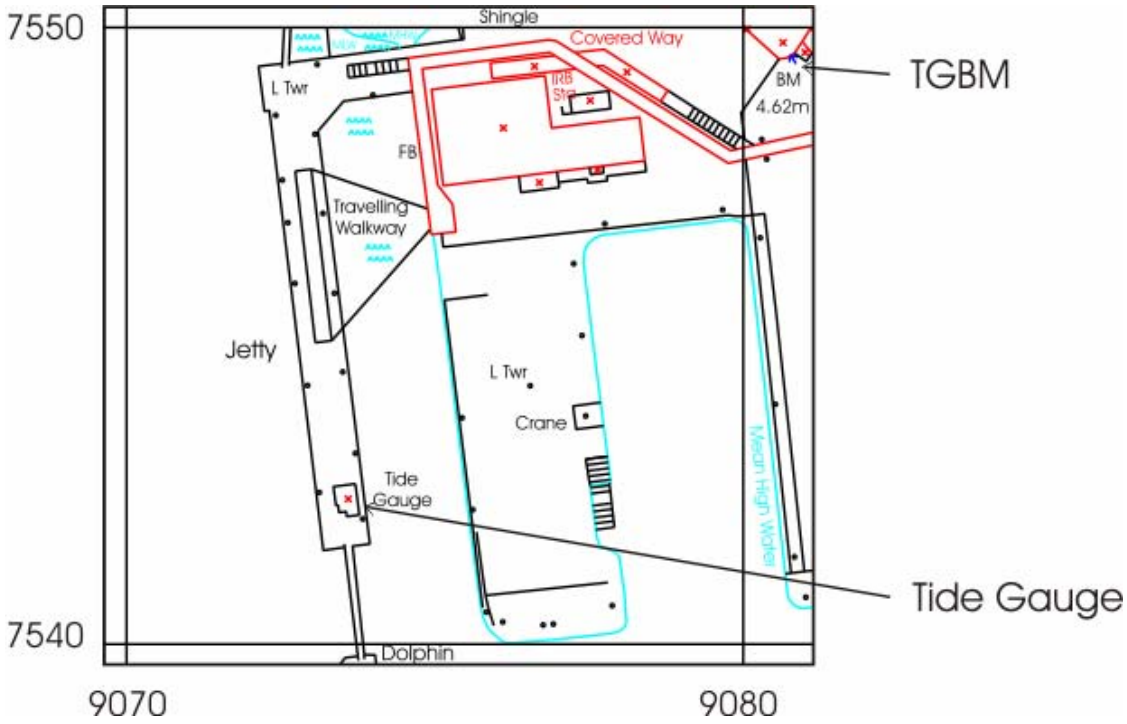
Latitude: 51° 26' 44.3" N Longitude: 00° 44' 36.4" E

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 is located on the jetty at Garrison Point, Sheerness Docks.



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

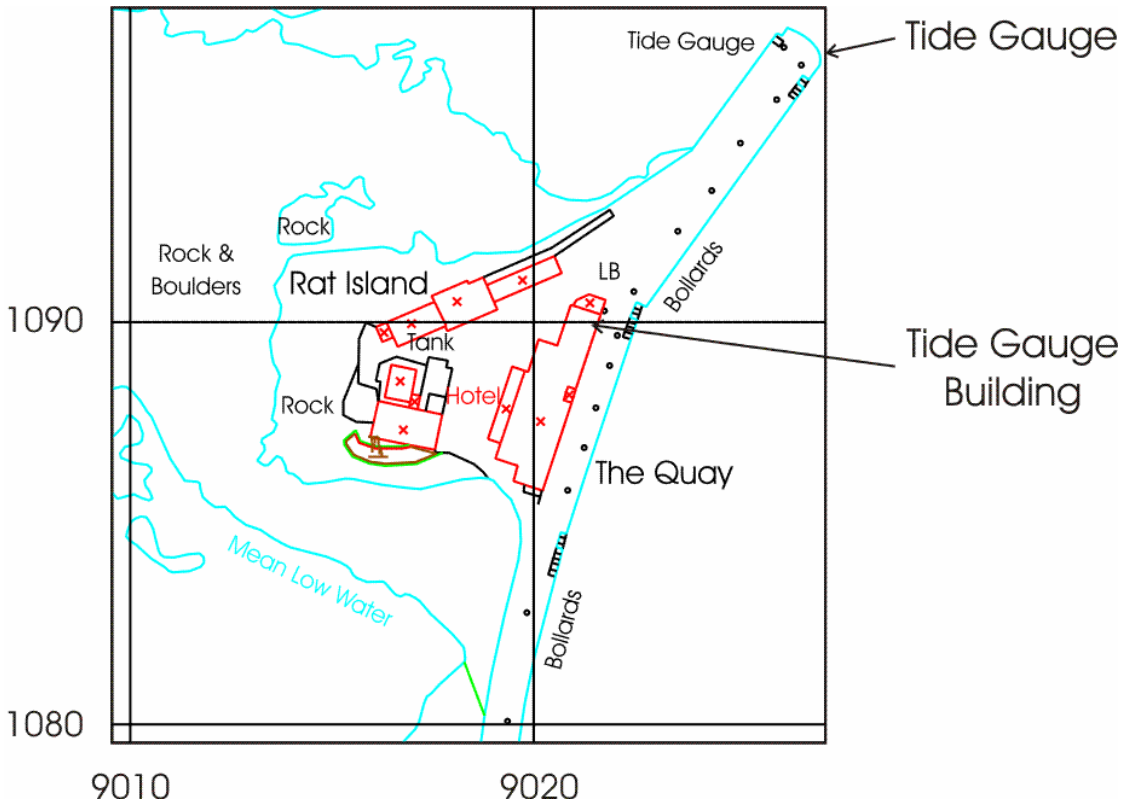
Latitude: 49° 55' 04.2" N Longitude: 06° 19' 02.1" W

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 is located on The Quay, Hugh Town, inside the ferry terminal store room. The measuring points are located on the nose of the quay.



Stornoway (Hebrides) Tide Gauge

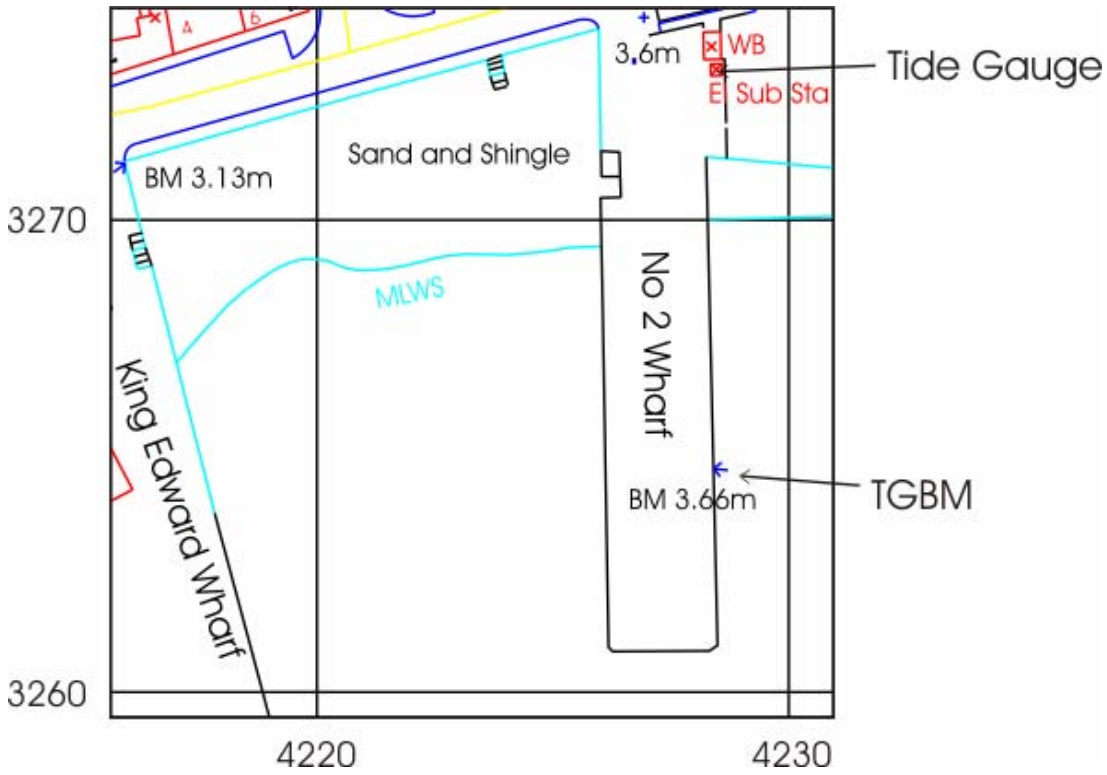
Latitude: 58° 12' 27.8" N Longitude: 06° 23' 20.3" W

Grid Reference: NB 4228 3273

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

Site of Gauge:

East side of No. 2 wharf.



Tobermory (Mull) Tide Gauge

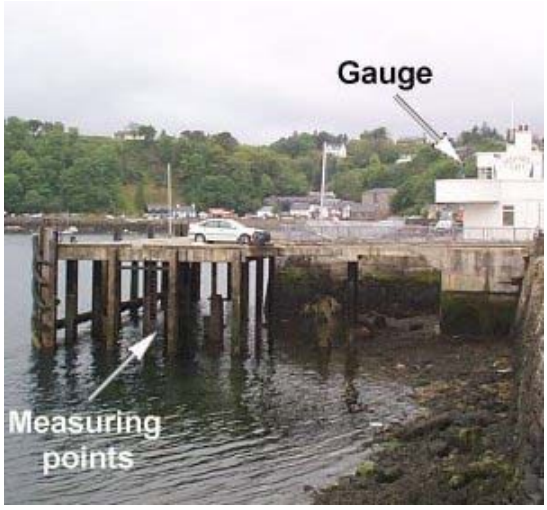
Latitude: 56° 37' 23.2" N Longitude: 06° 03' 51.2" W

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 equipment is located in the Caledonian MacBrayne ferry terminal on Mishnish Pier, Tobermory, and the pressure points are located on one of the pier legs as shown opposite.



Ullapool (Scotland) Tide Gauge

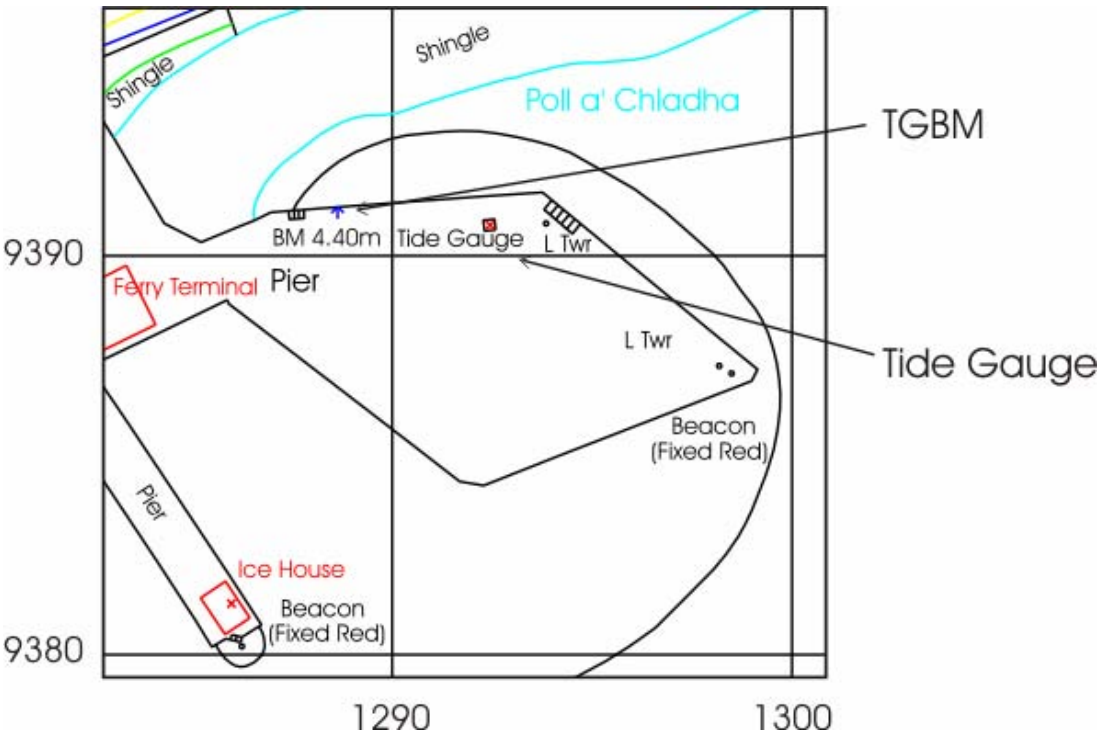
Latitude: 57° 53' 42.9" N Longitude: 05° 09' 29.0" W

Grid Reference: NH 1292 9391

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

Site of Gauge:

The Pier, Ullapool Harbour.



Weymouth (Dorset) Tide Gauge

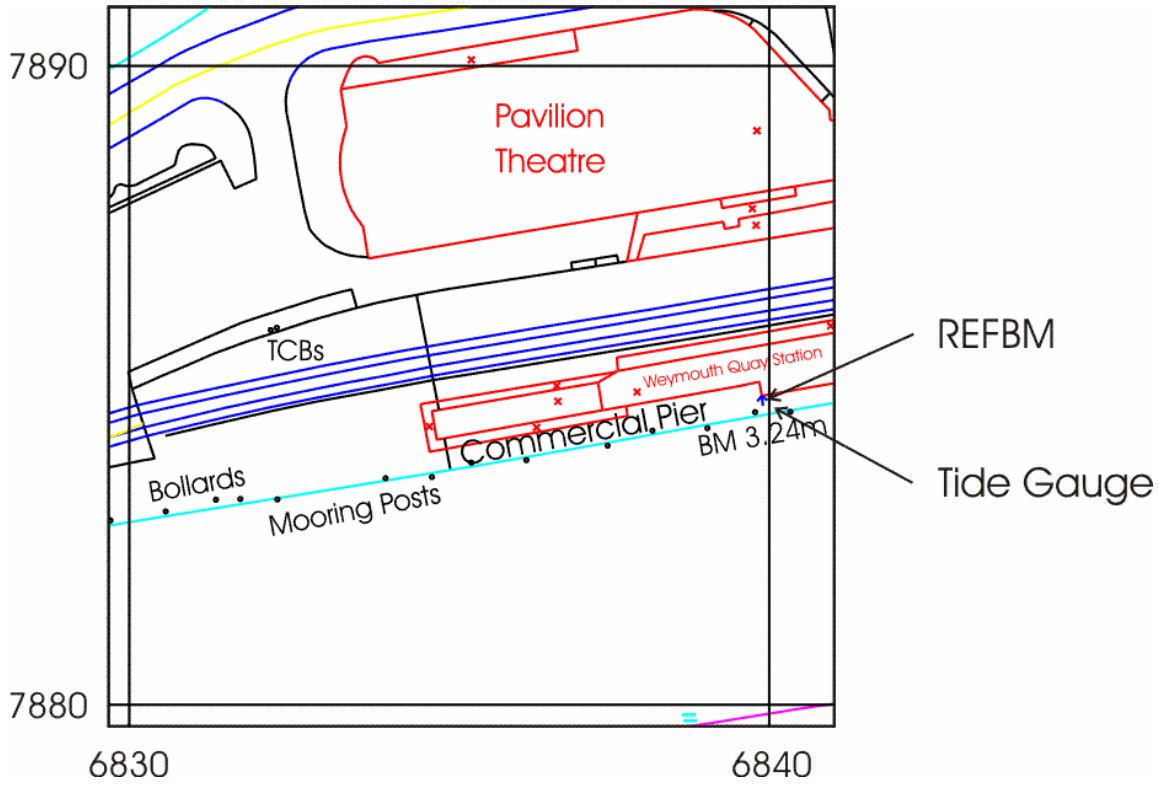
Latitude: 50° 36' 30.6" N Longitude: 02° 26' 52.6" W

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, and measuring points are located on the pier wall directly in front of the Tide Gauge building.



Whitby (Yorkshire) Tide Gauge

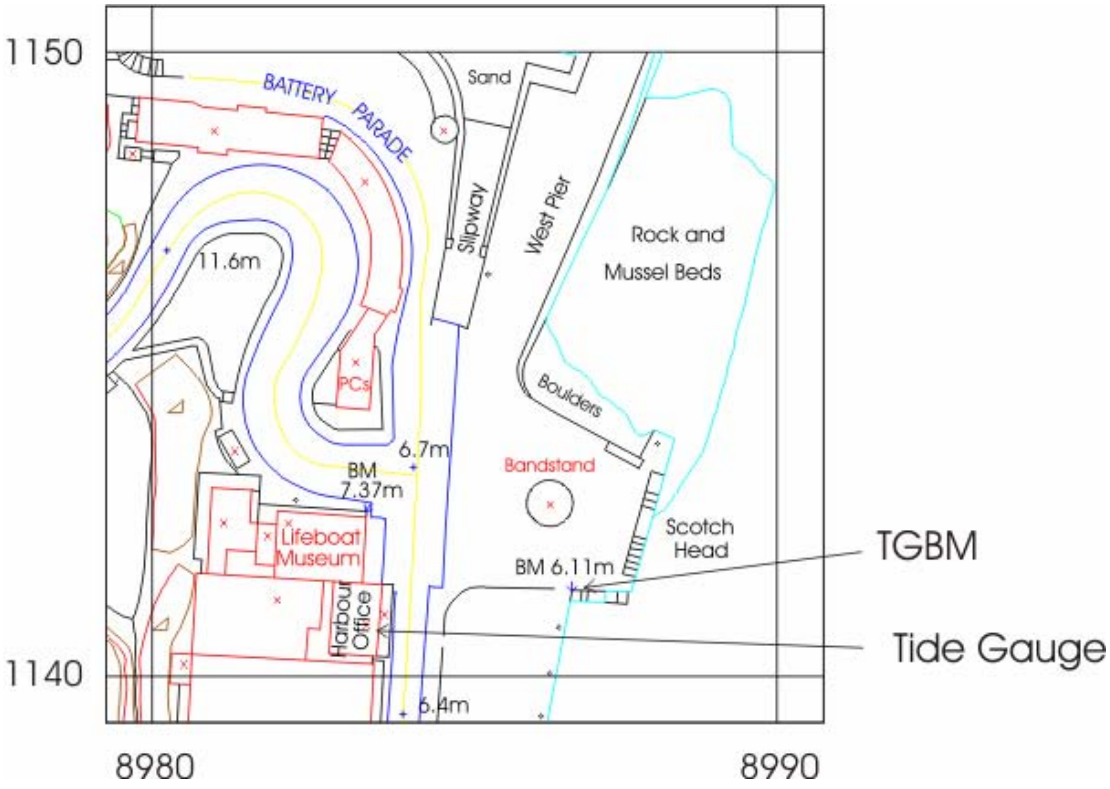
Latitude: 54° 29' 24.0" N Longitude: 00° 36' 52.6" W

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 measuring points are positioned underneath the Quay adjacent to the Harbour Office.



Wick (Scotland) Tide Gauge

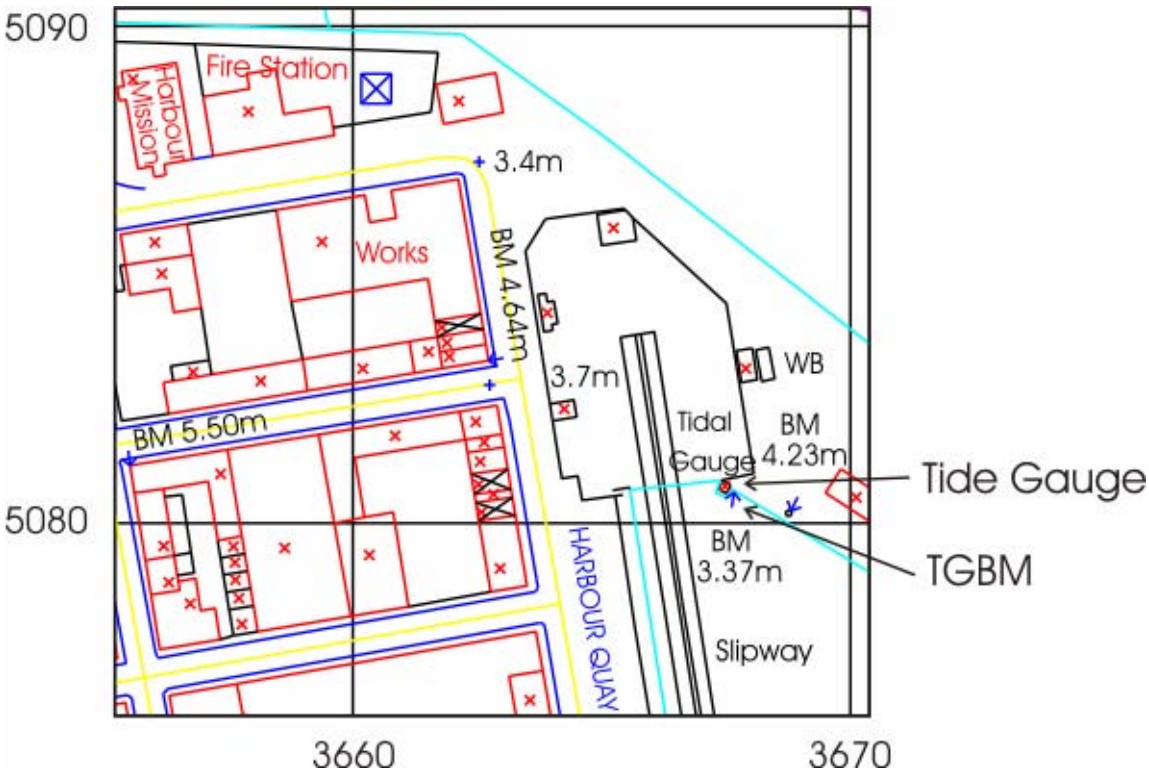
Latitude: 58° 26' 27.5" N Longitude: 03° 05' 11.3" W

Grid Reference: ND 3667 5081

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

Site of Gauge:

The tide gauge building is mounted over an unused stilling well at the end of Wick Harbour next to the ship repair slipway. The measuring points are located directly beneath the building.



Workington (Cumbria) Tide Gauge

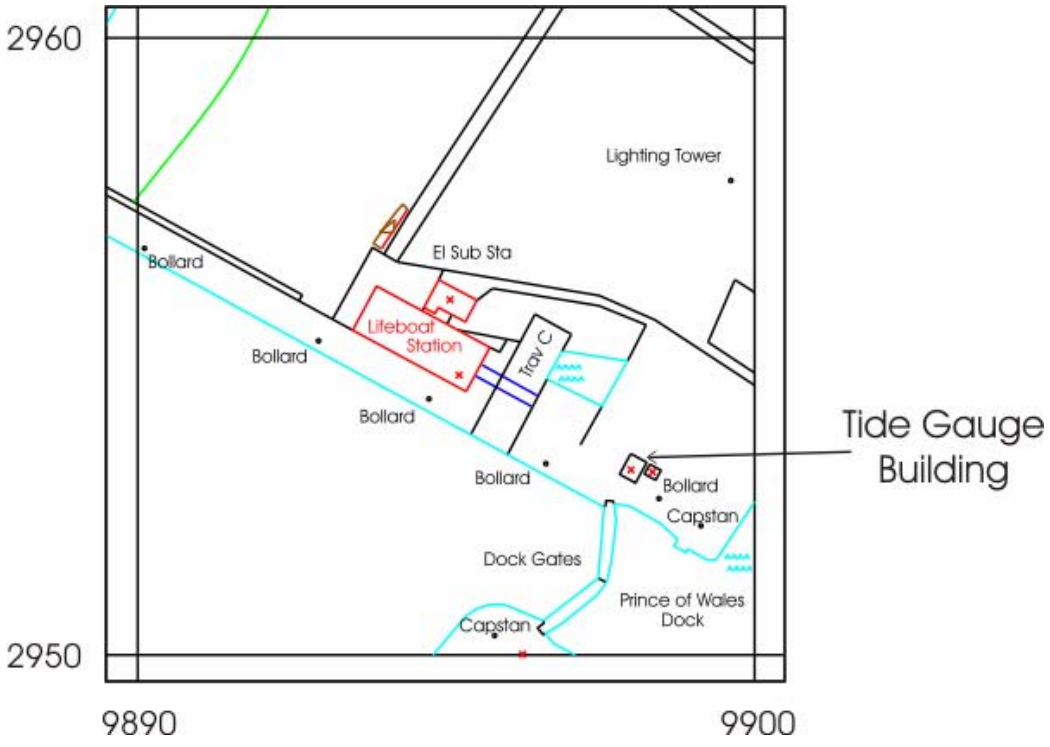
Latitude: 54° 39' 02.6" N Longitude: 03° 34' 01.8"W

Grid Reference: NX 9898 2953

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

Site of Gauge:

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



Report for 2003 on Data Quality and visits to sites

Aberdeen Tide Gauge

Latitude: 57° 08' 38.5" N
Longitude: 02° 04' 49.1" 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: The site was levelled in 2003. There were no changes in the bench mark values from the previous levelling.

T.G.I. visits to site: Day 136 General Maintenance, system purged.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	001-008	None

Statistics:

Surge Maxima	Value	Day	Time
January	0.754	15	23:00:00
February	0.37	24	06:00:00
March	0.493	11	13:00:00
April	0.646	1	11:00:00
May	0.507	8	13:45:00
June	0.555	19	01:30:00
July	0.275	11	07:15:00
August	0.364	21	18:30:00
September	0.345	22	03:30:00
October	0.435	8	18:30:00
November	0.542	18	23:45:00
December	0.525	13	12:15:00

Surge Minima	Value	Day	Time
January	-0.52	31	05:00:00
February	-0.318	15	19:45:00
March	-0.404	12	16:30:00
April	-0.226	6	04:30:00
May	-0.115	15	10:15:00
June	-0.022	26	05:45:00
July	-0.058	16	18:45:00
August	-0.141	25	07:00:00
September	-0.214	24	03:45:00
October	-0.288	15	04:15:00
November	-0.236	4	13:15:00
December	-0.488	31	22:00:00

Extreme Maxima	Value	Day	Time
January	4.605	20	14:30:00
February	4.587	19	14:45:00
March	4.592	20	14:30:00
April	4.706	1	13:15:00
May	4.571	18	14:45:00
June	4.421	19	04:30:00
July	4.322	16	02:30:00
August	4.487	30	02:30:00
September	4.714	29	02:45:00
October	4.729	28	02:30:00
November	4.808	26	02:00:00
December	4.619	25	14:30:00

Extreme Minima	Value	Day	Time
January	0.478	23	22:45:00
February	0.298	20	22:00:00
March	-0.006	19	20:00:00
April	-0.05	17	19:45:00
May	0.2	15	18:30:00
June	0.539	16	08:15:00
July	0.521	16	08:45:00
August	0.344	30	09:00:00
September	0.22	27	07:45:00
October	0.12	26	07:30:00
November	0.427	24	06:45:00
December	0.56	22	06:00:00

Mean Sea Level	No Days	MSL
January	22	2.665
February	28	2.504
March	31	2.527
April	30	2.492
May	31	2.549
June	30	2.601
July	31	2.583
August	31	2.564
September	30	2.603
October	31	2.607
November	30	2.682
December	31	2.619
	Sum	Avg
	356	2.583

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 2003.

T.G.I. visits to site: Day 261 TGI on site, new software fitted.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	175, 261	None

Statistics:

Surge Maxima	Value	Day	Time
January	0.872	21	04:45:00
February	0.718	28	18:30:00
March	1.261	7	17:45:00
April	0.947	10	19:15:00
May	1.025	5	04:30:00
June	0.873	3	16:30:00
July	0.935	17	05:45:00
August	0.69	21	19:45:00
September	1.025	19	18:45:00
October	0.99	18	18:30:00
November	1.709	14	16:30:00
December	0.997	20	12:15:00

Surge Minima	Value	Day	Time
January	-0.982	29	13:45:00
February	-0.736	13	21:15:00
March	-1.018	13	02:30:00
April	-0.746	19	16:30:00
May	-0.615	14	00:00:00
June	-0.62	12	12:00:00
July	-0.618	12	00:00:00
August	-0.576	14	13:30:00
September	-0.605	14	22:30:00
October	-0.889	23	00:00:00
November	-0.65	20	23:00:00
December	-0.711	22	00:30:00

Extreme Maxima	Value	Day	Time
January	13.492	20	08:30:00
February	13.636	19	09:00:00
March	14.137	20	08:45:00
April	14.142	17	20:00:00
May	13.931	17	20:15:00
June	13.247	14	19:15:00
July	13.115	15	20:30:00
August	13.519	30	21:15:00
September	14.256	27	20:15:00
October	14.291	26	19:45:00
November	14.102	26	08:30:00
December	13.627	25	08:30:00

Extreme Minima	Value	Day	Time
January	1.196	4	15:00:00
February	0.555	20	04:30:00
March	0.179	21	04:15:00
April	0.112	19	04:00:00
May	0.644	17	02:45:00
June	0.944	15	02:15:00
July	1.266	15	02:45:00
August	0.925	30	03:45:00
September	0.632	28	03:30:00
October	0.544	27	15:30:00
November	0.793	24	14:15:00
December	0.991	24	14:45:00

Mean Sea Level	No Days	MSL
January	31	6.894
February	28	6.81
March	31	6.856
April	30	6.878
May	31	6.917
June	30	6.915
July	31	6.934
August	31	6.9
September	27	6.977
October	31	7.042
November	30	7.139
December	31	7.003
	Sum	Avg
	362	6.939

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 2003.

T.G.I. visits to site: Day 350 New software fitted.
New compressor & general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	350	317-319,336,341-344,347

Statistics:

Surge Maxima	Value	Day	Time
January	0.674	17	05:15:00
February	0.493	10	16:00:00
March	0.551	9	13:30:00
April	0.499	28	09:00:00
May	0.551	8	01:00:00
June	0.448	10	16:00:00
July	0.359	23	16:00:00
August	0.402	21	15:15:00
September	0.365	22	00:00:00
October	0.207	9	19:45:00
November	0.614	2	01:30:00
December	0.518	31	20:15:00

Surge Minima	Value	Day	Time
January	-0.802	30	21:00:00
February	-0.353	4	16:30:00
March	-0.443	12	08:00:00
April	-0.225	5	01:00:00
May	-0.223	8	14:15:00
June	-0.102	16	07:00:00
July	-0.089	15	18:45:00
August	-0.157	11	05:30:00
September	-0.243	23	06:45:00
October	-0.378	5	04:00:00
November	-0.25	4	03:30:00
December	-0.604	21	20:30:00

Extreme Maxima	Value	Day	Time
January	4.022	20	12:15:00
February	3.836	19	12:30:00
March	3.808	4	12:15:00
April	3.745	1	10:45:00
May	3.777	18	12:45:00
June	3.645	6	02:30:00
July	3.632	18	01:45:00
August	3.645	1	00:30:00
September	3.794	29	00:45:00
October	3.743	29	01:15:00
November	3.919	26	00:00:00
December	4.086	26	13:15:00

Extreme Minima	Value	Day	Time
January	0.096	30	16:00:00
February	0.213	17	17:30:00
March	0.044	20	18:30:00
April	0.122	17	17:15:00
May	0.202	14	15:15:00
June	0.361	16	06:00:00
July	0.402	15	06:00:00
August	0.281	30	06:30:00
September	0.266	27	05:15:00
October	0.162	26	04:45:00
November	0.337	24	04:15:00
December	0.116	22	03:15:00

Mean Sea Level	No Days	MSL
January	31	2.092
February	28	1.992
March	31	2.032
April	30	2.007
May	31	2.052
June	30	2.077
July	31	2.058
August	31	2.003
September	30	2.04
October	31	2.038
November	25	2.21
December	19	2.069
	Sum	Avg
	348	2.056

Barmouth Tide Gauge

Latitude: 52° 43' 09.6" N
Longitude: 04° 02' 42.1" 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 2003.

T.G.I. visits to site: Day 155 TGI on site, compressor changed but problem remains. It is most likely that the pps have been 'swept away' in strong current. Gauge returned to POL.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
50	15 minutes	168-182,196-212, OFF NETWORK from 213	136-168,182-196, OFF NETWORK from 213

Statistics:

Surge Maxima	Value	Day	Time
January	0.687	17	02:45:00
February	0.393	28	19:30:00
March	0.708	8	14:30:00
April	0.618	28	11:15:00
May	0.581	3	17:15:00

Surge Minima	Value	Day	Time
January	-1.121	30	16:30:00
February	-0.375	1	10:00:00
March	-0.597	21	06:15:00
April	-0.353	19	18:15:00
May	-0.201	14	07:15:00

Extreme Maxima	Value	Day	Time
January	5.506	20	09:15:00
February	5.407	19	09:45:00
March	5.472	20	09:30:00
April	5.414	17	08:30:00
May	5.504	16	08:00:00

Extreme Minima	Value	Day	Time
January	0.627	30	15:00:00
February	0.622	17	16:45:00
March	0.273	21	06:00:00
April	0.556	19	18:00:00
May	0.749	14	14:30:00

Mean Sea Level	No Days	MSL
January	31	2.706
February	28	2.638
March	31	2.648
April	30	2.622
May	14	2.694
	Sum	Avg
	134	2.662

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 2003.

T.G.I. visits to site: There were no visits to site in 2003.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	223-228	221-223

Statistics:

Surge Maxima	Value	Day	Time
January	0.673	2	11:15:00
February	0.379	28	17:00:00
March	0.413	7	15:30:00
April	0.455	28	07:30:00
May	0.662	2	14:00:00
June	0.322	30	01:15:00
July	0.351	25	10:15:00
August	0.22	30	01:30:00
September	0.25	23	04:15:00
October	0.474	30	16:30:00
November	0.505	2	09:45:00
December	0.399	26	17:00:00

Surge Minima	Value	Day	Time
January	-0.449	31	03:45:00
February	-0.342	1	00:00:00
March	-0.346	15	19:15:00
April	-0.308	20	01:30:00
May	-0.222	8	12:00:00
June	-0.13	20	14:45:00
July	-0.132	7	07:30:00
August	-0.149	25	08:45:00
September	-0.227	13	12:45:00
October	-0.365	23	09:30:00
November	-0.43	15	04:00:00
December	-0.523	7	02:45:00

Extreme Maxima	Value	Day	Time
January	2.835	20	09:45:00
February	2.45	19	10:15:00
March	2.373	20	09:45:00
April	2.438	17	09:00:00
May	2.461	17	21:45:00
June	2.293	14	20:45:00
July	2.359	15	22:00:00
August	2.51	29	21:45:00
September	2.538	28	22:15:00
October	2.481	26	09:00:00
November	2.626	26	10:00:00
December	2.488	26	10:45:00

Extreme Minima	Value	Day	Time
January	0.313	31	15:15:00
February	0.095	17	16:15:00
March	-0.05	20	17:00:00
April	0.054	19	05:15:00
May	0.262	15	14:45:00
June	0.35	15	03:45:00
July	0.485	15	04:30:00
August	0.318	31	05:45:00
September	0.187	28	04:45:00
October	0.158	27	04:15:00
November	0.303	24	03:15:00
December	0.28	24	16:15:00

Mean Sea Level	No Days	MSL
January	31	1.618
February	28	1.519
March	31	1.543
April	30	1.577
May	31	1.575
June	30	1.614
July	31	1.613
August	23	1.602
September	30	1.61
October	31	1.649
November	30	1.676
December	31	1.629
	Sum	Avg
	357	1.602

Cromer Tide Gauge

Latitude: 52° 56' 03.4" 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: No levelling was carried out in 2003.

T.G.I. visits to site: Day 083-089 Gap in data following TGI site visit.
Day 238 TGI on site, problem at gauge.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
96	15 minutes	083-089,231-238	004,006,029-031,035-037,050-051

Statistics:

Surge Maxima	Value	Day	Time
January	1.136	16	02:15:00
February	0.678	24	10:00:00
March	0.878	12	08:00:00
April	1.076	2	14:15:00
May	0.836	8	19:45:00
June	0.815	19	07:00:00
July	0.661	2	04:30:00
August	0.546	14	15:45:00
September	0.962	23	00:30:00
October	1.166	7	12:15:00
November	0.577	30	16:30:00
December	1.862	21	11:00:00

Surge Minima	Value	Day	Time
January	-0.528	24	07:30:00
February	-0.455	1	00:15:00
March	-0.543	4	15:30:00
April	-0.244	1	00:00:00
May	-0.36	8	06:45:00
June	-0.041	18	18:30:00
July	-0.089	29	02:45:00
August	-0.091	5	11:30:00
September	-0.292	24	13:45:00
October	-0.326	6	01:15:00
November	-0.773	29	18:15:00
December	-1.063	31	22:45:00

Extreme Maxima	Value	Day	Time
January	5.313	2	18:00:00
February	5.313	3	19:45:00
March	5.46	20	19:45:00
April	5.613	1	18:30:00
May	5.171	16	18:30:00
June	5.178	19	09:30:00
July	5.175	16	08:00:00
August	5.492	30	08:00:00
September	5.545	28	07:30:00
October	5.514	26	06:15:00
November	5.354	24	06:00:00
December	5.705	14	21:30:00

Extreme Minima	Value	Day	Time
January	0.458	24	05:30:00
February	0.372	19	02:30:00
March	0.188	20	02:15:00
April	0.185	18	02:00:00
May	0.327	16	00:45:00
June	0.736	17	15:15:00
July	0.763	15	14:15:00
August	0.742	31	15:30:00
September	0.488	27	14:00:00
October	0.433	26	13:30:00
November	0.553	25	01:15:00
December	0.605	23	00:15:00

Mean Sea Level	No Days	MSL
January	26	3.063
February	21	2.833
March	24	2.85
April	30	2.92
May	31	2.895
June	30	2.98
July	31	2.976
August	22	2.989
September	30	3.007
October	31	3.076
November	30	2.956
December	31	3.049
	Sum	Avg
	337	2.966

Devonport Tide Gauge

Latitude: 50° 22' 06.2" N
Longitude: 04° 11' 06.9" 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: The site was levelled in 2003. There were no changes in the bench mark values from the previous levelling.

T.G.I. visits to site: Day 307 Gap in data, TGI on site. New software fitted.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	307	None

Statistics:

Surge Maxima	Value	Day	Time
January	0.592	2	06:30:00
February	0.436	28	14:15:00
March	0.338	7	16:30:00
April	0.489	28	02:15:00
May	0.471	2	10:45:00
June	0.31	30	14:30:00
July	0.347	25	08:15:00
August	0.226	18	05:00:00
September	0.197	18	17:45:00
October	0.5	31	05:15:00
November	0.418	2	06:00:00
December	0.348	29	05:45:00

Surge Minima	Value	Day	Time
January	-0.591	30	20:15:00
February	-0.325	1	00:15:00
March	-0.28	18	09:30:00
April	-0.262	5	20:45:00
May	-0.23	6	21:45:00
June	-0.22	20	01:45:00
July	-0.185	11	22:00:00
August	-0.185	7	06:45:00
September	-0.298	12	09:15:00
October	-0.307	8	18:45:00
November	-0.295	15	05:45:00
December	-0.377	22	10:30:00

Extreme Maxima	Value	Day	Time
January	6.036	20	06:45:00
February	5.882	19	07:30:00
March	5.794	20	07:00:00
April	5.838	17	06:00:00
May	5.79	17	18:45:00
June	5.6	16	19:15:00
July	5.665	15	19:00:00
August	5.782	29	19:00:00
September	5.872	28	19:15:00
October	5.807	26	18:15:00
November	5.993	26	07:15:00
December	5.827	26	07:45:00

Extreme Minima	Value	Day	Time
January	0.847	31	11:15:00
February	0.542	17	12:30:00
March	0.085	20	13:30:00
April	0.2	18	13:00:00
May	0.505	16	12:00:00
June	0.656	15	00:00:00
July	0.863	15	00:30:00
August	0.605	31	02:00:00
September	0.383	28	01:00:00
October	0.361	27	00:30:00
November	0.583	23	23:15:00
December	0.59	24	12:30:00

Mean Sea Level	No Days	MSL
January	31	3.396
February	28	3.328
March	31	3.351
April	30	3.375
May	31	3.35
June	30	3.395
July	31	3.389
August	31	3.379
September	30	3.374
October	31	3.444
November	29	3.49
December	31	3.434
	Sum	Avg
	364	3.392

Dover Tide Gauge

Latitude: 51° 06' 51.8" N
Longitude: 01° 19' 21.1" 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 2003.

T.G.I. visits to site: Day 142 TGI on site with BT engineer.
Day 246 On site fitting new software and general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
96	15 minutes	134-142,168-172,245-246	070-072

Statistics:

Surge Maxima	Value	Day	Time
January	0.701	16	09:15:00
February	0.667	4	21:30:00
March	0.45	6	11:30:00
April	0.851	1	20:15:00
May	0.656	2	20:45:00
June	0.408	23	16:30:00
July	0.475	2	11:15:00
August	0.375	29	22:45:00
September	0.541	23	03:30:00
October	0.938	7	17:15:00
November	0.676	3	03:00:00
December	1.188	21	13:30:00

Surge Minima	Value	Day	Time
January	-0.56	31	20:15:00
February	-0.523	1	05:30:00
March	-0.375	4	19:00:00
April	-0.428	19	22:45:00
May	-0.329	8	07:00:00
June	-0.163	12	17:45:00
July	-0.284	18	11:45:00
August	-0.228	5	13:15:00
September	-0.389	24	07:15:00
October	-0.563	23	06:45:00
November	-0.74	15	01:15:00
December	-0.657	7	07:30:00

Extreme Maxima	Value	Day	Time
January	7.029	2	10:15:00
February	7.022	5	01:00:00
March	7.112	21	00:30:00
April	7.147	2	23:45:00
May	6.545	1	23:15:00
June	6.814	15	23:45:00
July	6.783	16	12:45:00
August	7.122	30	12:45:00
September	7.18	28	12:15:00
October	7.191	26	11:00:00
November	7.048	24	10:45:00
December	7.122	21	21:00:00

Extreme Minima	Value	Day	Time
January	0.751	24	10:15:00
February	0.523	18	07:30:00
March	0.31	20	07:45:00
April	0.351	18	07:15:00
May	1.086	4	07:45:00
June	0.742	15	06:30:00
July	0.898	31	19:45:00
August	0.808	31	21:00:00
September	0.547	27	19:15:00
October	0.498	26	19:00:00
November	0.665	24	18:30:00
December	0.704	23	05:45:00

Mean Sea Level	No Days	MSL
January	31	3.844
February	28	3.666
March	26	3.688
April	30	3.747
May	20	3.742
June	23	3.786
July	31	3.782
August	31	3.793
September	27	3.784
October	31	3.841
November	30	3.787
December	31	3.819
	Sum	Avg
	339	3.773

Felixstowe Tide Gauge

Latitude: 51° 57' 27.7" 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 2003.

T.G.I. visits to site: Day 239-240 Gap in data, TGI on site. New software and general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	239-240	005,036,052,056-058,061,089,220-222

Statistics:

Surge Maxima	Value	Day	Time
January	1.202	30	17:00:00
February	0.95	4	20:15:00
March	0.776	12	03:00:00
April	0.878	2	20:00:00
May	0.608	9	00:30:00
June	0.526	19	13:00:00
July	0.441	2	08:00:00
August	0.399	22	18:15:00
September	0.748	23	03:30:00
October	1.109	7	17:30:00
November	0.504	4	05:00:00
December	1.53	21	12:45:00

Surge Minima	Value	Day	Time
January	-0.562	24	13:15:00
February	-0.553	1	06:15:00
March	-0.59	4	21:00:00
April	-0.322	14	18:00:00
May	-0.419	8	07:45:00
June	-0.272	18	21:45:00
July	-0.325	25	22:30:00
August	-0.251	6	15:00:00
September	-0.373	24	09:15:00
October	-0.603	6	04:30:00
November	-0.803	29	22:30:00
December	-0.698	31	23:45:00

Extreme Maxima	Value	Day	Time
January	4.288	2	10:45:00
February	4.02	20	14:00:00
March	4.078	20	13:00:00
April	4.287	2	12:30:00
May	4.037	19	01:15:00
June	4.033	16	00:15:00
July	3.962	16	01:00:00
August	4.202	30	01:00:00
September	4.29	27	00:00:00
October	4.467	8	22:45:00
November	4.08	23	23:00:00
December	4.448	21	09:30:00

Extreme Minima	Value	Day	Time
January	0.027	24	09:45:00
February	0.005	1	05:15:00
March	0.03	20	06:45:00
April	-0.015	18	06:15:00
May	0.052	16	05:00:00
June	0.266	18	20:30:00
July	0.256	17	20:15:00
August	0.349	31	20:00:00
September	0.146	13	19:15:00
October	0.114	26	17:45:00
November	0.239	26	18:45:00
December	0.127	23	04:45:00

Mean Sea Level	No Days	MSL
January	31	2.222
February	23	2.019
March	31	2.034
April	30	2.023
May	31	2.001
June	30	2.084
July	31	2.079
August	26	2.114
September	30	2.107
October	31	2.176
November	30	2.065
December	31	2.131
	Sum	Avg
	355	2.088

Fishguard Tide Gauge

Latitude: 52° 00' 47.6" N
Longitude: 04° 59' 01.5" 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: The site was levelled in 2003. There were no changes in the bench mark values from the previous levelling.

T.G.I. visits to site: Day 259 TGI site visit, new software fitted.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	259	036

Statistics:

Surge Maxima	Value	Day	Time
January	0.643	20	19:00:00
February	0.451	28	14:45:00
March	0.608	7	15:30:00
April	0.583	28	02:15:00
May	0.509	4	03:00:00
June	0.43	3	16:00:00
July	0.358	1	03:00:00
August	0.267	18	03:15:00
September	0.316	21	22:00:00
October	0.498	31	05:15:00
November	0.629	14	14:00:00
December	0.67	31	23:45:00

Surge Minima	Value	Day	Time
January	-0.622	30	15:30:00
February	-0.242	1	09:15:00
March	-0.16	12	05:45:00
April	-0.118	4	22:45:00
May	-0.103	8	11:00:00
June	-0.037	20	16:15:00
July	0.002	12	07:30:00
August	-0.021	7	11:00:00
September	-0.128	12	09:00:00
October	-0.216	5	05:15:00
November	-0.168	14	22:30:00
December	-0.295	22	01:30:00

Extreme Maxima	Value	Day	Time
January	5.303	20	08:15:00
February	5.3	19	09:00:00
March	5.275	20	08:30:00
April	5.284	17	07:30:00
May	5.235	17	07:45:00
June	4.892	16	20:45:00
July	4.963	15	20:30:00
August	5.113	29	20:30:00
September	5.334	28	20:45:00
October	5.309	26	19:45:00
November	5.32	26	08:30:00
December	5.254	26	09:15:00

Extreme Minima	Value	Day	Time
January	0.761	31	13:15:00
February	0.59	17	14:15:00
March	0.242	20	15:15:00
April	0.36	18	02:15:00
May	0.656	15	13:00:00
June	0.788	16	02:45:00
July	0.967	15	02:30:00
August	0.719	30	03:15:00
September	0.519	27	02:00:00
October	0.452	26	01:45:00
November	0.651	24	01:15:00
December	0.693	24	14:30:00

Mean Sea Level	No Days	MSL
January	31	2.775
February	26	2.723
March	31	2.763
April	30	2.759
May	31	2.753
June	30	2.792
July	31	2.783
August	31	2.742
September	27	2.759
October	31	2.798
November	30	2.897
December	31	2.785
	Sum	Avg
	360	2.777

Heysham Tide Gauge

Latitude: 54° 01' 54.6" 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: The site was levelled in 2003. There were no changes in the bench mark values from the previous levelling.

T.G.I. visits to site:		
	Day 120	Gap due to TGI visit.
	Day 122	Gap in data due to TGI site visit on 122. Mid tide re-connected. 'Leak' on Ch 1.
	Day 169	TGI on site. Gap in data due to refurbishment of tide gauge building. Gauge back on line and leak on Ch1 repaired.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
97	15 minutes	121-122, 161-169	None

Statistics:

Surge Maxima	Value	Day	Time
January	1.027	17	07:15:00
February	0.435	28	20:00:00
March	0.671	11	00:30:00
April	0.83	1	06:15:00
May	0.865	3	20:15:00
June	0.632	3	21:00:00
July	0.55	23	16:45:00
August	0.632	21	14:15:00
September	0.524	22	06:45:00
October	0.628	6	02:00:00
November	1.065	14	16:30:00
December	0.96	31	23:45:00

Surge Minima	Value	Day	Time
January	-1.232	30	19:15:00
February	-0.423	15	02:30:00
March	-0.56	12	08:15:00
April	-0.31	19	17:00:00
May	-0.022	8	17:45:00
June	0.005	24	09:30:05
July	0.018	8	13:30:00
August	-0.055	29	10:00:00
September	-0.145	12	18:00:00
October	-0.336	22	19:15:00
November	-0.24	8	03:30:00
December	-0.506	2	02:30:00

Extreme Maxima	Value	Day	Time
January	9.969	20	12:30:00
February	10.077	19	12:45:00
March	10.319	20	12:30:00
April	10.248	18	12:00:00
May	10.438	18	00:15:00
June	9.28	30	23:45:00
July	9.844	16	00:30:00
August	10.135	31	01:15:00
September	10.565	29	00:45:00
October	10.454	26	23:45:00
November	10.521	24	23:15:00
December	10.342	26	13:15:00

Extreme Minima	Value	Day	Time
January	1.157	30	16:45:00
February	0.698	19	19:45:00
March	0.207	20	19:30:00
April	0.201	17	18:15:00
May	0.743	15	17:00:00
June	1.921	19	09:30:00
July	1.253	15	06:30:00
August	0.913	30	07:30:00
September	0.683	28	07:00:00
October	0.483	26	06:00:00
November	0.807	24	05:30:00
December	1.161	22	04:15:00

Mean Sea Level	No Days	MSL
January	31	5.206
February	28	5.105
March	31	5.16
April	28	5.121
May	29	5.35
June	19	5.37
July	31	5.358
August	31	5.291
September	30	5.32
October	31	5.307
November	30	5.481
December	31	5.338
	Sum	Avg
	350	5.284

Hinkley Point Tide Gauge

Latitude: 51° 12' 54.9" N
Longitude: 03° 08' 04.1" W
Grid Reference: ST 2086 4684

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 2003.

T.G.I. visits to site: There were no visits to site in 2003.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
90	15 minutes	035-044, 114-121, 217-231, 280, 305-308	280

Statistics:

Surge Maxima	Value	Day	Time
January	0.717	1	16:45:00
February	0.577	28	17:44:59
March	0.923	7	16:14:59
April	0.556	1	12:14:59
May	0.609	3	14:59:59
June	0.51	3	15:29:59
July	0.53	17	04:59:59
August	0.394	21	18:45:00
September	0.413	22	05:00:00
October	0.415	9	13:15:00
November	1.235	14	14:59:59
December	0.619	20	11:44:59

Surge Minima	Value	Day	Time
January	-0.865	29	12:15:00
February	-0.54	13	20:14:59
March	-0.718	13	02:14:59
April	-0.386	11	01:14:59
May	-0.377	10	00:29:59
June	-0.294	20	16:14:59
July	-0.303	22	15:14:59
August	-0.265	2	22:59:59
September	-0.411	12	11:45:00
October	-0.581	23	01:00:00
November	-0.401	18	00:44:59
December	-0.508	6	16:59:59

Extreme Maxima	Value	Day	Time
January	12.122	20	08:00:00
February	12.283	19	08:29:59
March	12.67	20	08:14:59
April	12.651	17	19:29:59
May	12.468	17	19:44:59
June	11.859	14	18:44:59
July	11.791	15	19:59:59
August	12.181	29	20:00:00
September	12.639	27	19:45:00
October	12.645	26	19:15:00
November	12.523	26	07:59:59
December	12.061	25	07:59:59

Extreme Minima	Value	Day	Time
January	1.131	4	13:45:00
February	0.443	19	02:29:59
March	-0.142	21	02:59:59
April	-0.086	18	01:44:59
May	0.422	17	01:29:59
June	0.765	15	00:59:59
July	1.101	15	01:44:59
August	0.616	30	14:45:00
September	0.308	28	02:15:00
October	0.234	27	14:00:00
November	0.524	24	12:59:59
December	0.794	24	13:29:59

Mean Sea Level	No Days	MSL
January	31	6.229
February	17	6.142
March	31	6.18
April	22	6.158
May	30	6.217
June	30	6.239
July	31	6.244
August	15	6.223
September	30	6.232
October	23	6.221
November	25	6.329
December	31	6.245
	Sum	Avg
	316	6.222

Holyhead Tide Gauge

Latitude: 53° 18' 50.2" N
Longitude: 04° 37' 14.1" 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 2003.

T.G.I. visits to site: Day 224-225 Gap in data, TGI visit to upgrade software.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	106,224-225,239,357-358	None

Statistics:

Surge Maxima	Value	Day	Time
January	0.65	17	06:00:00
February	0.301	28	17:15:00
March	0.431	7	16:45:00
April	0.483	28	07:15:00
May	0.424	4	07:30:00
June	0.368	10	02:00:00
July	0.241	1	08:30:00
August	0.267	21	14:30:00
September	0.333	21	22:45:00
October	0.295	31	05:45:00
November	0.705	2	03:30:00
December	0.781	31	23:45:00

Surge Minima	Value	Day	Time
January	-0.962	30	16:30:00
February	-0.349	1	10:00:00
March	-0.417	12	06:00:00
April	-0.22	5	01:15:00
May	-0.182	8	16:30:00
June	-0.144	15	17:45:00
July	-0.105	12	01:30:00
August	-0.158	10	15:45:00
September	-0.215	12	06:00:00
October	-0.325	5	06:15:00
November	-0.211	15	02:15:00
December	-0.498	21	22:00:00

Extreme Maxima	Value	Day	Time
January	6.021	21	12:15:00
February	6.032	19	12:00:00
March	5.96	20	11:30:00
April	5.961	17	10:30:00
May	6.007	17	23:15:00
June	5.7	16	23:45:00
July	5.747	15	23:45:00
August	5.883	29	23:30:00
September	6.125	28	23:45:00
October	6.058	26	22:45:00
November	6.162	24	22:30:00
December	6.209	26	12:15:00

Extreme Minima	Value	Day	Time
January	0.486	30	15:00:00
February	0.354	17	17:00:00
March	-0.099	20	17:45:00
April	-0.011	18	17:15:00
May	0.302	15	15:30:00
June	0.516	16	05:15:00
July	0.66	15	05:00:00
August	0.452	30	05:45:00
September	0.296	27	04:45:00
October	0.099	26	04:00:00
November	0.382	24	03:45:00
December	0.528	24	16:45:00

Mean Sea Level	No Days	MSL
January	31	3.247
February	28	3.184
March	31	3.215
April	28	3.212
May	31	3.23
June	30	3.263
July	31	3.251
August	27	3.235
September	30	3.275
October	31	3.3
November	30	3.438
December	28	3.326
	Sum	Avg
	356	3.265

Ilfracombe Tide Gauge

Latitude: 51° 12' 40.1" N
Longitude: 04° 06' 44.6" 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 2003.

T.G.I. visits to site: Day 310 TGI on site - new software and compressor. System purged.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	114, 310	007,020-021,029-031,050-051,109-110,244-249,259-265,266-278,284-286,289-290,293-304,340-341

Statistics:

Surge Maxima	Value	Day	Time
January	0.644	20	17:00:00
February	0.496	28	14:30:00
March	0.721	7	16:30:00
April	0.555	28	02:00:00
May	0.494	3	14:45:00
June	0.444	30	01:45:00
July	0.393	1	02:30:00
August	0.288	18	03:45:00
September	0.306	22	04:00:00
October	0.515	31	07:15:00
November	0.853	14	13:00:00
December	0.485	31	22:15:00

Surge Minima	Value	Day	Time
January	-0.7	29	12:45:00
February	-0.279	11	16:00:00
March	-0.322	13	02:00:00
April	-0.209	4	21:00:00
May	-0.164	10	00:45:00
June	-0.132	20	14:15:00
July	-0.101	22	14:30:00
August	-0.115	10	21:00:00
September	-0.219	13	22:45:00
October	-0.295	14	22:30:00
November	-0.255	17	00:00:00
December	-0.32	7	06:30:00

Extreme Maxima	Value	Day	Time
January	9.537	21	07:45:00
February	9.683	19	07:30:00
March	9.886	20	07:15:00
April	9.919	17	18:30:00
May	9.775	17	18:45:00
June	9.313	14	17:45:00
July	9.294	15	19:15:00
August	9.623	30	19:45:00
September	9.296	11	18:30:00
October	9.188	10	18:15:00
November	9.848	26	07:00:00
December	9.514	26	07:45:00

Extreme Minima	Value	Day	Time
January	1.116	31	11:15:00
February	0.609	20	14:15:00
March	0.006	21	01:30:00
April	0.072	18	00:30:00
May	0.523	17	00:15:00
June	0.825	15	00:00:00
July	1.117	15	00:30:00
August	0.753	30	01:15:00
September	0.811	12	00:30:00
October	1.003	11	00:00:00
November	0.625	24	11:45:00
December	0.777	24	12:15:00

Mean Sea Level	No Days	MSL
January	27	5.033
February	26	4.925
March	31	4.949
April	30	4.971
May	31	4.972
June	30	5.012
July	31	5.009
August	31	4.994
September	7	4.928
October	10	5.011
November	30	5.119
December	30	5.024
	Sum	Avg
	314	4.996

Immingham Tide Gauge

Latitude: 53° 37' 49.5" N
Longitude: 00° 11' 14.2" 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 2003.

T.G.I. visits to site: There were no visits to site in 2003.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	020,245,250-251,253-256,284,294,297-303,305-306

Statistics:

Surge Maxima	Value	Day	Time
January	1.203	30	11:30:00
February	0.849	4	14:45:00
March	0.713	12	05:30:00
April	0.796	2	14:15:00
May	0.669	8	19:15:00
June	0.534	19	05:15:00
July	0.521	2	02:30:00
August	0.348	14	15:30:00
September	0.644	22	23:45:00
October	0.788	7	10:45:00
November	0.451	19	03:30:00
December	1.304	21	10:00:00

Surge Minima	Value	Day	Time
January	-0.661	24	09:15:00
February	-0.605	1	00:15:00
March	-0.544	4	13:45:00
April	-0.422	1	07:30:00
May	-0.546	8	06:15:00
June	-0.291	1	08:00:00
July	-0.274	23	16:30:00
August	-0.299	21	15:00:00
September	-0.435	24	04:30:00
October	-0.471	6	02:45:00
November	-0.741	29	17:00:00
December	-1.14	31	23:45:00

Extreme Maxima	Value	Day	Time
January	7.357	2	17:30:00
February	7.585	19	19:45:00
March	7.628	20	19:15:00
April	7.583	1	17:45:00
May	7.441	16	18:00:00
June	7.222	15	18:30:00
July	7.201	16	07:15:00
August	7.455	30	07:30:00
September	7.658	28	07:00:00
October	7.523	28	07:15:00
November	7.347	24	05:30:00
December	7.476	27	20:45:00

Extreme Minima	Value	Day	Time
January	0.698	24	04:15:00
February	0.551	21	03:15:00
March	0.225	20	01:30:00
April	0.207	18	01:15:00
May	0.42	17	00:45:00
June	0.854	15	00:15:00
July	0.958	15	13:15:00
August	0.766	30	14:15:00
September	0.545	28	13:45:00
October	0.508	26	12:45:00
November	0.676	24	12:15:00
December	0.853	25	01:00:00

Mean Sea Level	No Days	MSL
January	31	4.254
February	28	4.075
March	31	4.083
April	30	4.11
May	31	4.086
June	30	4.162
July	31	4.174
August	31	4.179
September	22	4.206
October	23	4.259
November	27	4.166
December	31	4.204
	Sum	Avg
	346	4.163

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: The site was levelled in 2003. There were no changes in the bench mark values from the previous levelling.

T.G.I. visits to site: There were no visits to site in 2003.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	106-112,212	None

Statistics:

Surge Maxima	Value	Day	Time
January	0.643	17	06:30:00
February	0.381	10	16:30:00
March	0.427	9	13:15:00
April	0.496	28	08:00:00
May	0.485	3	22:30:00
June	0.378	6	01:00:00
July	0.222	23	16:45:00
August	0.234	21	14:00:00
September	0.3	21	23:45:00
October	0.16	5	23:30:00
November	0.682	2	03:15:00
December	0.598	31	23:45:00

Surge Minima	Value	Day	Time
January	-0.986	30	19:15:00
February	-0.383	4	17:45:00
March	-0.466	12	08:30:00
April	-0.245	5	04:30:00
May	-0.234	8	14:30:00
June	-0.151	15	18:30:00
July	-0.162	30	10:30:00
August	-0.198	29	11:15:00
September	-0.29	23	09:15:00
October	-0.425	5	05:00:00
November	-0.311	15	02:15:00
December	-0.664	21	21:00:00

Extreme Maxima	Value	Day	Time
January	5.691	20	12:30:00
February	5.608	19	12:45:00
March	5.529	4	12:15:00
April	5.404	1	11:15:00
May	5.609	17	11:45:00
June	5.312	17	00:45:00
July	5.317	16	00:30:00
August	5.394	30	00:30:00
September	5.662	29	00:45:00
October	5.537	26	23:45:00
November	5.732	24	23:15:00
December	5.804	26	13:15:00

Extreme Minima	Value	Day	Time
January	0.047	30	16:15:00
February	0.019	17	17:45:00
March	-0.353	20	18:45:00
April	0.193	15	16:15:00
May	0.004	15	16:30:00
June	0.196	16	06:15:00
July	0.291	15	06:00:00
August	0.054	30	06:45:00
September	-0.048	27	05:45:00
October	-0.202	26	05:15:00
November	0.045	24	04:45:00
December	0.086	22	03:45:00

Mean Sea Level	No Days	MSL
January	31	2.851
February	28	2.785
March	31	2.817
April	22	2.829
May	31	2.841
June	30	2.869
July	29	2.852
August	31	2.79
September	30	2.823
October	31	2.836
November	30	3
December	31	2.853
	Sum	Avg
	355	2.846

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 2003.

T.G.I. visits to site: There were no visits to site in 2003.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	063	007, 013

Statistics:

Surge Maxima	Value	Day	Time
January	0.698	17	05:30:11
February	0.508	10	16:15:00
March	0.602	9	14:44:59
April	0.499	28	09:00:00
May	0.717	7	23:15:00
June	0.544	6	01:30:00
July	0.402	23	17:15:00
August	0.34	21	16:45:00
September	0.305	21	23:00:00
October	0.23	6	04:15:00
November	0.712	2	01:45:00
December	0.612	31	18:59:59

Surge Minima	Value	Day	Time
January	-0.881	30	21:45:00
February	-0.412	4	07:45:00
March	-0.403	12	07:44:59
April	-0.203	5	05:30:00
May	-0.189	14	05:15:00
June	-0.057	15	20:15:00
July	-0.077	30	08:30:00
August	-0.132	29	08:45:00
September	-0.214	23	06:15:00
October	-0.35	23	09:00:00
November	-0.22	15	02:30:00
December	-0.729	21	20:59:59

Extreme Maxima	Value	Day	Time
January	1.319	17	05:00:11
February	1.139	19	06:45:00
March	1.158	9	17:29:59
April	1.191	1	05:29:59
May	1.164	4	03:30:00
June	0.986	10	23:30:00
July	1.005	31	18:45:00
August	0.9	1	18:45:00
September	1.055	25	17:00:00
October	1.054	9	17:00:00
November	1.307	2	08:15:00
December	1.305	31	19:14:59

Extreme Minima	Value	Day	Time
January	-0.585	30	22:00:00
February	-0.279	5	00:00:00
March	-0.377	21	00:14:59
April	-0.308	17	23:30:00
May	-0.2	14	21:15:00
June	-0.078	20	12:45:00
July	-0.097	30	11:30:00
August	-0.27	29	11:45:00
September	-0.235	12	11:45:00
October	-0.297	26	11:15:00
November	0.045	23	10:00:00
December	-0.3	21	20:59:59

Mean Sea Level	No Days	MSL
January	29	0.502
February	28	0.45
March	28	0.448
April	30	0.426
May	31	0.477
June	30	0.505
July	31	0.481
August	31	0.413
September	30	0.461
October	31	0.445
November	30	0.648
December	31	0.478
	Sum	Avg
	360	0.478

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 2003.

T.G.I. visits to site: There were no visits to site in 2003.

Data quality:

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

Statistics:

Surge Maxima	Value	Day	Time
January	0.791	2	14:00:00
February	0.469	28	16:00:00
March	0.529	7	16:45:00
April	0.544	28	01:15:00
May	0.841	2	14:30:00
June	0.448	30	14:30:00
July	0.449	16	18:15:00
August	0.363	17	19:15:00
September	0.345	22	14:15:00
October	0.698	30	19:15:00
November	0.624	2	08:45:00
December	0.598	20	13:15:00

Surge Minima	Value	Day	Time
January	-0.535	30	19:15:00
February	-0.308	1	00:00:00
March	-0.542	13	00:45:00
April	-0.246	5	10:30:00
May	-0.191	6	20:45:00
June	-0.198	20	15:15:00
July	-0.156	5	23:45:00
August	-0.221	2	23:15:00
September	-0.248	14	23:00:00
October	-0.348	24	01:15:00
November	-0.34	17	11:15:00
December	-0.444	7	02:15:00

Extreme Maxima	Value	Day	Time
January	11.19	21	08:15:00
February	11.572	19	08:00:00
March	11.871	20	07:45:00
April	11.895	18	07:30:00
May	11.606	17	19:30:00
June	11.07	15	19:15:00
July	11.017	15	19:45:00
August	11.443	29	19:45:00
September	11.806	28	20:00:00
October	11.723	26	19:00:00
November	11.679	26	07:45:00
December	11.186	25	07:30:00

Extreme Minima	Value	Day	Time
January	1.665	4	14:00:00
February	0.866	18	14:15:00
March	0.235	20	14:45:00
April	0.335	18	14:15:00
May	0.788	17	01:30:00
June	1.171	16	02:00:00
July	1.483	15	01:45:00
August	1.04	31	03:15:00
September	0.677	28	02:15:00
October	0.603	27	01:45:00
November	0.968	24	13:00:00
December	1.067	24	13:30:00

Mean Sea Level	No Days	MSL
January	31	6.049
February	28	5.973
March	31	5.987
April	30	6.027
May	31	6.03
June	30	6.061
July	31	6.059
August	31	6.029
September	30	6.027
October	31	6.097
November	30	6.15
December	31	6.069
	Sum	Avg
	365	6.047

Kinlochbervie Tide Gauge

Latitude: 58° 27' 24.1" N
Longitude: 05° 03' 01.3" W
Grid Reference: NC 2213 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: The site was levelled in 2003. There were no changes in the bench mark values from the previous levelling.

T.G.I. visits to site:

Day 139	TGI at site. Divers cleared pp's
Day 104	Mid-tide installed.
Day 286	General maintenance and new software.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
83	15 minutes	001-063,286	None

Statistics:

Surge Maxima	Value	Day	Time
March	0.66	10	07:15:00
April	0.583	1	02:45:00
May	0.591	4	09:45:00
June	0.471	18	19:30:00
July	0.305	23	23:15:00
August	0.451	21	08:15:00
September	0.393	13	10:15:00
October	0.517	10	02:00:00
November	0.586	2	10:00:00
December	0.559	31	21:45:00

Surge Minima	Value	Day	Time
March	-0.394	12	12:00:00
April	-0.224	5	12:00:00
May	-0.169	14	13:15:00
June	-0.048	16	11:15:00
July	-0.096	16	12:30:00
August	-0.191	25	00:45:00
September	-0.198	23	13:00:00
October	-0.323	26	00:45:00
November	-0.248	15	19:15:00
December	-0.775	21	19:30:00

Extreme Maxima	Value	Day	Time
March	5.317	20	08:30:00
April	5.191	1	07:00:00
May	5.255	17	20:15:00
June	4.979	14	19:15:00
July	4.917	31	20:45:00
August	4.971	13	20:00:00
September	5.292	28	20:30:00
October	5.269	27	20:15:00
November	5.467	25	07:30:00
December	5.312	25	08:15:00

Extreme Minima	Value	Day	Time
March	-0.12	20	15:00:00
April	-0.105	18	14:30:00
May	0.185	15	12:30:00
June	0.594	16	02:15:00
July	0.615	16	03:00:00
August	0.224	30	03:00:00
September	0.107	27	02:00:00
October	-0.018	26	01:15:00
November	0.389	24	00:45:00
December	0.288	22	00:00:00

Mean Sea Level	No Days	MSL
March	26	2.862
April	30	2.815
May	31	2.876
June	30	2.915
July	31	2.877
August	31	2.83
September	30	2.896
October	30	2.863
November	30	3.057
December	31	2.906
	Sum	Avg
	300	2.89

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: The site was levelled in 2003. There were no changes in the bench mark values from the previous levelling.

T.G.I. visits to site: Day 231 New compressor and general maintenance.

Data quality:

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

Statistics:

Surge Maxima	Value	Day	Time
January	0.687	15	23:30:00
February	0.44	24	04:30:00
March	0.437	11	13:15:00
April	0.622	1	12:00:00
May	0.488	8	14:45:00
June	0.496	19	02:00:00
July	0.258	1	09:15:00
August	0.273	21	19:30:00
September	0.316	18	03:00:00
October	0.5	8	16:15:00
November	0.518	18	23:30:00
December	0.665	21	02:45:00

Surge Minima	Value	Day	Time
January	-0.611	31	06:45:00
February	-0.459	16	06:30:00
March	-0.533	12	17:30:00
April	-0.317	5	07:15:00
May	-0.542	8	03:45:00
June	-0.238	18	16:45:00
July	-0.212	6	05:00:00
August	-0.31	5	06:00:00
September	-0.366	13	09:15:00
October	-0.341	16	06:45:00
November	-0.751	29	19:45:00
December	-0.768	31	21:45:00

Extreme Maxima	Value	Day	Time
January	5.869	2	13:45:00
February	5.766	19	16:15:00
March	5.86	20	16:00:00
April	5.77	18	15:45:00
May	5.89	18	16:15:00
June	5.699	15	15:15:00
July	5.574	14	15:00:00
August	5.719	29	15:45:00
September	5.973	29	04:15:00
October	5.92	28	04:00:00
November	6.067	26	03:30:00
December	5.811	26	04:15:00

Extreme Minima	Value	Day	Time
January	0.507	24	00:30:00
February	0.279	20	23:30:00
March	-0.114	19	21:30:00
April	-0.158	17	21:15:00
May	0.206	15	20:00:00
June	0.521	16	09:45:00
July	0.581	15	09:45:00
August	0.287	30	10:15:00
September	0.154	27	09:15:00
October	0.051	26	08:45:00
November	0.388	24	08:15:00
December	0.562	26	23:00:00

Mean Sea Level	No Days	MSL
January	31	3.226
February	28	3.073
March	31	3.087
April	30	3.076
May	31	3.109
June	30	3.162
July	31	3.153
August	31	3.131
September	30	3.16
October	31	3.175
November	29	3.217
December	31	3.168
	Sum	Avg
	364	3.145

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: The site was levelled in 2003. There were no changes in the bench mark values from the previous levelling.

T.G.I. visits to site:

Day 137-138	Underwater survey and land survey - levelling in preparation for installation.
Day 216	Back on network. TGI installed wind speed and direction instrumentation.
Day 280	Ch1 leak on system fixed after TGI site visit.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
40	15 minutes	001-216,280	None

Statistics:

Surge Maxima	Value	Day	Time
August	0.326	22	00:15:00
September	0.283	22	04:45:00
October	0.303	10	04:00:00
November	0.349	3	02:45:00
December	0.432	13	17:45:00

Surge Minima	Value	Day	Time
August	-0.144	25	09:00:00
September	-0.143	20	01:15:00
October	-0.28	22	15:30:00
November	-0.177	8	04:15:00
December	-0.37	6	08:30:00

Extreme Maxima	Value	Day	Time
August	2.284	14	00:00:00
September	2.421	29	00:30:00
October	2.48	28	00:00:00
November	2.554	26	11:45:00
December	2.483	26	13:00:00

Extreme Minima	Value	Day	Time
August	0.2	30	06:00:00
September	0.161	27	05:00:00
October	0.077	26	04:45:00
November	0.393	24	04:15:00
December	0.299	22	03:30:00

Mean Sea Level	No Days	MSL
August	26	1.3
September	30	1.353
October	28	1.336
November	30	1.454
December	31	1.375
	Sum	Avg
	145	1.364

Liverpool Tide Gauge

Latitude: 53° 26' 58.9" 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: The site was levelled in 2003. There were no changes in the bench mark values from the previous levelling.

T.G.I. visits to site: There were no visits to site in 2003.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
96	15 minutes	001-006, 084-085, 315-321	227, 231

Statistics:

Surge Maxima	Value	Day	Time
January	0.768	17	07:15:00
February	0.754	3	08:30:00
March	0.534	10	10:15:00
April	0.682	1	07:30:00
May	0.625	3	20:00:00
June	0.466	3	20:15:00
July	0.284	23	16:30:00
August	0.305	21	12:30:00
September	0.3	22	08:00:00
October	0.756	7	02:45:00
November	0.753	3	13:15:00
December	0.71	20	16:00:00

Surge Minima	Value	Day	Time
January	-1.262	30	18:15:00
February	-0.514	17	13:30:00
March	-0.557	12	07:00:00
April	-0.528	19	21:00:00
May	-0.31	8	15:15:00
June	-0.245	21	09:00:00
July	-0.246	18	19:45:00
August	-0.332	15	06:00:00
September	-0.416	12	17:45:00
October	-0.644	26	07:00:00
November	-0.464	24	06:15:00
December	-0.726	2	02:30:00

Extreme Maxima	Value	Day	Time
January	9.591	20	12:15:00
February	9.682	19	12:45:00
March	9.862	20	12:15:00
April	9.794	17	11:15:00
May	9.799	18	00:00:00
June	9.348	15	23:45:00
July	9.293	16	00:15:00
August	9.56	31	01:00:00
September	9.905	29	00:30:00
October	9.871	26	23:30:00
November	9.886	24	23:00:00
December	9.775	26	13:00:00

Extreme Minima	Value	Day	Time
January	1.083	31	17:15:00
February	0.541	19	20:00:00
March	0.001	20	19:30:00
April	0.012	17	18:30:00
May	0.435	15	17:15:00
June	0.803	14	17:30:00
July	1.003	15	06:45:00
August	0.623	30	07:30:00
September	0.413	27	06:30:00
October	0.204	26	06:00:00
November	0.529	24	05:30:00
December	0.875	24	18:30:00

Mean Sea Level	No Days	MSL
January	24	5.171
February	28	5.084
March	28	5.117
April	30	5.108
May	31	5.172
June	30	5.174
July	31	5.169
August	30	5.108
September	30	5.146
October	31	5.164
November	21	5.298
December	31	5.186
	Sum	Avg
	345	5.158

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 2003.

T.G.I. visits to site:

Day 071	Back on system after pier refurbishment.
Day 331	Back on line after TGI site visit. Found power off. New battery and new modem fitted.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
71	15 minutes	007-071,274-279,294-331	001-007

Statistics:

Surge Maxima	Value	Day	Time
March	0.118	24	07:30:00
April	0.455	28	07:45:00
May	0.458	3	19:45:00
June	0.339	10	03:45:00
July	0.237	23	15:30:00
August	0.233	21	13:15:00
September	0.274	21	23:15:00
October	0.108	8	05:30:00
November	0.447	29	15:30:00
December	0.677	31	23:45:00

Surge Minima	Value	Day	Time
March	-0.384	12	20:15:00
April	-0.393	19	21:00:00
May	-0.288	14	08:30:00
June	-0.204	15	19:15:00
July	-0.185	30	12:30:00
August	-0.268	14	17:45:00
September	-0.382	22	17:15:00
October	-0.447	7	18:15:00
November	-0.213	27	21:00:00
December	-0.865	21	19:45:00

Extreme Maxima	Value	Day	Time
March	8.105	20	12:00:00
April	8.067	17	10:45:00
May	8.073	17	11:15:00
June	7.669	17	00:15:00
July	7.68	16	00:00:00
August	7.855	31	00:30:00
September	8.169	29	00:15:00
October	7.64	9	22:15:00
November	7.414	29	14:30:00
December	8.079	26	12:45:00

Extreme Minima	Value	Day	Time
March	-0.467	20	18:45:00
April	-0.406	17	17:30:00
May	-0.03	15	16:30:00
June	0.269	14	16:45:00
July	0.433	15	06:00:00
August	0.098	30	06:30:00
September	-0.088	28	06:15:00
October	0.494	11	05:30:00
November	0.613	27	19:30:00
December	0.085	22	03:30:00

Mean Sea Level	No Days	MSL
March	18	3.904
April	30	3.969
May	31	4.007
June	30	4.034
July	31	4.022
August	31	3.963
September	28	3.991
October	13	3.961
November	2	4.236
December	31	3.982
	Sum	Avg
	245	4.007

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: The site was levelled in 2003. There were no changes in the bench mark values from the previous levelling.

T.G.I. visits to site: Day 239 On site fitting new software and general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	239	None

Statistics:

Surge Maxima	Value	Day	Time
January	1.192	30	12:45:00
February	0.985	4	18:00:00
March	0.681	12	09:30:00
April	0.893	2	16:15:00
May	0.587	8	21:45:00
June	0.538	19	11:45:00
July	0.477	2	06:45:00
August	0.404	14	17:15:00
September	0.799	23	00:45:00
October	1.076	7	16:30:00
November	0.505	30	18:00:00
December	1.681	21	12:15:00

Surge Minima	Value	Day	Time
January	-0.508	17	12:15:00
February	-0.522	1	04:45:00
March	-0.519	4	17:45:00
April	-0.279	1	09:45:00
May	-0.369	8	04:45:00
June	-0.146	1	09:15:00
July	-0.183	25	22:15:00
August	-0.198	6	13:00:00
September	-0.298	13	15:45:00
October	-0.373	6	04:00:00
November	-0.739	29	20:15:00
December	-0.907	31	23:45:00

Extreme Maxima	Value	Day	Time
January	3.147	16	07:45:00
February	3.102	4	22:45:00
March	2.761	30	20:15:00
April	3.191	1	21:45:00
May	2.636	14	19:30:00
June	2.923	19	12:30:00
July	2.868	2	10:30:00
August	2.965	14	10:30:00
September	3.009	12	10:15:00
October	3.186	7	19:45:00
November	2.799	23	08:00:00
December	3.703	15	00:45:00

Extreme Minima	Value	Day	Time
January	0.054	24	07:45:00
February	0.104	1	03:30:00
March	0.098	20	05:00:00
April	0.129	18	04:30:00
May	0.189	16	03:15:00
June	0.343	18	18:45:00
July	0.366	17	18:15:00
August	0.478	1	18:00:00
September	0.215	13	17:15:00
October	0.267	26	16:00:00
November	0.274	29	07:15:00
December	0.352	23	03:00:00

Mean Sea Level	No Days	MSL
January	31	1.794
February	28	1.58
March	31	1.581
April	30	1.614
May	31	1.597
June	30	1.681
July	31	1.681
August	29	1.712
September	30	1.703
October	31	1.776
November	30	1.657
December	31	1.745
	Sum	Avg
	363	1.677

Milford Haven Tide Gauge

Latitude: 51° 42' 26.6" N
Longitude: 05° 03' 06.7" 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 2003.

T.G.I. visits to site: Day 259 Gap in data - TGI on site fitting new software.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	259	209-219,281,283-289,293-304,306-319,323-365

Statistics:

Surge Maxima	Value	Day	Time
January	0.679	20	17:00:00
February	0.511	28	14:00:00
March	0.699	7	15:30:00
April	0.595	28	01:45:00
May	0.533	3	15:00:00
June	0.434	3	14:45:00
July	0.375	1	02:45:00
August	0.192	27	12:45:00
September	0.26	22	02:30:00
October	0.417	31	05:00:00
November	0.504	1	21:45:00
December	0.358	26	14:15:00

Surge Minima	Value	Day	Time
January	-0.702	29	12:15:00
February	-0.244	1	08:15:00
March	-0.189	12	02:45:00
April	-0.203	4	21:45:00
May	-0.157	14	04:45:00
June	-0.103	20	15:30:00
July	-0.071	6	23:15:00
August	-0.125	31	22:15:00
September	-0.231	12	12:15:00
October	-0.272	5	03:30:00
November	-0.292	14	21:15:00
December	-0.359	21	23:45:00

Extreme Maxima	Value	Day	Time
January	7.459	20	07:00:00
February	7.451	19	07:45:00
March	7.519	20	07:30:00
April	7.517	18	07:00:00
May	7.477	17	19:00:00
June	7.038	14	18:00:00
July	7.076	15	19:30:00
August	7.24	29	19:30:00
September	7.529	27	19:00:00
October	6.947	9	17:45:00
November	6.629	9	19:00:00
December	5.936	12	21:15:00

Extreme Minima	Value	Day	Time
January	0.881	31	11:45:00
February	0.593	17	12:45:00
March	0.039	20	13:45:00
April	0.077	18	13:30:00
May	0.486	17	00:45:00
June	0.678	16	01:15:00
July	0.944	15	01:15:00
August	0.551	31	02:30:00
September	0.288	28	01:30:00
October	0.232	26	00:30:00
November	0.453	24	00:00:00
December	0.564	24	13:00:00

Mean Sea Level	No Days	MSL
January	31	3.888
February	28	3.844
March	31	3.883
April	30	3.866
May	31	3.849
June	30	3.891
July	26	3.879
August	24	3.821
September	27	3.821
October	16	3.857
November	4	3.911
December	-	-
	Sum	Avg
	278	3.865

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: The site was levelled in 2003. There were no changes in the bench mark values from the previous levelling.

T.G.I. visits to site:

Day 092	TGI at site to repair chart recorder.
Day 190	TGI at site - general maintenance.
Day 232	TGI on site.
Day 328-330	Data set short as TGI on site. Structure erected on sea bed to house pps whilst pier is refurbished. There are no levelling differences.
Day 357	TGI on site to fit new modem.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
91	15 minutes	092,217-232,329-330,343-357	None

Statistics:

Surge Maxima	Value	Day	Time
January	0.852	17	04:15:00
February	0.579	10	15:00:00
March	0.657	9	14:00:00
April	0.53	28	08:30:00
May	0.769	3	22:30:00
June	0.629	6	01:30:00
July	0.434	23	15:45:00
August	0.43	21	15:30:00
September	0.339	21	23:15:00
October	0.247	5	19:45:00
November	0.833	2	01:00:00
December	0.774	31	19:00:00

Surge Minima	Value	Day	Time
January	-1.019	30	22:15:00
February	-0.491	4	16:45:00
March	-0.532	12	08:45:00
April	-0.256	20	01:15:00
May	-0.247	8	15:00:00
June	-0.075	15	22:30:00
July	-0.126	16	08:45:00
August	-0.163	29	06:30:00
September	-0.232	23	12:30:00
October	-0.376	22	22:45:00
November	-0.299	15	02:30:00
December	-0.6	2	00:15:00

Extreme Maxima	Value	Day	Time
January	4.04	20	13:15:00
February	3.786	19	13:45:00
March	3.852	4	13:30:00
April	3.704	1	12:15:00
May	3.735	19	02:00:00
June	3.688	6	03:15:00
July	3.58	18	03:00:00
August	3.634	1	01:45:00
September	3.824	29	02:00:00
October	3.739	29	02:15:00
November	3.915	25	00:30:00
December	4.032	26	14:00:00

Extreme Minima	Value	Day	Time
January	-0.175	30	16:30:00
February	0.128	17	18:15:00
March	-0.102	20	19:00:00
April	-0.045	18	18:45:00
May	0.126	14	16:00:00
June	0.156	16	06:45:00
July	0.198	16	07:30:00
August	0.11	29	06:30:00
September	0.12	27	06:00:00
October	0.011	26	05:30:00
November	0.242	24	05:00:00
December	0.224	2	00:30:00

Mean Sea Level	No Days	MSL
January	31	2.035
February	28	1.964
March	31	1.994
April	28	1.966
May	31	2.023
June	30	2.046
July	31	2.02
August	14	1.959
September	30	1.998
October	31	1.974
November	27	2.171
December	15	1.944
	Sum	Avg
	327	2.008

Moray Firth Tide Gauge

Latitude: 57° 35' 55.3" N
Longitude: 04° 00' 10.1" W
Grid Reference: NH 8040 5829

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	N/A	Concrete corner of compound (JC 1)
Aux 1	N/A	Sheet piling quay edge (SP5)
Aux 2	N/A	Top of steelwork above pressure point
Aux 3	N/A	Bolt corner of light tower

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.10m below Ordnance Datum Newlyn (ODN)
TGZ = 6.619m below TGBM

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

Levelling information: No levelling was carried out in 2003.

T.G.I. visits to site: Day 065 TGI at site - changed compressor.
Day 138 TGI at site - general maintenance.

Data quality:

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

Statistics:

Surge Maxima	Value	Day	Time
January	0.672	15	19:30:00
February	0.444	24	02:00:00
March	0.539	10	22:15:00
April	0.579	1	07:45:00
May	0.53	4	20:30:00
June	0.547	18	22:15:00
July	0.327	25	02:45:00
August	0.432	21	17:15:00
September	0.386	17	22:15:00
October	0.357	8	12:45:00
November	0.553	2	14:45:00
December	0.518	13	08:30:00

Surge Minima	Value	Day	Time
January	-0.627	31	05:00:00
February	-0.4	4	22:00:00
March	-0.397	12	18:30:00
April	-0.327	17	19:45:00
May	-0.165	25	11:00:00
June	-0.016	29	15:00:00
July	-0.141	5	11:30:00
August	-0.214	25	05:45:00
September	-0.341	24	06:30:00
October	-0.33	26	07:15:00
November	-0.33	29	23:30:00
December	-0.595	22	05:30:00

Extreme Maxima	Value	Day	Time
January	4.662	20	13:15:00
February	4.754	19	13:45:00
March	4.695	20	13:30:00
April	4.712	1	12:00:00
May	4.815	18	13:45:00
June	4.514	15	12:30:00
July	4.433	16	01:30:00
August	4.562	31	02:15:00
September	4.839	29	01:45:00
October	4.823	28	01:15:00
November	4.953	25	00:30:00
December	4.756	25	13:15:00

Extreme Minima	Value	Day	Time
January	0.693	31	18:00:00
February	0.472	20	21:15:00
March	0.127	20	20:15:00
April	0.098	17	19:00:00
May	0.405	15	17:45:00
June	0.665	16	07:15:00
July	0.627	16	07:45:00
August	0.391	30	07:45:00
September	0.285	27	06:45:00
October	0.185	26	06:30:00
November	0.516	24	05:45:00
December	0.485	22	05:00:00

Mean Sea Level	No Days	MSL
January	31	2.666
February	28	2.555
March	31	2.537
April	30	2.505
May	31	2.571
June	30	2.608
July	31	2.581
August	31	2.557
September	30	2.613
October	31	2.595
November	30	2.712
December	31	2.613
	Sum	Avg
	365	2.593

Mumbles (West Glamorgan) Tide Gauge

Latitude: 51° 34' 12.0" N
Longitude: 03° 58' 31.6" 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 2003.

T.G.I. visits to site:
Day 219 TGI on site - compressor problems.
Day 260 TGI at site. New datalogger board, battery and compressor. New software fitted.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
97	15 minutes	249-260	048-057,199-224

Statistics:

Surge Maxima	Value	Day	Time
January	0.578	20	17:45:00
February	0.436	28	14:45:00
March	0.752	7	15:30:00
April	0.558	28	02:30:00
May	0.451	3	14:30:00
June	0.344	30	02:45:00
July	0.3	1	04:00:00
August	0.309	21	20:15:00
September	0.272	22	04:15:00
October	0.504	30	19:30:00
November	0.82	14	13:00:00
December	0.446	20	10:45:00

Surge Minima	Value	Day	Time
January	-0.856	30	15:15:00
February	-0.425	1	10:00:00
March	-0.542	12	02:15:00
April	-0.31	8	12:45:00
May	-0.291	6	11:30:00
June	-0.307	20	14:45:00
July	-0.266	16	12:00:00
August	-0.284	13	11:15:00
September	-0.314	18	00:30:00
October	-0.546	23	00:30:00
November	-0.343	17	00:30:00
December	-0.508	22	00:45:00

Extreme Maxima	Value	Day	Time
January	9.858	20	07:15:00
February	9.906	19	08:00:00
March	10.122	20	07:30:00
April	10.143	17	18:45:00
May	10.042	17	19:15:00
June	9.547	14	18:15:00
July	9.537	15	19:30:00
August	9.826	29	19:30:00
September	10.142	28	19:45:00
October	10.144	26	18:45:00
November	10.124	26	07:30:00
December	9.758	26	08:15:00

Extreme Minima	Value	Day	Time
January	1.23	31	11:30:00
February	0.774	18	01:00:00
March	0.174	21	02:00:00
April	0.224	18	01:00:00
May	0.67	17	00:30:00
June	0.957	15	00:15:00
July	1.236	15	01:00:00
August	0.859	30	13:45:00
September	0.507	28	01:15:00
October	0.45	27	13:15:00
November	0.747	24	12:00:00
December	0.902	24	12:45:00

Mean Sea Level	No Days	MSL
January	31	5.207
February	17	5.12
March	31	5.174
April	30	5.184
May	31	5.191
June	30	5.222
July	16	5.18
August	19	5.232
September	17	5.216
October	31	5.219
November	30	5.321
December	31	5.208
	Sum	Avg
	314	5.206

Newlyn Tide Gauge

Latitude: 50° 06' 10.8" N
Longitude: 05° 32' 34.2" 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 2003.

T.G.I. visits to site: Day 307 TGI on site - new software installed.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	307	007

Statistics:

Surge Maxima	Value	Day	Time
January	0.624	2	06:45:00
February	0.425	28	13:00:00
March	0.3	7	13:45:00
April	0.475	28	02:45:00
May	0.424	2	02:45:00
June	0.353	30	13:45:00
July	0.329	1	00:45:00
August	0.262	27	15:00:00
September	0.25	22	00:30:00
October	0.522	31	05:45:00
November	0.42	2	06:15:00
December	0.343	27	18:00:00

Surge Minima	Value	Day	Time
January	-0.459	29	10:15:00
February	-0.217	1	00:15:00
March	-0.146	20	08:45:00
April	-0.175	4	08:45:00
May	-0.152	6	18:30:00
June	-0.09	20	02:30:00
July	-0.08	11	08:00:00
August	-0.092	7	05:15:00
September	-0.184	12	10:15:00
October	-0.215	8	19:00:00
November	-0.196	17	21:30:00
December	-0.272	22	10:45:00

Extreme Maxima	Value	Day	Time
January	6.004	21	06:30:00
February	6.001	19	06:15:00
March	5.863	20	06:00:00
April	5.938	17	04:45:00
May	5.849	17	17:30:00
June	5.619	16	18:15:00
July	5.708	15	18:00:00
August	5.839	29	17:45:00
September	5.955	28	18:15:00
October	5.941	26	17:00:00
November	6.035	26	05:45:00
December	5.835	26	06:30:00

Extreme Minima	Value	Day	Time
January	0.849	31	10:30:00
February	0.623	17	11:30:00
March	0.182	20	12:45:00
April	0.332	18	12:15:00
May	0.576	16	11:15:00
June	0.706	14	23:00:00
July	0.925	15	00:00:00
August	0.681	31	01:15:00
September	0.479	28	00:15:00
October	0.46	25	23:00:00
November	0.63	23	22:45:00
December	0.597	24	11:30:00

Mean Sea Level	No Days	MSL
January	31	3.23
February	28	3.184
March	31	3.208
April	30	3.234
May	31	3.191
June	30	3.246
July	31	3.233
August	31	3.231
September	30	3.231
October	31	3.299
November	30	3.333
December	31	3.257
	Sum	Avg
	365	3.24

Newhaven (Sussex) Tide Gauge

Latitude: 50° 46' 54.4" 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 2003.

T.G.I. visits to site:

Day 043	TGI at site to fit wind speed and direction instruments for harbour authorities.
Day 157	TGI at site - compressor changed. Site met instruments investigated. Anemometer useless.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
97	15 minutes	203-211,364	019,112

Statistics:

Surge Maxima	Value	Day	Time
January	0.739	2	09:00:00
February	0.373	5	00:00:00
March	0.366	7	14:30:00
April	0.505	1	22:00:00
May	0.633	2	17:15:00
June	0.341	30	07:00:00
July	0.346	2	11:15:00
August	0.289	22	14:15:00
September	0.281	23	04:30:00
October	0.5	7	17:30:00
November	0.657	3	05:30:00
December	0.604	21	16:45:00

Surge Minima	Value	Day	Time
January	-0.408	31	20:30:00
February	-0.332	15	20:30:00
March	-0.49	13	06:00:00
April	-0.334	19	23:00:00
May	-0.211	11	06:15:00
June	-0.283	22	23:45:00
July	-0.149	18	19:15:00
August	-0.161	13	18:30:00
September	-0.31	24	07:30:00
October	-0.527	23	07:00:00
November	-0.528	15	02:00:00
December	-0.55	7	01:15:00

Extreme Maxima	Value	Day	Time
January	7.23	2	10:15:00
February	6.888	20	01:15:00
March	7.088	21	01:00:00
April	7.1	17	23:45:00
May	7.032	16	23:30:00
June	6.788	16	00:00:00
July	6.702	16	12:45:00
August	6.984	30	13:00:00
September	7.172	28	12:30:00
October	7.187	26	11:15:00
November	7.065	25	11:45:00
December	6.827	26	00:45:00

Extreme Minima	Value	Day	Time
January	0.753	31	17:00:00
February	0.412	19	19:15:00
March	0.19	20	19:00:00
April	0.249	18	06:15:00
May	0.435	17	05:45:00
June	0.604	15	05:30:00
July	0.801	15	06:15:00
August	0.669	31	07:30:00
September	0.447	28	06:30:00
October	0.416	27	06:15:00
November	0.563	24	17:30:00
December	0.549	24	18:00:00

Mean Sea Level	No Days	MSL
January	29	3.688
February	28	3.554
March	31	3.572
April	27	3.609
May	31	3.612
June	30	3.649
July	20	3.65
August	31	3.649
September	30	3.649
October	31	3.699
November	30	3.709
December	30	3.678
	Sum	Avg
	348	3.643

Newport (Wales) Tide Gauge

Latitude: 51° 33' 00.0" N
Longitude: 02° 59' 14.8" 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 2003.

T.G.I. visits to site: Day 261 TGI visit to fit new software.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	261	298-299,343

Statistics:

Surge Maxima	Value	Day	Time
January	0.863	21	04:30:00
February	0.597	28	18:15:00
March	1.29	7	17:15:00
April	0.834	29	01:15:00
May	1.056	5	04:15:00
June	0.938	3	16:30:00
July	0.8	1	15:45:00
August	0.649	21	19:15:00
September	0.876	19	18:30:00
October	0.807	18	18:00:00
November	1.692	14	15:45:00
December	0.868	20	12:00:00

Surge Minima	Value	Day	Time
January	-1.183	30	12:30:00
February	-0.687	13	21:00:00
March	-0.951	13	02:15:00
April	-1.025	19	16:30:00
May	-0.723	14	00:00:00
June	-0.612	13	13:00:00
July	-0.524	11	23:45:00
August	-0.525	31	16:45:00
September	-0.788	27	15:30:00
October	-0.929	27	15:45:00
November	-0.699	23	01:00:00
December	-0.773	22	00:15:00

Extreme Maxima	Value	Day	Time
January	12.368	20	08:15:00
February	12.468	19	08:45:00
March	12.927	20	08:30:00
April	12.931	17	19:45:00
May	12.741	17	20:00:00
June	12.144	15	19:45:00
July	11.977	15	20:30:00
August	12.37	30	21:00:00
September	13.048	28	20:45:00
October	13.013	26	19:45:00
November	12.816	26	08:30:00
December	12.461	25	08:15:00

Extreme Minima	Value	Day	Time
January	0.593	31	13:15:00
February	0.261	18	03:15:00
March	0.188	19	15:30:00
April	0.094	19	16:30:00
May	0.324	15	13:30:00
June	0.396	15	02:15:00
July	0.527	15	02:45:00
August	0.248	30	03:45:00
September	0.1	27	03:00:00
October	0.127	27	03:15:00
November	0.224	24	14:15:00
December	0.414	24	02:15:00

Mean Sea Level	No Days	MSL
January	31	6.02
February	28	5.937
March	31	5.99
April	30	6.02
May	31	6.043
June	30	6.056
July	31	6.068
August	31	6.038
September	29	6.093
October	31	6.14
November	30	6.241
December	31	6.108
	Sum	Avg
	364	6.063

North Shields (Tyne and Wear) Tide Gauge

Latitude: 55° 00' 26.8" N
Longitude: 01°26' 23.2" 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 2003.

T.G.I. visits to site: Day 176 TGI at site checking gauge.
Day 182-189 Munro - well cleaned and wire recalibrated.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	098	162-176

Statistics:

Surge Maxima	Value	Day	Time
January	0.799	16	00:15:00
February	0.444	24	06:15:00
March	0.513	12	00:30:00
April	0.664	1	14:00:00
May	0.561	8	16:15:00
June	0.276	9	05:30:00
July	0.35	1	23:30:00
August	0.352	22	15:45:00
September	0.422	22	19:30:00
October	0.648	8	20:00:00
November	0.578	19	02:00:00
December	0.834	21	04:30:00

Surge Minima	Value	Day	Time
January	-0.485	31	19:15:00
February	-0.348	16	07:30:00
March	-0.317	4	11:15:00
April	-0.2	6	06:30:00
May	-0.366	8	04:30:00
June	-0.039	1	06:45:00
July	-0.058	31	07:00:00
August	-0.128	5	08:00:00
September	-0.26	13	08:30:00
October	-0.261	15	06:15:00
November	-0.386	29	22:15:00
December	-0.884	31	23:30:00

Extreme Maxima	Value	Day	Time
January	5.431	2	14:45:00
February	5.362	19	17:00:00
March	5.455	20	16:45:00
April	5.49	1	15:15:00
May	5.392	16	15:15:00
June	4.86	2	04:30:00
July	5.155	16	04:45:00
August	5.426	30	04:45:00
September	5.564	28	04:15:00
October	5.534	28	04:45:00
November	5.567	26	04:15:00
December	5.463	27	18:00:00

Extreme Minima	Value	Day	Time
January	0.442	24	01:30:00
February	0.279	21	00:30:00
March	-0.015	19	22:45:00
April	-0.079	17	22:15:00
May	0.192	15	21:00:00
June	1.046	10	18:00:00
July	0.599	16	11:30:00
August	0.462	30	11:15:00
September	0.265	27	10:15:00
October	0.174	26	09:45:00
November	0.445	24	09:30:00
December	0.716	23	21:30:00

Mean Sea Level	No Days	MSL
January	31	3.105
February	28	2.895
March	31	2.904
April	30	2.894
May	31	2.926
June	14	3.005
July	31	2.999
August	31	2.991
September	30	3.009
October	31	3.052
November	30	3.055
December	31	3.058
	Sum	Avg
	349	2.991

Portpatrick (Scotland) Tide Gauge

Latitude: 54° 50' 33.2" 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 2003.

T.G.I. visits to site: Day 190 TGI at site. Ch2 was useless due to blown fuse.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	100,109-133,179-190

Statistics:

Surge Maxima	Value	Day	Time
January	0.856	17	03:45:00
February	0.55	10	16:15:00
March	0.627	9	14:30:00
April	0.471	1	07:45:00
May	0.323	18	18:15:00
June	0.515	6	01:15:00
July	0.347	23	16:00:00
August	0.335	21	16:15:00
September	0.383	22	00:30:00
October	0.206	5	21:15:00
November	0.762	2	01:15:00
December	0.679	31	20:45:00

Surge Minima	Value	Day	Time
January	-0.95	30	20:45:00
February	-0.334	4	08:30:00
March	-0.437	12	08:15:00
April	-0.182	5	06:15:00
May	-0.163	14	08:30:00
June	-0.065	15	21:00:00
July	-0.074	12	04:00:00
August	-0.143	7	14:15:00
September	-0.214	23	10:30:00
October	-0.353	5	05:15:00
November	-0.301	15	01:30:00
December	-0.667	21	20:30:00

Extreme Maxima	Value	Day	Time
January	4.427	20	12:45:00
February	4.26	19	13:15:00
March	4.256	4	12:30:00
April	4.143	1	11:30:00
May	4.216	18	13:00:00
June	4.005	17	01:15:00
July	4.007	18	02:15:00
August	4.042	31	01:30:00
September	4.276	29	01:00:00
October	4.184	29	01:30:00
November	4.38	26	00:30:00
December	4.507	26	13:30:00

Extreme Minima	Value	Day	Time
January	-0.089	30	16:15:00
February	0.132	17	18:00:00
March	-0.137	20	19:00:00
April	-0.052	18	18:30:00
May	0.107	14	16:00:00
June	0.21	16	06:30:00
July	0.28	15	06:30:00
August	0.159	29	06:15:00
September	0.114	27	06:00:00
October	-0.016	26	05:30:00
November	0.216	24	05:00:00
December	0.054	22	03:45:00

Mean Sea Level	No Days	MSL
January	31	2.196
February	28	2.129
March	31	2.16
April	16	2.073
May	18	2.148
June	27	2.205
July	21	2.208
August	31	2.118
September	30	2.16
October	31	2.159
November	30	2.342
December	31	2.186
	Sum	Avg
	325	2.174

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 2003.

T.G.I. visits to site: Day 350 TGI on site. Channels swapped but datums adjusted so there is no shift. Present Ch2 still to be used as primary. Blockage (now on Ch1) partially removed. Divers needed.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	315,350	308-350

Statistics:

Surge Maxima	Value	Day	Time
January	0.526	17	06:00:00
February	0.403	10	16:00:00
March	0.557	11	03:00:00
April	0.476	1	06:45:00
May	0.667	8	00:15:00
June	0.506	10	14:30:00
July	0.358	23	16:00:00
August	0.359	21	14:30:00
September	0.259	21	23:15:00
October	0.244	6	00:45:00
November	0.559	2	01:15:00
December	0.486	31	23:45:00

Surge Minima	Value	Day	Time
January	-0.719	30	22:15:00
February	-0.386	4	15:45:00
March	-0.384	12	08:30:00
April	-0.225	5	05:15:00
May	-0.168	14	05:00:00
June	-0.066	20	12:30:00
July	-0.14	30	07:45:00
August	-0.195	25	14:45:00
September	-0.236	23	15:00:00
October	-0.315	23	07:30:00
November	-0.18	4	01:45:00
December	-0.645	21	20:15:00

Extreme Maxima	Value	Day	Time
January	2.499	21	08:30:00
February	2.545	19	07:45:00
March	2.507	5	08:00:00
April	2.561	1	06:30:00
May	2.448	17	19:30:00
June	2.281	16	19:45:00
July	2.322	31	20:00:00
August	2.332	12	19:00:00
September	2.483	25	18:00:00
October	2.453	9	18:00:00
November	2.463	2	14:30:00
December	2.532	26	08:30:00

Extreme Minima	Value	Day	Time
January	-0.004	30	23:30:00
February	0.198	18	01:00:00
March	-0.035	21	01:45:00
April	-0.036	18	00:45:00
May	0.146	14	11:15:00
June	0.345	15	13:00:00
July	0.36	30	12:45:00
August	0.132	29	13:15:00
September	0.14	27	12:45:00
October	0.105	26	12:15:00
November	0.852	3	23:00:00
December	0.016	21	22:45:00

Mean Sea Level	No Days	MSL
January	31	1.344
February	28	1.246
March	31	1.269
April	30	1.242
May	31	1.296
June	30	1.339
July	31	1.31
August	31	1.256
September	30	1.3
October	31	1.306
November	2	1.665
December	14	1.31
	Sum	Avg
	320	1.324

Portsmouth (Hampshire) Tide Gauge

Latitude: 50° 48' 07.9" N
Longitude: 01° 06' 40.2" W
Grid Reference: SU 6269 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 2003.

T.G.I. visits to site: Day 223 Channel 2 altered by TGI.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	203-210	364-365

Statistics:

Surge Maxima	Value	Day	Time
January	0.804	2	12:30:00
February	0.513	28	18:00:00
March	0.514	7	19:45:00
April	0.573	28	08:15:00
May	0.79	2	16:15:00
June	0.364	30	07:15:00
July	0.342	1	11:30:00
August	0.239	30	02:45:00
September	0.266	23	05:15:00
October	0.445	7	17:30:00
November	0.656	3	06:00:00
December	0.505	21	16:45:00

Surge Minima	Value	Day	Time
January	-0.373	31	16:15:00
February	-0.295	1	00:15:00
March	-0.382	13	06:45:00
April	-0.238	4	05:30:00
May	-0.177	7	09:45:00
June	-0.072	19	03:45:00
July	-0.105	8	22:45:00
August	-0.164	25	02:30:00
September	-0.263	3	20:45:00
October	-0.435	23	10:15:00
November	-0.511	15	04:45:00
December	-0.555	7	02:30:00

Extreme Maxima	Value	Day	Time
January	5.354	2	10:30:00
February	4.857	20	01:30:00
March	4.916	21	01:15:00
April	4.978	1	23:45:00
May	4.993	18	00:15:00
June	4.804	14	23:15:00
July	4.782	16	00:45:00
August	4.846	30	13:15:00
September	4.981	28	12:45:00
October	4.998	26	11:30:00
November	5.121	26	12:30:00
December	4.907	26	13:15:00

Extreme Minima	Value	Day	Time
January	0.646	31	16:15:00
February	0.385	17	17:15:00
March	0.156	20	18:15:00
April	0.256	18	17:45:00
May	0.525	17	05:00:00
June	0.615	15	04:45:00
July	0.778	16	06:00:00
August	0.544	31	06:45:00
September	0.355	28	05:45:00
October	0.342	27	05:15:00
November	0.508	24	16:30:00
December	0.505	24	17:15:00

Mean Sea Level	No Days	MSL
January	31	2.943
February	28	2.83
March	31	2.855
April	30	2.886
May	31	2.885
June	30	2.923
July	21	2.92
August	31	2.878
September	30	2.853
October	31	2.903
November	30	2.922
December	29	2.887
	Sum	Avg
	353	2.89

Sheerness (Kent) Tide Gauge

Latitude: 51° 26' 44.3" N
Longitude: 00° 44' 36.4" 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 2003.

T.G.I. visits to site: Day 245 Gap in data due to site visit. New software and general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	245	None

Statistics:

Surge Maxima	Value	Day	Time
January	1.74	30	18:15:00
February	1.134	4	22:00:00
March	0.953	12	14:00:00
April	1.045	2	21:00:00
May	0.822	9	02:00:00
June	0.59	19	12:30:00
July	0.587	2	09:45:00
August	0.62	14	22:30:00
September	0.895	23	05:30:00
October	1.39	7	19:15:00
November	0.644	4	06:15:00
December	1.586	15	00:15:00

Surge Minima	Value	Day	Time
January	-0.587	16	22:00:00
February	-0.681	1	07:45:00
March	-0.657	4	21:15:00
April	-0.308	1	14:30:00
May	-0.416	8	08:15:00
June	-0.347	10	18:30:00
July	-0.342	25	18:30:00
August	-0.262	21	21:30:00
September	-0.346	24	10:00:00
October	-0.603	6	05:30:00
November	-0.943	14	23:45:00
December	-0.793	13	00:00:00

Extreme Maxima	Value	Day	Time
January	6.237	3	00:15:00
February	6.011	20	15:00:00
March	6.135	20	14:00:00
April	6.25	2	13:15:00
May	6.047	19	02:15:00
June	5.999	16	01:30:00
July	5.956	16	02:00:00
August	6.244	30	02:00:00
September	6.312	27	01:00:00
October	6.397	8	23:45:00
November	6.185	24	00:00:00
December	6.263	21	10:30:00

Extreme Minima	Value	Day	Time
January	0.254	24	11:00:00
February	0.1	1	06:45:00
March	0.149	20	08:15:00
April	0.182	18	07:45:00
May	0.206	17	07:30:00
June	0.461	18	22:00:00
July	0.411	17	21:45:00
August	0.623	1	21:15:00
September	0.386	13	20:45:00
October	0.309	26	19:15:00
November	0.418	26	20:30:00
December	0.258	23	06:15:00

Mean Sea Level	No Days	MSL
January	31	3.166
February	28	2.988
March	31	3.009
April	30	3.058
May	31	2.986
June	30	3.09
July	31	3.077
August	31	3.191
September	27	3.122
October	31	3.227
November	30	3.06
December	31	3.13
	Sum	Avg
	362	3.092

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

Latitude: 49° 55' 04.2" N
Longitude: 06° 19' 02.1" 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 2003.

T.G.I. visits to site: Day 308-309 TGI on site - new software. Gap in data due to visit.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	291-294,308-309	None

Statistics:

Surge Maxima	Value	Day	Time
January	0.54	2	03:45:00
February	0.334	28	12:45:00
March	0.322	7	14:30:00
April	0.412	27	23:30:00
May	0.344	2	01:30:00
June	0.32	30	13:15:00
July	0.296	1	03:45:00
August	0.207	27	15:30:00
September	0.23	22	02:00:00
October	0.445	31	06:30:00
November	0.409	2	06:30:00
December	0.284	27	18:30:00

Surge Minima	Value	Day	Time
January	-0.416	29	09:45:00
February	-0.237	1	09:30:00
March	-0.137	12	12:45:00
April	-0.193	3	20:30:00
May	-0.163	6	19:00:00
June	-0.086	20	13:45:00
July	-0.064	11	19:45:00
August	-0.087	31	21:45:00
September	-0.178	9	06:45:00
October	-0.212	8	19:00:00
November	-0.193	16	22:30:00
December	-0.287	22	19:00:00

Extreme Maxima	Value	Day	Time
January	6.106	21	06:30:00
February	6.15	19	06:15:00
March	6.067	20	06:00:00
April	6.097	18	05:30:00
May	6.012	17	17:30:00
June	5.714	16	18:00:00
July	5.761	15	18:00:00
August	5.89	29	17:45:00
September	6.062	28	18:15:00
October	6.076	26	17:00:00
November	6.103	26	06:00:00
December	5.928	26	06:30:00

Extreme Minima	Value	Day	Time
January	0.782	31	10:30:00
February	0.519	17	11:30:00
March	0.092	20	12:30:00
April	0.189	18	12:00:00
May	0.462	16	23:15:00
June	0.615	14	23:00:00
July	0.83	14	23:45:00
August	0.567	31	01:00:00
September	0.365	28	00:00:00
October	0.331	26	23:30:00
November	0.534	23	22:30:00
December	0.505	24	11:30:00

Mean Sea Level	No Days	MSL
January	31	3.211
February	28	3.183
March	31	3.205
April	30	3.199
May	31	3.161
June	30	3.213
July	31	3.194
August	31	3.17
September	30	3.17
October	26	3.23
November	28	3.305
December	31	3.225
	Sum	Avg
	358	3.206

Stornoway (Hebrides) Tide Gauge

Latitude: 58° 12' 27.8" N
Longitude: 06° 23' 20.3" W
Grid Reference: NB 4228 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: The site was levelled in 2003. There were no changes in the bench mark values from the previous levelling.

T.G.I. visits to site: There were no visits to site in 2003.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
95	15 minutes	235-254	312-316

Statistics:

Surge Maxima	Value	Day	Time
January	0.724	15	13:00:00
February	0.414	23	19:30:00
March	0.55	9	18:30:00
April	0.506	1	03:15:00
May	0.632	4	16:00:00
June	0.494	10	15:15:00
July	0.317	11	00:45:00
August	0.382	21	12:15:00
September	0.306	13	16:45:00
October	0.379	10	02:45:00
November	0.552	2	10:45:00
December	0.493	31	23:00:00

Surge Minima	Value	Day	Time
January	-0.615	31	01:00:00
February	-0.386	5	03:30:00
March	-0.32	12	14:15:00
April	-0.24	4	22:00:00
May	-0.146	14	06:00:00
June	-0.006	14	11:45:00
July	-0.094	17	13:15:00
August	-0.184	7	05:30:00
September	-0.18	23	13:00:00
October	-0.289	26	02:00:00
November	-0.169	16	01:45:00
December	-0.562	22	00:45:00

Extreme Maxima	Value	Day	Time
January	5.143	21	08:45:00
February	5.478	19	08:30:00
March	5.322	20	07:45:00
April	5.142	1	06:30:00
May	5.236	17	19:30:00
June	4.969	14	18:45:00
July	4.969	15	20:00:00
August	5.016	13	19:45:00
September	5.287	28	20:00:00
October	5.247	26	19:00:00
November	5.415	25	07:15:00
December	5.254	25	07:45:00

Extreme Minima	Value	Day	Time
January	0.643	22	16:15:00
February	0.531	20	15:30:00
March	-0.043	20	14:30:00
April	-0.051	17	13:30:00
May	0.234	15	12:15:00
June	0.615	14	12:45:00
July	0.717	16	02:30:00
August	0.648	14	02:15:00
September	0.194	28	02:00:00
October	0.033	26	01:00:00
November	0.402	24	00:45:00
December	0.489	21	23:45:00

Mean Sea Level	No Days	MSL
January	31	2.988
February	28	2.931
March	31	2.911
April	30	2.854
May	31	2.902
June	30	2.951
July	31	2.922
August	21	2.901
September	18	2.958
October	31	2.909
November	24	3.096
December	31	2.938
	Sum	Avg
	337	2.938

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 2003.

T.G.I. visits to site: Day 288 TGI on site - new compressor. Ch2 blockage examined.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
89	15 minutes	017-021,239-242,245,252-256,268-284,287-294	149-239,242-245,245-252,256-268,284-287,294-365

Statistics:

Surge Maxima	Value	Day	Time
January	0.66	15	10:14:59
February	0.423	23	13:15:00
March	0.638	11	04:44:59
April	0.532	1	00:15:00
May	0.788	8	01:44:59

Surge Minima	Value	Day	Time
January	-0.804	29	09:44:59
February	-0.39	4	14:29:59
March	-0.353	12	08:29:59
April	-0.225	5	10:15:00
May	-0.152	14	04:59:59

Extreme Maxima	Value	Day	Time
January	4.691	2	05:14:59
February	5.093	19	07:30:00
March	4.965	20	07:00:00
April	4.916	1	05:45:00
May	5.001	17	18:44:59

Extreme Minima	Value	Day	Time
January	0.518	30	23:14:59
February	0.527	21	03:00:00
March	0.121	21	01:45:00
April	0.069	18	00:44:59
May	0.462	15	23:29:59

Mean Sea Level	No Days	MSL
January	25	2.731
February	28	2.71
March	31	2.725
April	30	2.692
May	27	2.779
	Sum	Avg
	141	2.727

Ullapool (Scotland) Tide Gauge

Latitude: 57° 53' 42.9" N
Longitude: 05° 09' 29.0" 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 2003.

T.G.I. visits to site:		
	Day 064	Dataset short. TGI at site fitting DRII.
	Day 140	TGI at site. Divers cleaned pp's. General maintenance.
	Day 286	TGI site visit. New compressor, new software and general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
99	15 minutes	063-064,286	360-361,363-365

Statistics:

Surge Maxima	Value	Day	Time
January	0.832	15	12:45:00
February	0.412	10	20:15:00
March	0.633	9	18:30:00
April	0.545	1	00:15:00
May	0.577	8	03:00:00
June	0.477	10	15:30:00
July	0.295	23	18:45:00
August	0.415	21	12:00:00
September	0.328	13	16:30:00
October	0.42	10	02:15:00
November	0.555	2	10:15:00
December	0.409	13	05:15:00

Surge Minima	Value	Day	Time
January	-0.753	29	12:32:08
February	-0.47	5	03:30:00
March	-0.409	12	12:30:00
April	-0.248	4	22:00:00
May	-0.164	14	19:15:00
June	-0.06	16	13:30:00
July	-0.147	17	13:30:00
August	-0.221	25	07:15:00
September	-0.25	23	12:45:00
October	-0.326	23	06:45:00
November	-0.27	1	03:30:00
December	-0.734	22	00:30:00

Extreme Maxima	Value	Day	Time
January	5.448	21	09:15:00
February	5.768	19	08:29:59
March	5.657	20	08:00:00
April	5.53	1	06:45:00
May	5.591	17	19:45:00
June	5.296	14	19:00:00
July	5.222	15	20:15:00
August	5.281	29	20:00:00
September	5.597	28	20:15:00
October	5.568	26	19:15:00
November	5.828	25	07:15:00
December	5.597	25	08:00:00

Extreme Minima	Value	Day	Time
January	0.578	22	16:00:00
February	0.466	20	16:01:03
March	-0.062	20	14:45:00
April	-0.038	18	14:15:00
May	0.263	15	12:30:00
June	0.666	16	02:00:00
July	0.717	16	02:45:00
August	0.349	31	03:15:00
September	0.195	28	02:15:00
October	0.093	26	01:15:00
November	0.435	24	00:45:00
December	0.491	21	23:30:00

Mean Sea Level	No Days	MSL
January	31	3.152
February	28	3.094
March	27	3.064
April	30	3.023
May	31	3.081
June	30	3.124
July	31	3.085
August	31	3.037
September	30	3.098
October	28	3.086
November	30	3.278
December	25	3.111
	Sum	Avg
	352	3.103

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: The site was levelled in 2003. There were no changes in the bench mark values from the previous levelling.

T.G.I. visits to site:
Day 156 TGI at site. New battery charger and new battery fitted.
Day 274 TGI on site. New compressor and general maintenance.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
98	15 minutes	149-156	None

Statistics:

Surge Maxima	Value	Day	Time
January	0.629	2	11:30:00
February	0.455	28	16:15:00
March	0.428	7	15:15:00
April	0.539	28	09:15:00
May	0.715	2	14:30:00
June	0.33	30	02:00:00
July	0.402	25	10:15:00
August	0.232	30	01:45:00
September	0.243	22	10:45:00
October	0.51	30	16:30:00
November	0.523	2	08:15:00
December	0.441	26	16:30:00

Surge Minima	Value	Day	Time
January	-0.525	30	19:00:00
February	-0.335	1	00:00:00
March	-0.271	18	11:30:00
April	-0.229	20	01:30:00
May	-0.208	8	10:30:00
June	-0.161	13	22:45:00
July	-0.123	11	08:15:00
August	-0.145	6	21:15:00
September	-0.225	13	23:00:00
October	-0.337	23	09:30:00
November	-0.361	15	04:15:00
December	-0.417	7	00:00:00

Extreme Maxima	Value	Day	Time
January	2.84	20	08:00:00
February	2.528	19	08:30:00
March	2.437	20	08:15:00
April	2.48	17	07:00:00
May	2.491	17	20:00:00
June	2.319	16	20:30:00
July	2.402	15	20:15:00
August	2.54	29	20:15:00
September	2.574	28	20:30:00
October	2.505	26	07:00:00
November	2.725	26	07:45:00
December	2.513	26	08:45:00

Extreme Minima	Value	Day	Time
January	0.119	31	23:15:00
February	-0.108	17	15:30:00
March	-0.268	20	16:15:00
April	-0.132	17	15:15:00
May	0.069	15	14:00:00
June	0.149	15	03:00:00
July	0.284	31	04:00:00
August	0.118	31	05:00:00
September	-0.041	28	04:00:00
October	-0.033	27	03:30:00
November	0.102	24	02:30:00
December	0.084	24	15:30:00

Mean Sea Level	No Days	MSL
January	31	1.184
February	28	1.097
March	31	1.119
April	30	1.15
May	27	1.14
June	24	1.169
July	31	1.181
August	31	1.169
September	30	1.165
October	31	1.224
November	30	1.254
December	31	1.197
	Sum	Avg
	355	1.171

Whitby (Yorkshire) Tide Gauge

Latitude: 54° 29' 24.0" N
Longitude: 00° 36' 52.6" W
Grid Reference: NZ 8986 1140

Benchmarks and Benchmark relationships:

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

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

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

Levelling information: No levelling was carried out in 2003.

T.G.I. visits to site: Day 022 TGI at site. Sensors reported to be sitting on mud.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	196-203

Statistics:

Surge Maxima	Value	Day	Time
January	1.045	30	09:45:00
February	0.749	4	11:45:00
March	0.581	12	03:00:00
April	0.707	2	11:15:00
May	0.605	8	17:00:00
June	0.526	19	04:45:00
July	0.4	1	23:45:00
August	0.36	22	16:30:00
September	0.485	23	07:15:00
October	0.714	8	19:15:00
November	0.547	19	02:45:00
December	1.26	21	08:30:00

Surge Minima	Value	Day	Time
January	-0.431	31	22:00:00
February	-0.357	1	00:00:00
March	-0.365	4	11:30:00
April	-0.168	14	12:30:00
May	-0.358	8	04:00:00
June	-0.071	18	17:00:00
July	-0.078	31	07:45:00
August	-0.161	5	07:45:00
September	-0.271	13	11:00:00
October	-0.265	15	07:15:00
November	-0.432	4	16:30:00
December	-1.017	31	23:45:00

Extreme Maxima	Value	Day	Time
January	5.849	2	15:30:00
February	5.817	19	17:45:00
March	5.912	20	17:15:00
April	5.983	1	16:15:00
May	5.823	16	16:00:00
June	5.686	15	16:30:00
July	5.558	2	05:30:00
August	5.921	30	05:30:00
September	6.025	28	05:00:00
October	5.98	28	05:15:00
November	5.921	26	04:45:00
December	5.924	27	18:45:00

Extreme Minima	Value	Day	Time
January	0.641	24	02:00:00
February	0.523	21	01:00:00
March	0.22	19	23:15:00
April	0.174	17	22:45:00
May	0.434	15	21:30:00
June	0.837	16	11:15:00
July	0.941	31	11:30:00
August	0.752	31	12:30:00
September	0.5	27	10:45:00
October	0.456	26	10:15:00
November	0.648	24	09:45:00
December	0.947	24	22:45:00

Mean Sea Level	No Days	MSL
January	31	3.504
February	28	3.283
March	31	3.293
April	30	3.298
May	31	3.312
June	30	3.375
July	22	3.387
August	31	3.382
September	30	3.394
October	31	3.449
November	30	3.413
December	31	3.449
	Sum	Avg
	356	3.378

Wick (Scotland) Tide Gauge

Latitude: 58° 26' 27.5" N
Longitude: 03° 05' 11.3" 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: The site was levelled in 2003. There were no changes in the bench mark values from the previous levelling.

T.G.I. visits to site: There were no visits to site in 2003.

Data quality:

CI%	Sample Interval	Missing Data	Suspect Data
100	15 minutes	None	188-189,240

Statistics:

Surge Maxima	Value	Day	Time
January	0.725	15	18:00:00
February	0.333	24	04:00:00
March	0.549	11	02:45:00
April	0.626	1	09:00:00
May	0.57	4	20:00:00
June	0.549	18	23:00:00
July	0.325	11	08:30:00
August	0.421	21	15:45:00
September	0.338	21	20:30:00
October	0.323	10	05:45:00
November	0.512	2	16:45:00
December	0.538	13	08:00:00

Surge Minima	Value	Day	Time
January	-0.621	31	03:00:00
February	-0.265	12	03:30:00
March	-0.335	12	18:30:00
April	-0.211	6	04:30:00
May	-0.068	15	06:00:00
June	-0.003	14	14:30:00
July	-0.061	16	14:15:00
August	-0.156	25	06:45:00
September	-0.17	19	20:45:00
October	-0.274	22	06:30:00
November	-0.155	16	03:30:00
December	-0.5	22	03:45:00

Extreme Maxima	Value	Day	Time
January	3.785	17	10:30:00
February	3.833	19	13:00:00
March	3.765	20	12:45:00
April	3.909	1	11:15:00
May	3.791	18	12:45:00
June	3.732	19	02:15:00
July	3.544	16	00:45:00
August	3.639	14	00:30:00
September	3.876	29	00:45:00
October	3.905	28	00:30:00
November	4	24	23:45:00
December	3.861	25	12:30:00

Extreme Minima	Value	Day	Time
January	0.468	22	20:15:00
February	0.339	18	18:30:00
March	0.006	19	18:00:00
April	-0.017	17	17:30:00
May	0.182	15	16:30:00
June	0.503	16	06:15:00
July	0.44	16	06:45:00
August	0.247	30	06:45:00
September	0.202	27	05:45:00
October	0.088	26	05:00:00
November	0.456	24	04:30:00
December	0.284	22	03:45:00

Mean Sea Level	No Days	MSL
January	31	2.173
February	28	2.048
March	31	2.067
April	30	2.005
May	31	2.071
June	30	2.118
July	27	2.1
August	31	2.06
September	30	2.113
October	31	2.092
November	30	2.226
December	31	2.123
	Sum	Avg
	361	2.1

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 2003.

T.G.I. visits to site: There were no visits to site in 2003.

Data quality:

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

Statistics:

Surge Maxima	Value	Day	Time
January	1.167	17	05:45:00
February	0.647	10	15:30:00
March	0.813	9	12:00:00
April	0.741	1	06:00:00
May	0.862	3	21:30:00
June	0.638	10	04:30:00
July	0.524	23	16:00:00
August	0.61	21	15:30:00
September	0.655	22	01:30:00
October	0.479	6	02:45:00
November	0.855	2	02:45:00
December	0.808	31	23:30:00

Surge Minima	Value	Day	Time
January	-1.188	30	19:30:00
February	-0.369	4	18:15:00
March	-0.449	12	08:45:00
April	-0.177	19	22:15:00
May	-0.08	8	13:45:00
June	0.015	20	20:30:00
July	0.015	30	15:00:00
August	-0.083	29	10:45:00
September	-0.164	23	11:30:00
October	-0.314	5	04:30:00
November	-0.358	19	17:45:00
December	-0.812	21	23:00:00

Extreme Maxima	Value	Day	Time
January	8.735	20	12:30:00
February	8.787	19	13:00:00
March	8.887	20	12:45:00
April	8.795	18	12:15:00
May	8.873	17	12:00:00
June	8.418	17	01:00:00
July	8.371	16	00:45:00
August	8.586	31	01:15:00
September	8.972	29	01:00:00
October	8.867	26	23:45:00
November	9.028	24	23:30:00
December	8.933	26	13:30:00

Extreme Minima	Value	Day	Time
January	0.832	30	16:30:00
February	0.534	20	20:30:00
March	0.055	20	19:30:00
April	0.082	18	19:00:00
May	0.462	15	17:00:00
June	0.76	16	06:45:00
July	0.871	16	07:30:00
August	0.558	30	07:15:00
September	0.383	28	07:00:00
October	0.195	26	05:45:00
November	0.537	24	05:30:00
December	0.743	22	04:15:00

Mean Sea Level	No Days	MSL
January	31	4.557
February	28	4.483
March	31	4.525
April	30	4.494
May	31	4.57
June	30	4.581
July	31	4.567
August	31	4.49
September	30	4.534
October	31	4.508
November	30	4.718
December	31	4.551
	Sum	Avg
	365	4.548

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. This has 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.

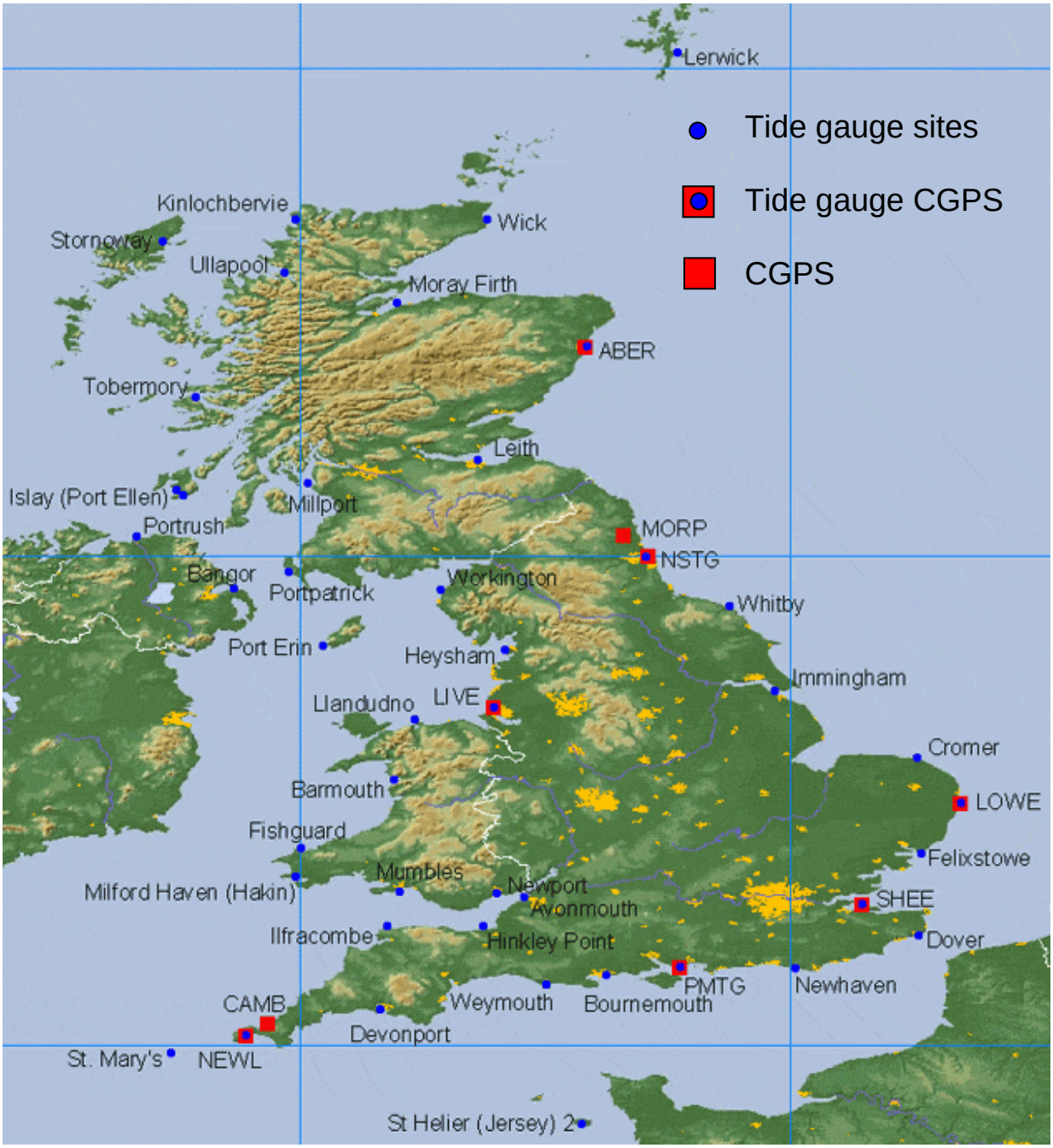
The data from the seven CGPS stations at, or close to, tide gauges are archived as part of the British Isles GPS archive Facility (BIGF), which is also operated by the IESSG at the University of Nottingham. By the end of 2003, BIGF contained data for a total of 55 CGPS stations, some of which are also used to help to understand vertical land movements at non-coastal locations in the British Isles.

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

This report includes copies of the log files for the seven 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 in Europe that form part of the IGS global 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. 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.



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           : 1998-09-30T00:00Z
     Date Removed             : 1999-08-15T23:59Z
     Temperature Stabiliz.    : NONE
```

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     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)
```

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     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)    :
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       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Additional Information   : (multiple lines)


12.  Responsible Agency (if different from 11.)

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


13.  More Information

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

ASH700936F_C


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

  <--                      0.3794                      -->


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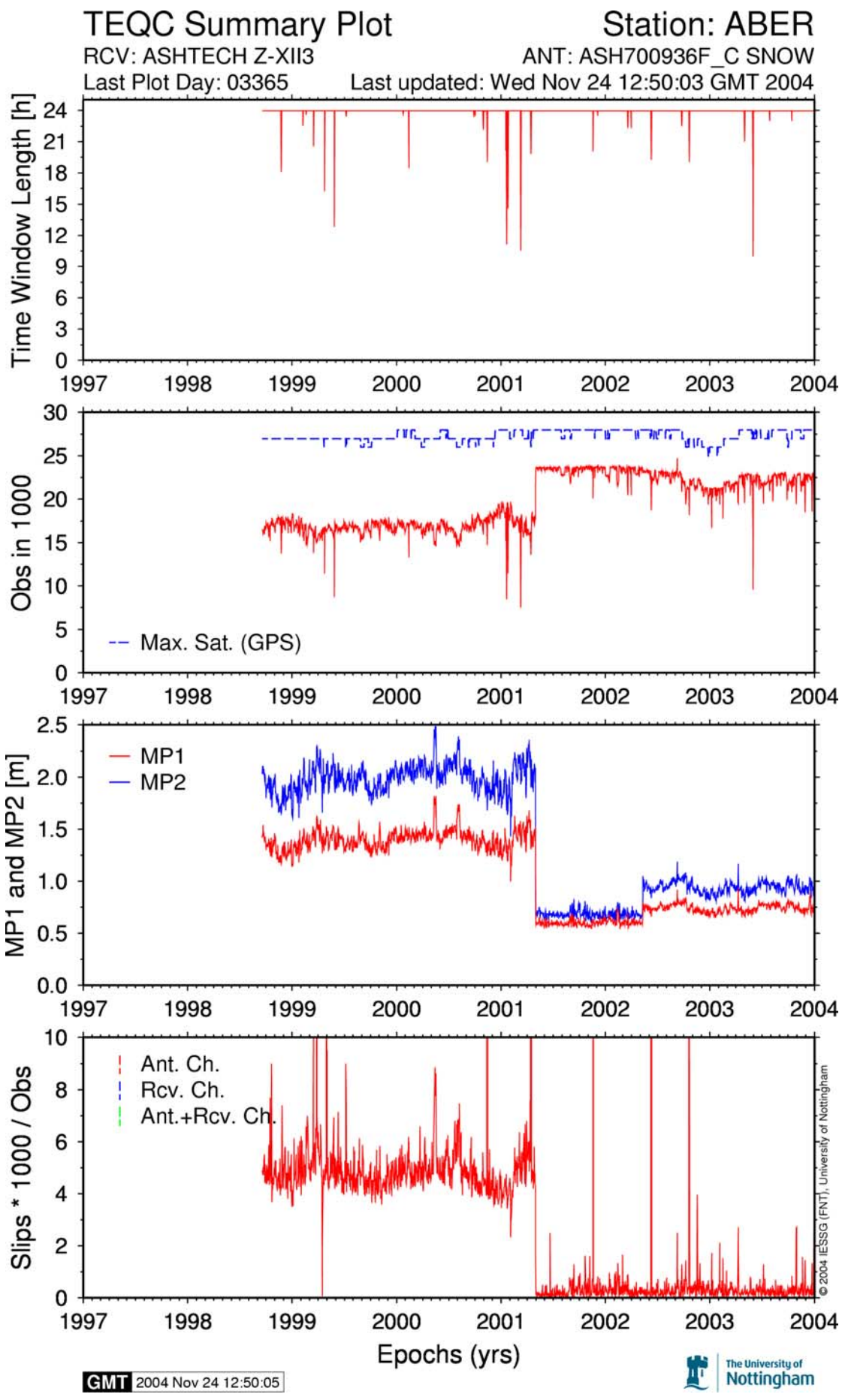


TEQC Summary Plot
Station: ABER
RCV: ASHTECH Z-XII3
ANT: ASH700936F_C SNOW
Last Plot Day: 03365
Last updated: Wed Nov 24 12:50:03 GMT 2004
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
© 2004 IESSG (FNT), University of Nottingham
Epochs (yrs)
GMT 2004 Nov 24 12:50:05
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            : 2001-12-12
     Report Type              : NEW
     If Update:
      Previous Site Log       :
      Modified/Added Sections :


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             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is CR 14774.

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

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


10.  Local Episodic Effects Possibly Affecting Data Quality

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

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


11.  On-Site, Point of Contact Agency Information

     Agency                   : Mersey Docks and Harbour Company
     Preferred Abbreviation   : (A10)
     Mailing Address          : Maritime Centre
                              : Port of Liverpool
                              : Merseyside L21 1LA
                              : UK
     Primary Contact
       Contact Name           : Marine Operations Manager
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           :
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Additional Information   : (multiple lines)
```

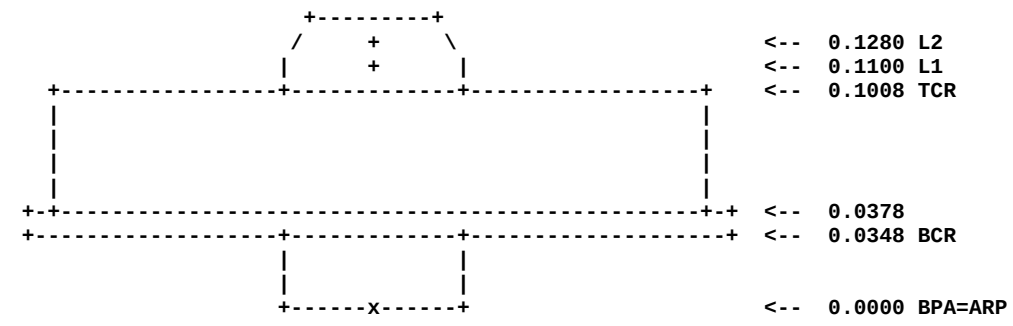
12. Responsible Agency (if different from 11.)

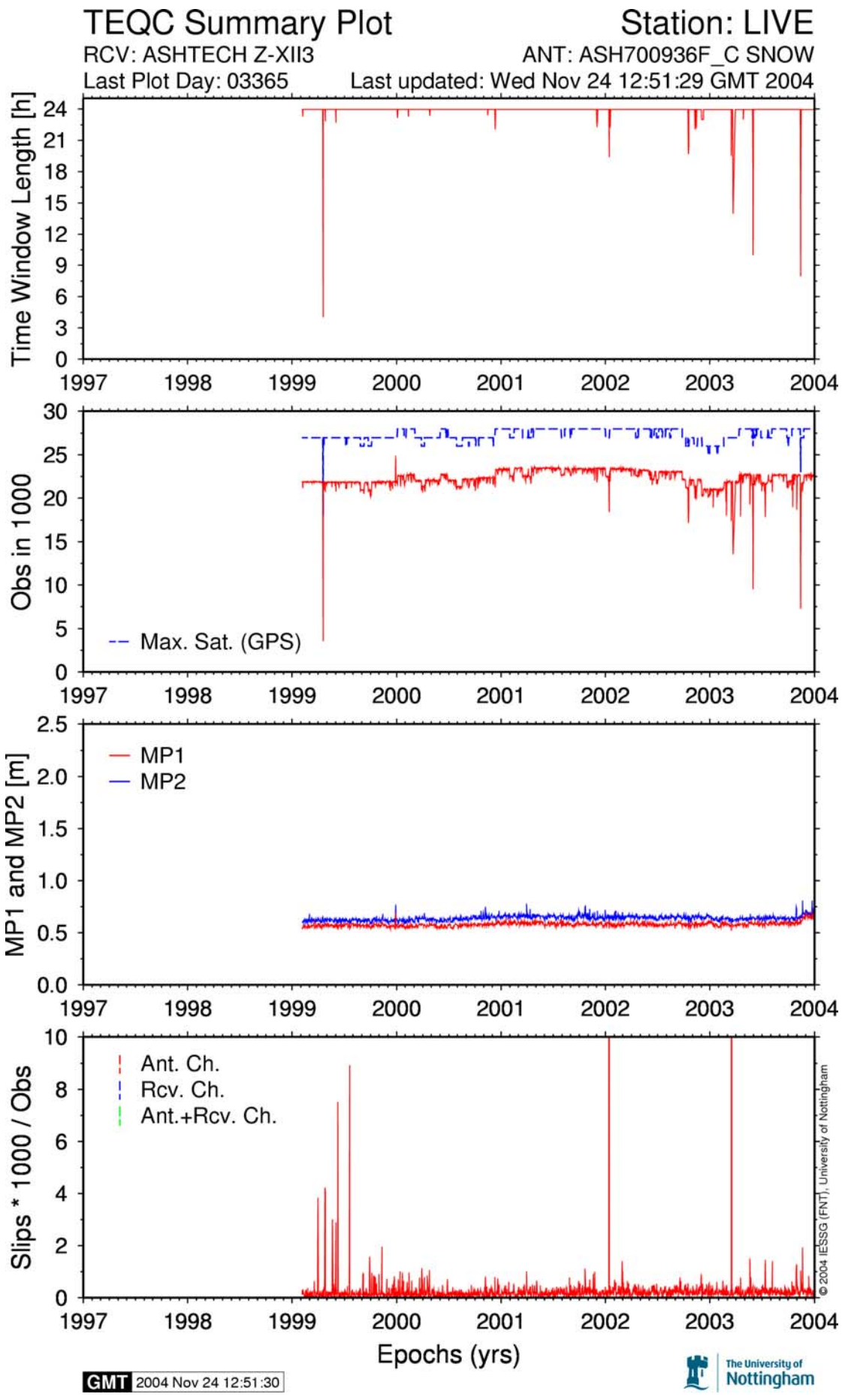
Agency	: IESSG
Preferred Abbreviation	: IESSG
Mailing Address	: University of Nottingham
	: University Park
	: Nottingham NG72RD
	: UK
Primary Contact	
Contact Name	: Richard Bingley
Telephone (primary)	: +44 (0)115 9513932
Telephone (secondary)	: +44 (0)115 9513880
Fax	: +44 (0)115 9513881
E-mail	: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

13. More Information

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

ASH700936F_C




TEQC Summary Plot
Station: LIVE
RCV: ASHTECH Z-XII3
ANT: ASH700936F_C SNOW
Last Plot Day: 03365
Last updated: Wed Nov 24 12:51:29 GMT 2004
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.
© 2004 IESSG (FNT), University of Nottingham
Epochs (yrs)
GMT 2004 Nov 24 12:51:30
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)
```

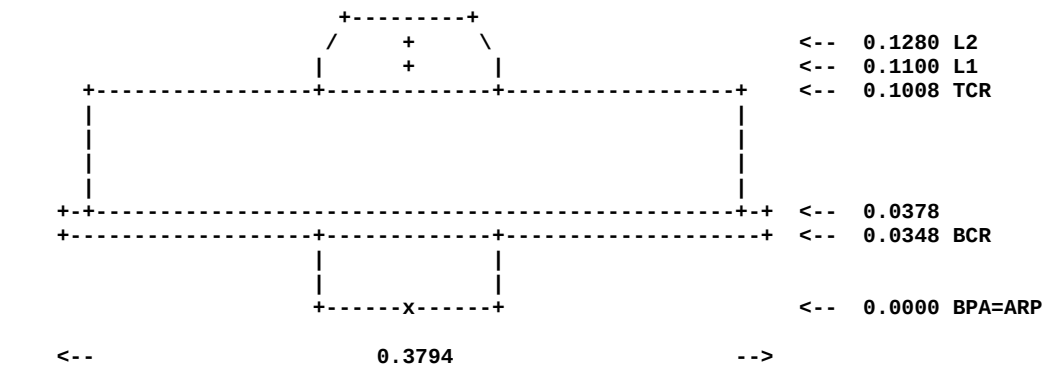
12. Responsible Agency (if different from 11.)

```
     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 Environment, Food
                               : and Rural Affairs (Defra)
```

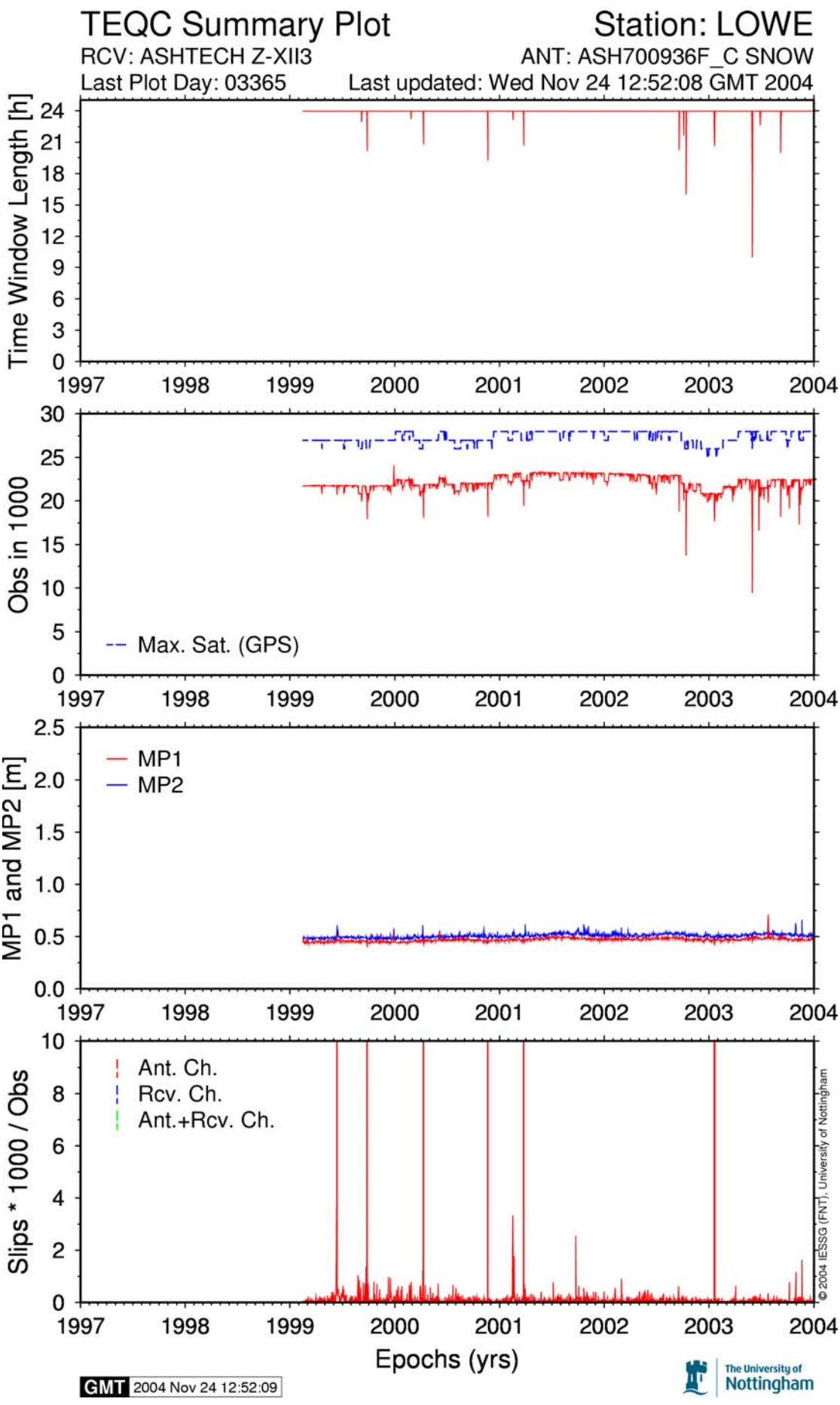
13. More Information

```
     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




```
  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 Plot Day: 03365
Last updated: Wed Nov 24 12:52:08 GMT 2004
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 2004 Nov 24 12:52:09
© 2004 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            : 2001-12-12
     Report Type              : NEW
     If Update:
      Previous Site Log       :
      Modified/Added Sections :


1.   Site Identification of the GNSS Monument

     Site Name                : Newlyn Tide Gauge
     Four Character ID        : NEWL
     Monument Inscription     :
     IERS DOMES Number        : 13273M103
     CDP Number               : (A4)
     Monument Description     : STEEL PLATE AND CARBON FIBRE PIPE
       Height of the Monument : 3.0m
       Monument Foundation    : LIGHTHOUSE
       Foundation Depth       : (m)
     Marker Description       : TOP OF 40mm DIA THREAD ON STEEL PLATE
     Date Installed           : 1998-09-29T12:00Z
     Geologic Characteristic  : BEDROCK
       Bedrock Type           : SEDIMENTARY (SANDSTONE)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : The monument is mounted on the
                              : observation platform of a steel
                              : lighthouse adjacent to the tide gauge
                              : building, which is located at the end
                              : of a stone pier, which is founded
                              : on the Sandstone bedrock
                              : The GPS antenna is located on the monument
                              : which consists of a 3m carbon fibre pipe mounted
                              : on a steel plate, which is fixed to the
                              : observation platform.
                              : The GPS antenna is attached to the carbon fibre
                              : pipe using a 5/8" thread.
                              : The carbon fibre pipe is attached to the steel
                              : plate using a 40 mm diameter thread.
                              : The male part of the 40mm diameter thread is on
                              : the steel plate and has a domed head, which
                              : serves as the survey marker.


2.   Site Location Information

     City or Town             : Newlyn
     State or Province        : Cornwall
     Country                  : England
     Tectonic Plate           : EURASIAN
     Approximate Position
       X coordinate (m)       : 4079954.1
       Y coordinate (m)       : -395930.4
       Z coordinate (m)       : 4870196.8
       Latitude (N is +)      : +500610.90
       Longitude (E is +)     : -0053234.04
       Elevation (m,ellips.)  : 64.5
     Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 02964
     Firmware Version         : 1F50
     Elevation Cutoff Setting : 5
```

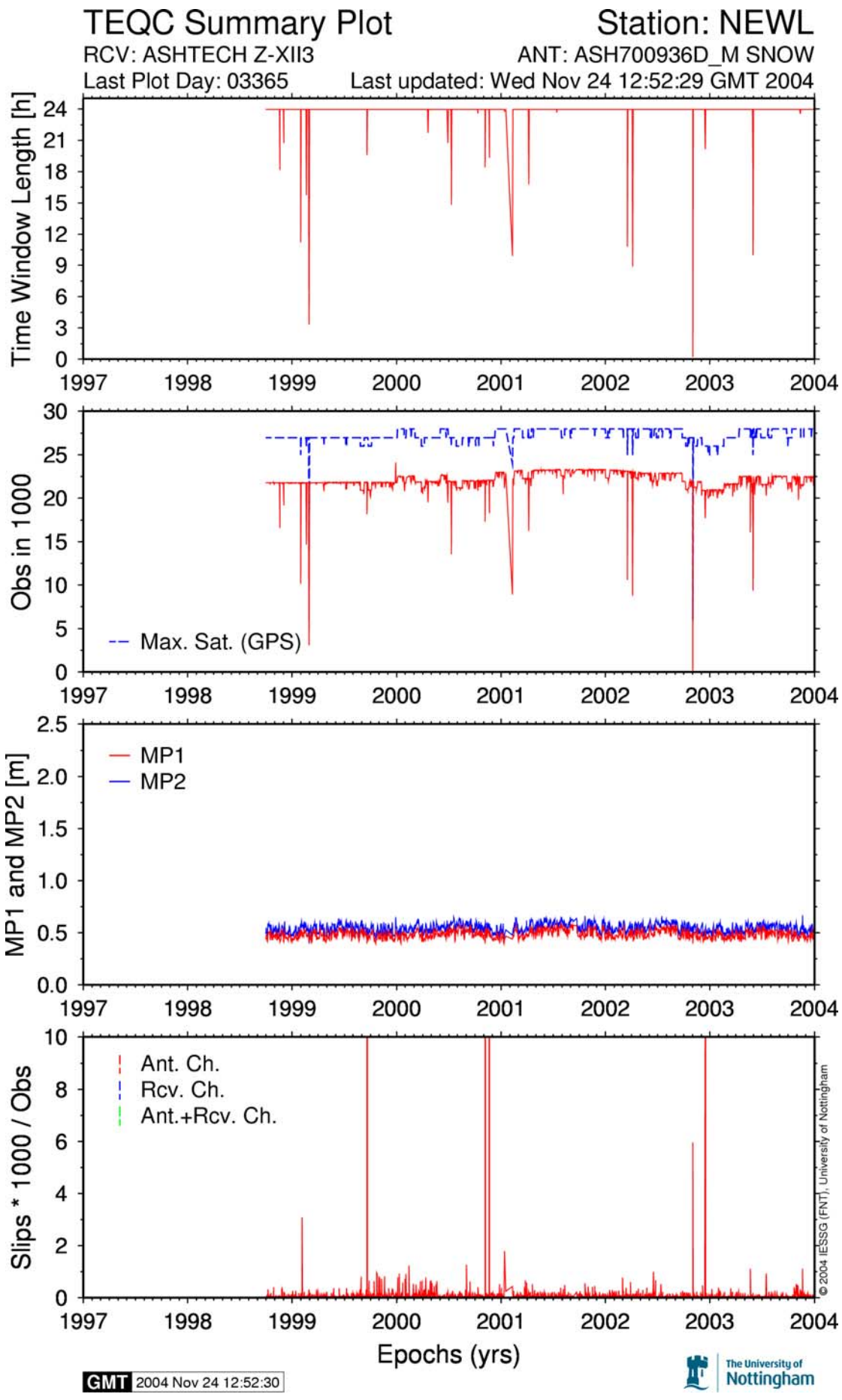
```
     Date Installed           : 1998-09-30T00:00Z
     Date Removed             : 1999-08-15T23:59Z
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 02964.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRS1F50 and
                              : CGHOSE v5.4.00 CGRS1F50
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0)

3.2  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 02964
     Firmware Version         : CD00
     Elevation Cutoff Setting : 5
     Date Installed           : 1999-08-17T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Temperature Stabiliz.    : NONE
     Additional Information   : Full receiver serial number is LP 02964.
                              : Operation using a direct modem connection.
                              : Download using CGREMOTE v5.4.00 CGRSCD00 and
                              : CGHOSE v6.0.00 CGRSCD00.
                              : Conversion to RINEX using ASRINEXO v2.9.7
                              : (with PR SMOOTH FLAG 0).

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


4.   GNSS Antenna Information

4.1  Antenna Type             : ASH700936D_M    SNOW
     Serial Number            : 15402
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   2.9650
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 1998-09-30T00:00Z
     Date Removed             : 2001-01-17T23:59Z
     Additional Information   : Full antenna serial number is CR 15042.
                              : Antenna cable damaged in 2001-01

4.2  Antenna Type             : ASH700936D_M    SNOW
     Serial Number            : 15402
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  :   2.9650
     Marker->ARP North Ecc(m) :   0.0000
     Marker->ARP East Ecc(m)  :   0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : SNOW
     Radome Serial Number     :
     Antenna Cable Type       : ASHTECH 100914 REVA
     Antenna Cable Length     : 30m
     Date Installed           : 2001-02-09T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Additional Information   : Full antenna serial number is CR 15042.
                              : New antenna cable installed

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

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


5.   Surveyed Local Ties

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


6.   Frequency Standard

6.1  Standard Type            : INTERNAL
       Input Frequency        : (if external)
       Effective Dates        : 1998-09-30/CCYY-MM-DD
       Notes                  : (multiple lines)

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


7.   Collocation Information

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


8.   Meteorological Instrumentation

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

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

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

8.2.x Pressure Sensor Model   :
```

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

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

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

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

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

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

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

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

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


10.  Local Episodic Effects Possibly Affecting Data Quality

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

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


11.  On-Site, Point of Contact Agency Information
```

```
     Agency                    : Newlyn Pier and Harbour Commissioners
     Preferred Abbreviation    : NPHC
     Mailing Address           : Newlyn
                               : Penzance
                               : Cornwall
                               : UK

     Primary Contact
       Contact Name            : Andrew Munson (Harbour Master)
       Telephone (primary)     :
       Telephone (secondary)   :
       Fax                     :
       E-mail                  :
     Secondary Contact
       Contact Name            : Richard Turner (Tide Gauge)
       Telephone (primary)     :
       Telephone (secondary)   :
       Fax                     :
       E-mail                  :
     Additional Information    : (multiple lines)


12.  Responsible Agency (if different from 11.)

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


13.  More Information

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

ASH700936D_M

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

<--                      0.381                      -->
```

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


TEQC Summary Plot
Station: NEWL
RCV: ASHTECH Z-XII3
ANT: ASH700936D_M SNOW
Last Plot Day: 03365
Last updated: Wed Nov 24 12:52:29 GMT 2004
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 2004 Nov 24 12:52:30
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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 : 4.9


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           : 1998-03-22T00:00Z
     Date Removed             : 1998-08-30T23:59Z
     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            : ??????
     Firmware Version         : 1L00
     Elevation Cutoff Setting : 5
     Date Installed           : 1999-12-04T00:00Z
     Date Removed             : 1999-12-10T23:59Z
     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            : 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.

3.4  Receiver Type            : ASHTECH Z-XII3
     Satellite System         : GPS
     Serial Number            : 00111
     Firmware Version         : CD00
     Elevation Cutoff Setting : 5
     Date Installed           : 2001-05-09T00:00Z
     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).

3.5  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).

3.6  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           : 1998-03-22T00:00Z
     Date Removed             : 1998-08-30T23:59Z
     Additional Information   : Full antenna serial number is not known.

4.2  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           : 1999-12-04T00:00Z
     Date Removed             : 1999-12-10T23:59Z
     Additional Information   : Full antenna serial number is not known.

4.3  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.

4.4  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     : 10m
     Date Installed           : 2001-05-09T00:00Z
     Date Removed             : 2001-06-12T12:59Z
     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     : 30m
```

```
     Date Installed           : 2001-06-12T13:00Z
     Date Removed             : 2002-03-11T23:59Z
     Additional Information   : Full antenna serial number is CR 13570.

4.6  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.

4.7  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.

4.8  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           : 2003-10-20T16:00Z
     Date Removed             : 2003-11-18T10:00Z
     Additional Information   : Full antenna serial number is CR 13570.
                              : Antenna cable replaced.

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           : 2003-11-18T11:00Z
     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
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                              : North Shields NE30 1LJ
                              : UK
     Primary Contact
       Contact Name           : Port Control
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           : Martin Robertson
       Telephone (primary)    : +44 (0)191 2227834
       Telephone (secondary)  : +44 (0)191 2226445
       Fax                    : +44 (0)191 2228691
       E-mail                 : Martin.Robertson@newcastle.ac.uk
     Additional Information   : (multiple lines)


12.  Responsible Agency (if different from 11.)

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

13.  More Information

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

ASH700936B_M

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

<--                     0.381                      -->

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

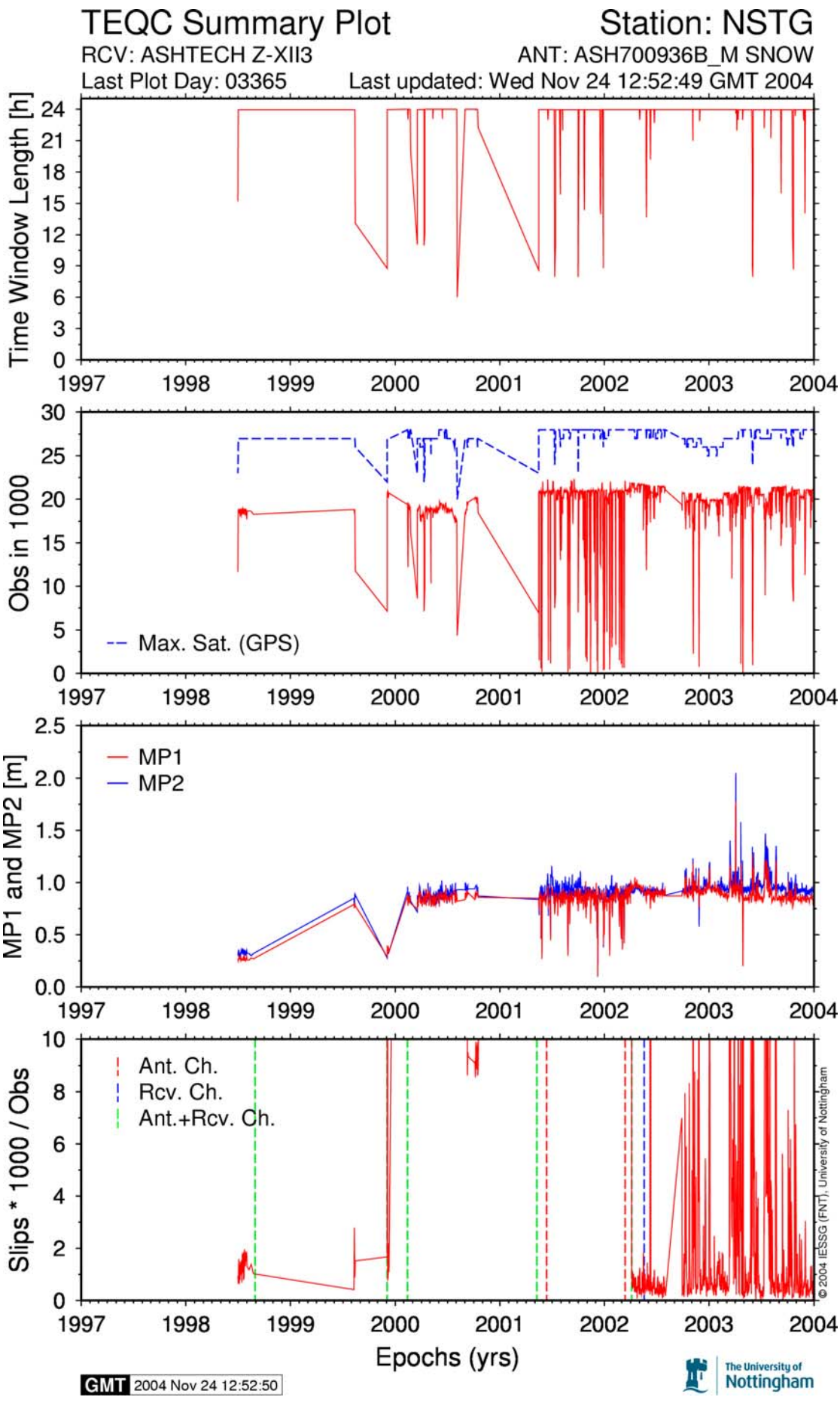
TEQC Summary Plot
Station: NSTG
RCV: ASHTECH Z-XII3
ANT: ASH700936B_M SNOW
Last Plot Day: 03365
Last updated: Wed Nov 24 12:52:49 GMT 2004
Time Window Length [h]
Obs in 1000
Max. Sat. (GPS)
MP1 and MP2 [m]
MP1
MP2
Slips * 1000 / Obs
Ant. Ch.
Rcv. Ch.
Ant.+Rcv. Ch.
Epochs (yrs)
GMT 2004 Nov 24 12:52:50
© 2004 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            : 2001-09-26
     Report Type              : NEW
     If Update:
      Previous Site Log       :
      Modified/Added Sections :


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         :
     Elevation Cutoff Setting : 5
     Date Installed           : 2001-09-26T00:00Z
     Date Removed             : CCYY-MM-DDThh:mmZ
     Temperature Stabiliz.    : NONE
     Additional Information   : Receiver is an Ashtech Micro-Z.
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                              : 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.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)
```

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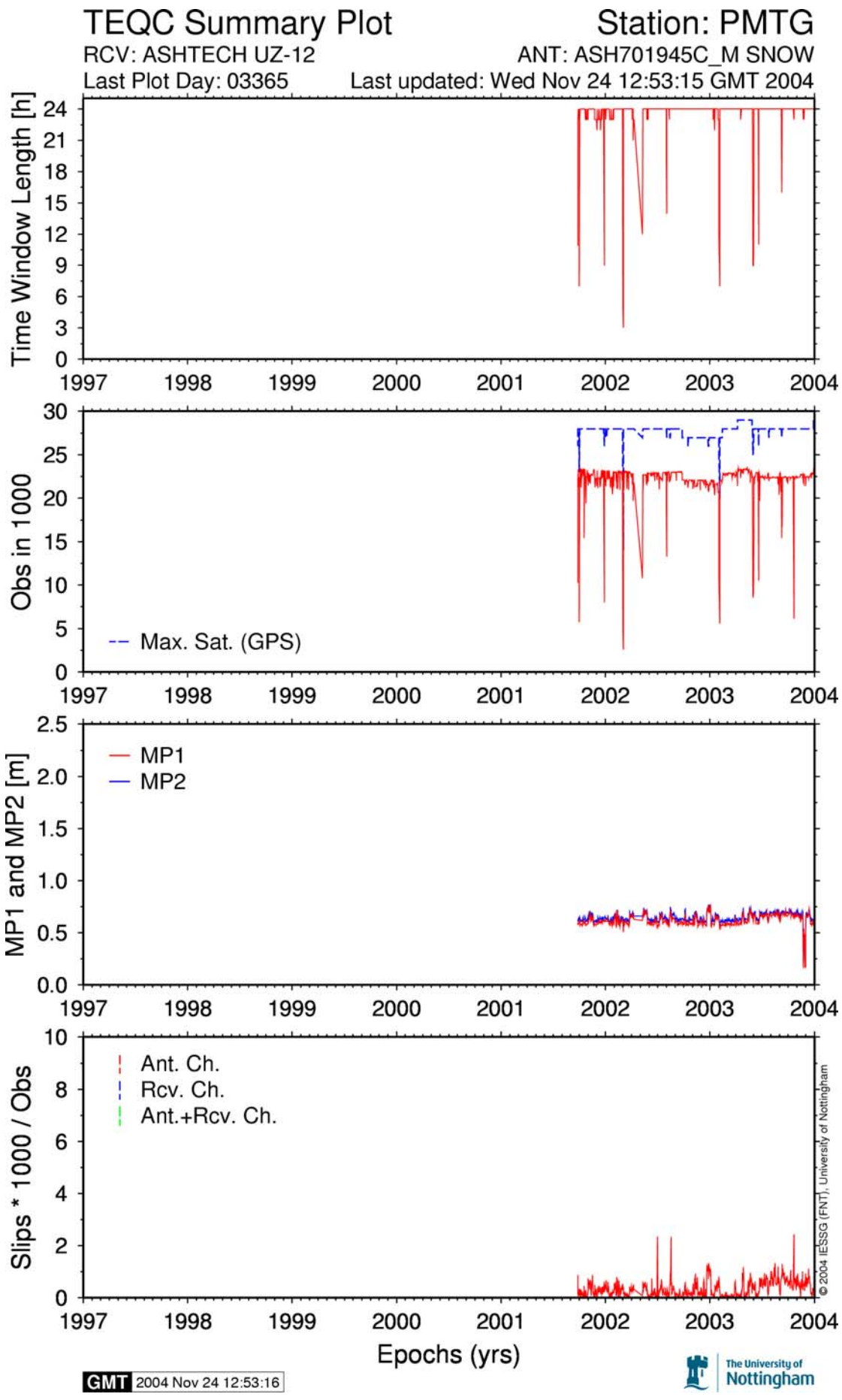
```
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

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

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

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

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

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


10.  Local Episodic Effects Possibly Affecting Data Quality

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

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


11.  On-Site, Point of Contact Agency Information

     Agency                   : Queen's Harbour Master
     Preferred Abbreviation   :
     Mailing Address          : HM Naval Base
                              : Portsmouth
                              : Hampshire
                              : UK
     Primary Contact
       Contact Name           : CPO Surveyor for Queen's Harbour Master
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Secondary Contact
       Contact Name           :
       Telephone (primary)    :
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Additional Information   : (multiple lines)


12.  Responsible Agency (if different from 11.)

     Agency                   : IESSG
     Preferred Abbreviation   : IESSG
     Mailing Address          : University of Nottingham
                              : University Park
                              : Nottingham NG72RD
                              : UK
     Primary Contact
       Contact Name           : Richard Bingley
       Telephone (primary)    : +44 (0)115 9513932
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : richard.bingley@nottingham.ac.uk
     Secondary Contact
```

```
       Contact Name           : IESSG Experimental Officers
       Telephone (primary)    : +44 (0)115 9513921
       Telephone (secondary)  : +44 (0)115 9513880
       Fax                    : +44 (0)115 9513881
       E-mail                 : iessg@nottingham.ac.uk
     Additional Information   : PMTG is operated by the IESSG for the
                              : Proudman Oceanographic Laboratory and
                              : the UK Department for Environment, Food
                              : and Rural Affairs (Defra)


13.  More Information

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

ASH700936C_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 Plot Day: 03365
Last updated: Wed Nov 24 12:53:15 GMT 2004
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.
1997
1998
1999
2000
2001
2002
2003
2004
Epochs (yrs)
GMT 2004 Nov 24 12:53:16
© 2004 IESSG (FNT), University of Nottingham
The University of Nottingham

Sheerness

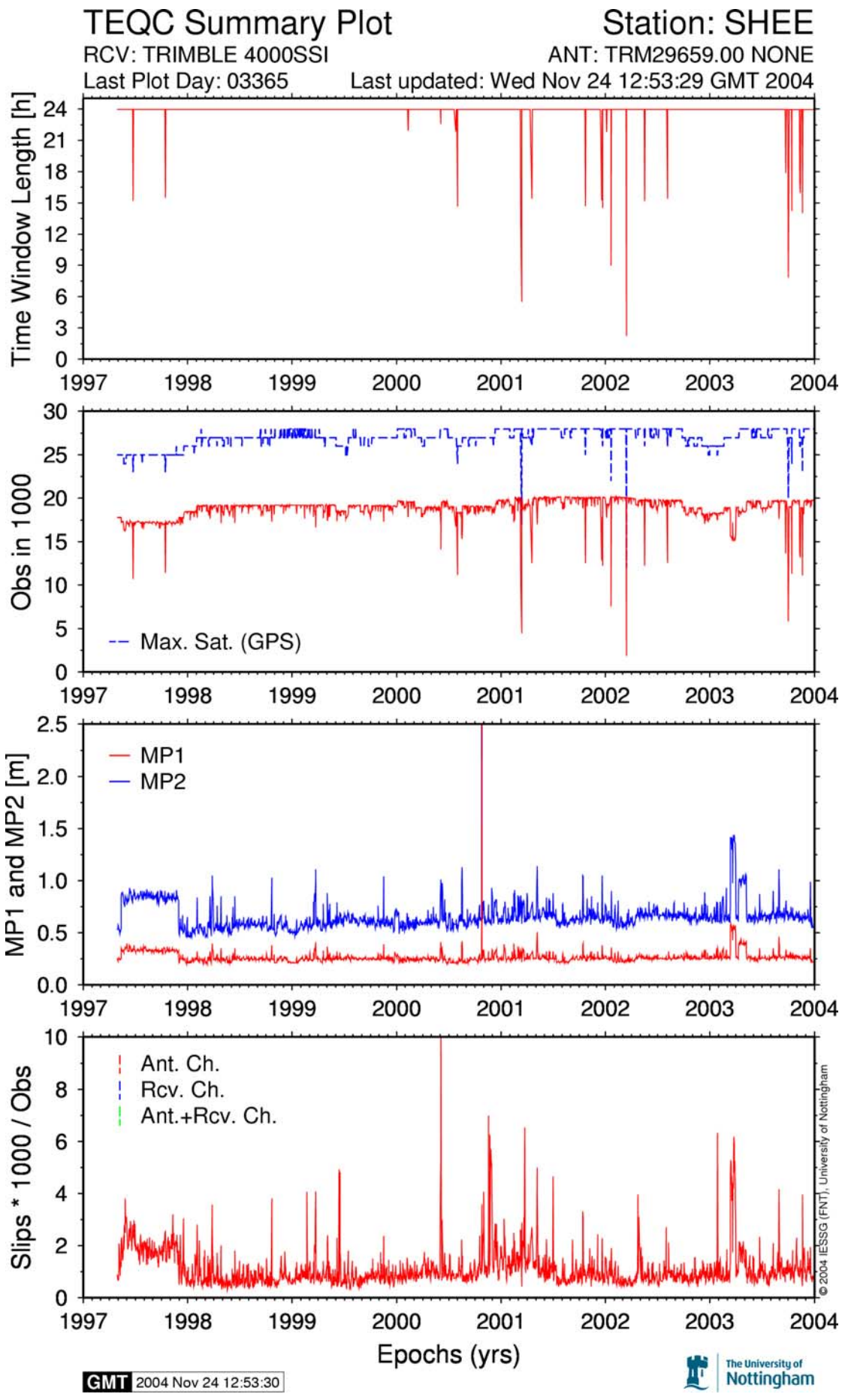
```
     SHEE Site Information Form (site log)
     International GPS Service
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

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: TRIMBLE 4000SSI
ANT: TRM29659.00 NONE
Last Plot Day: 03365
Last updated: Wed Nov 24 12:53:29 GMT 2004
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.
© 2004 IESSG (FNT), University of Nottingham
Epochs (yrs)
GMT 2004 Nov 24 12:53:30
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, together with an ongoing research programme in satellite altimetry.

Phase 1 of ACCLAIM Coastal Gauges

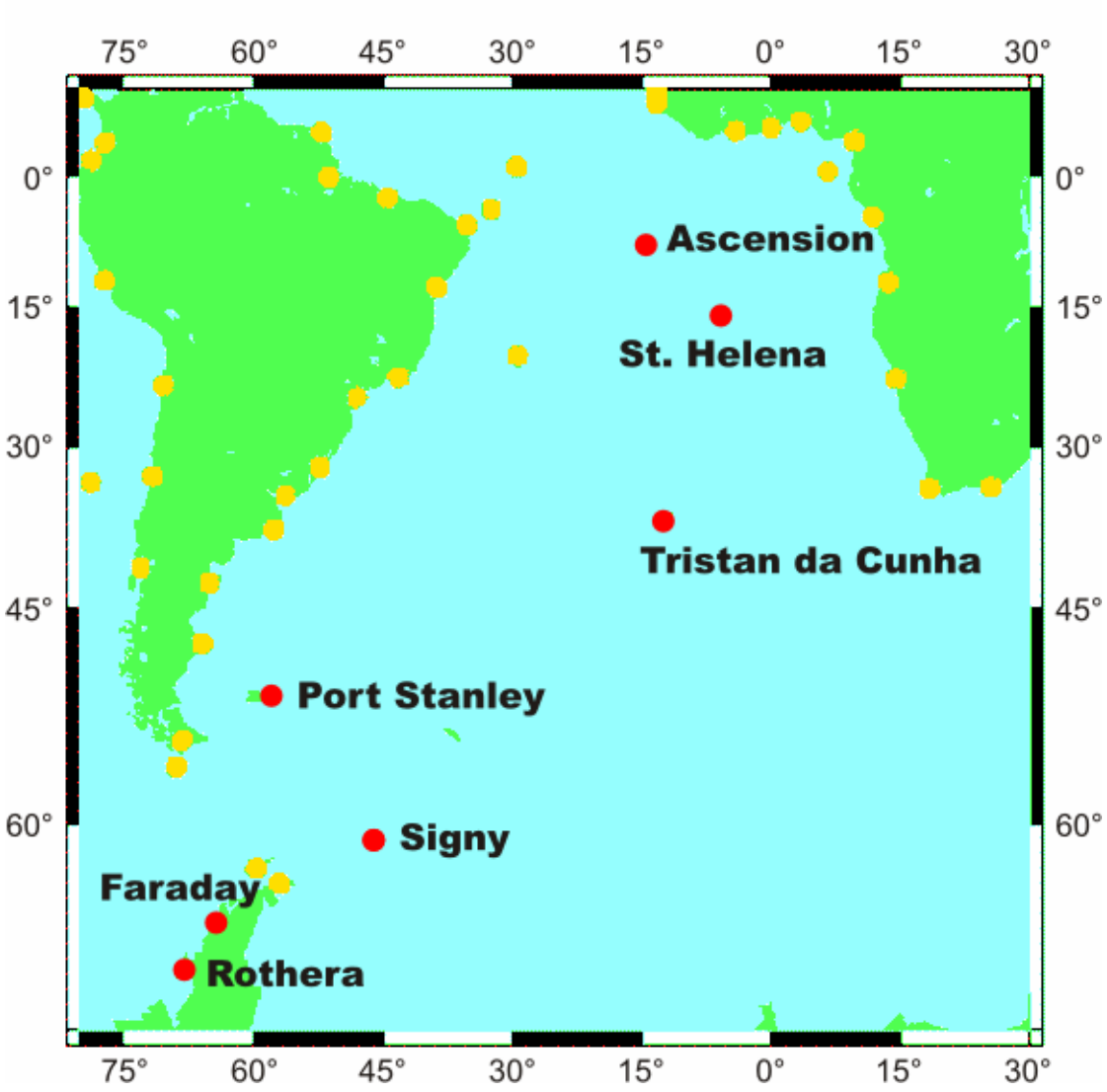
In Phase 1 of ACCLAIM from 1983, measurements at coastal tide gauge sites took the form of sub-surface pressure (SSP) measurements (units of pressure e.g. mbar) rather than sea level (units of length e.g. centimetres). SSP is here defined as the total, measured pressure recorded by a sub-surface pressure transducer, a measurement which includes the pressure load from the atmosphere as well as from the water column. It is absolutely essential that any user of ACCLAIM data realises which data type (either SSP or sea level) is being analysed.

The Phase 1 coastal SSP data were acquired in different ways (e.g. with a diver-replaced Aanderaa pressure gauge at Ascension, or with a Digiquartz in the sea sensor at St. Helena, see Spencer et al. 1993 for details) and with different pressure integration periods (e.g. quarter hour, half hour, one hour). For some data sets, the original data have been filtered to give one hour sampling. However, common to all records is an uncertainty connected with potential offset biases and drifts in the pressure sensors. At some sites (e.g. St. Helena) extensive tide pole data are also available and biases and long term drifts in the sensor data may eventually be rectified (this is under study at present). However, the drifts in general mean that in most cases the records should not be used, without further careful attention in particular studies, for the study of timescales seasonal or longer.

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 Ascension, St. Helena and Port Stanley can be considered to be complete 'Phase 2' sites, while Tristan, Signy and Rothera remain 'Phase 1' (i.e. simple pressure transducer sites). At Faraday (which contains the longest tide gauge record in Antarctica and which is now called Vernadsky and operated by groups from the Ukraine) there is a conventional float gauge 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

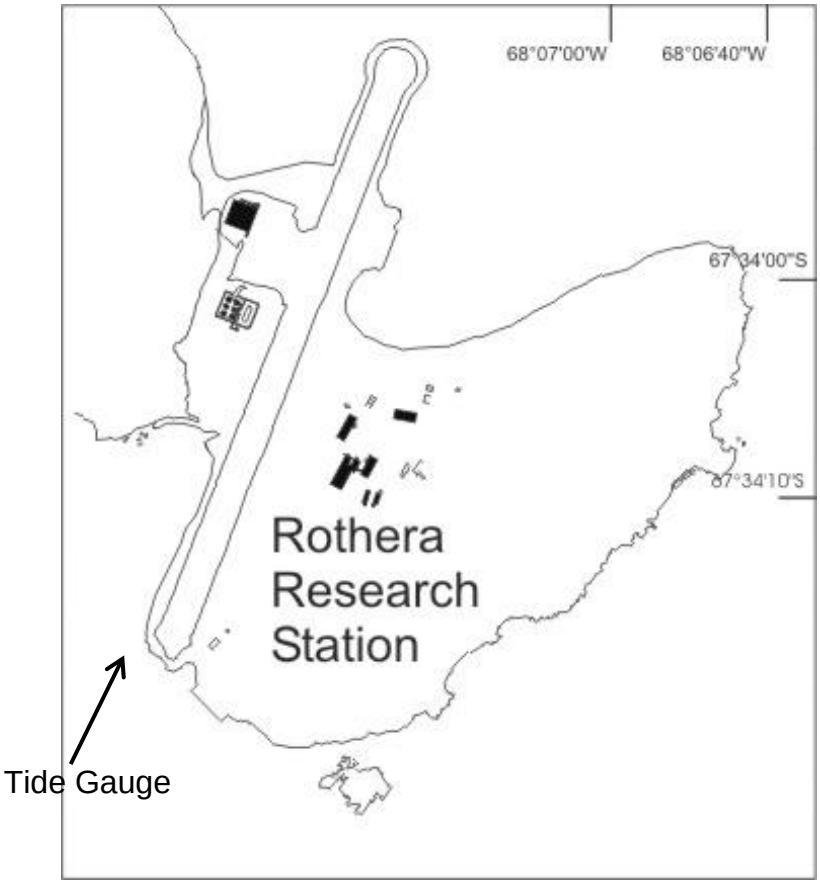
There are three directories: bprs, phase1 and phase2. Each has an inventory file, giving more information about the tide gauges.

Rothera Tide Gauge

Latitude: 67° 34.3' S Longitude: 068° 07.7' W

Instrument type: Full tide pressure gauge and half tide pressure gauge.

Site of Gauge: The tide gauge is mounted in a sea water well, approximately 100 metres shorewards of the main jetty.

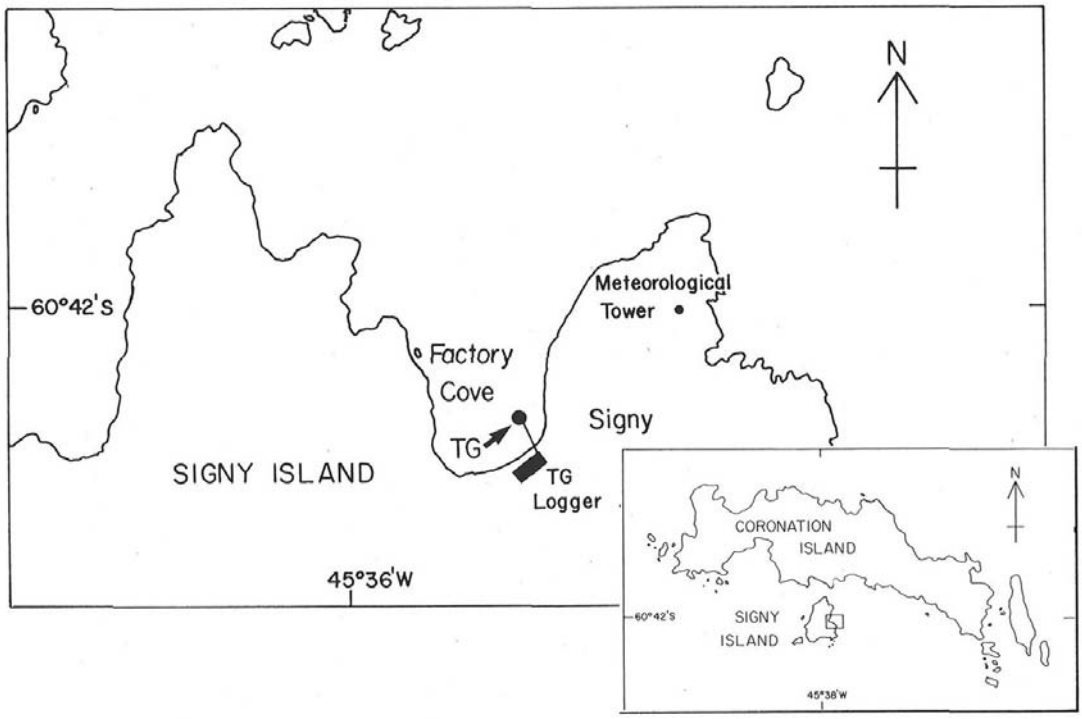


Signy (South Orkney Islands)

Latitude: 60° 43.0' S Longitude: 045° 34.0' W

Instrument type: Digiquartz pressure sensor

Site of Gauge: Data logger in nearby British Antarctic Survey boat house / generator building.

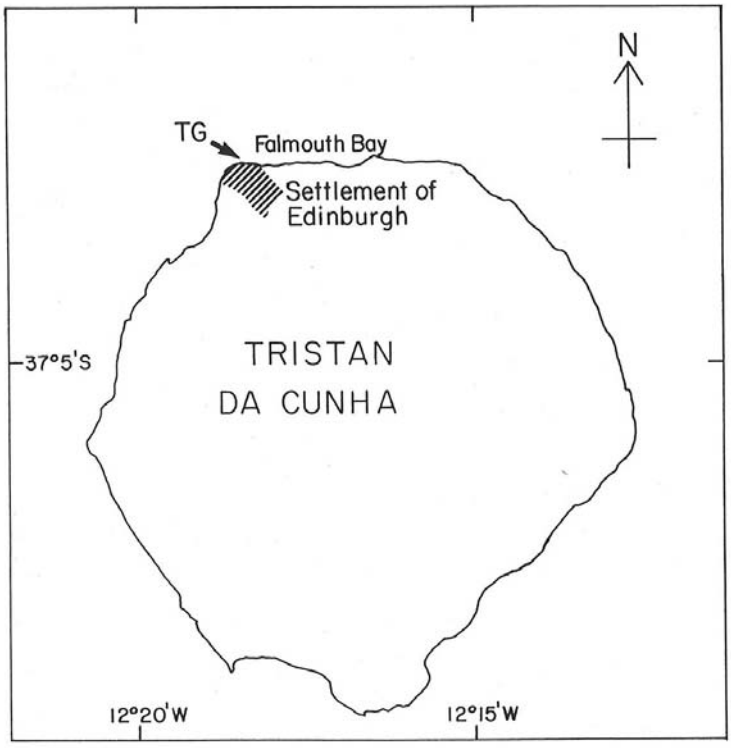


Tristan da Cunha

Latitude: 37° 03.0' S Longitude: 012° 18.0' W

Instrument type: Digiquartz pressure sensor

Site of Gauge: Tristan da Cunha harbour (data logger in the nearby settlement of Edinburgh).



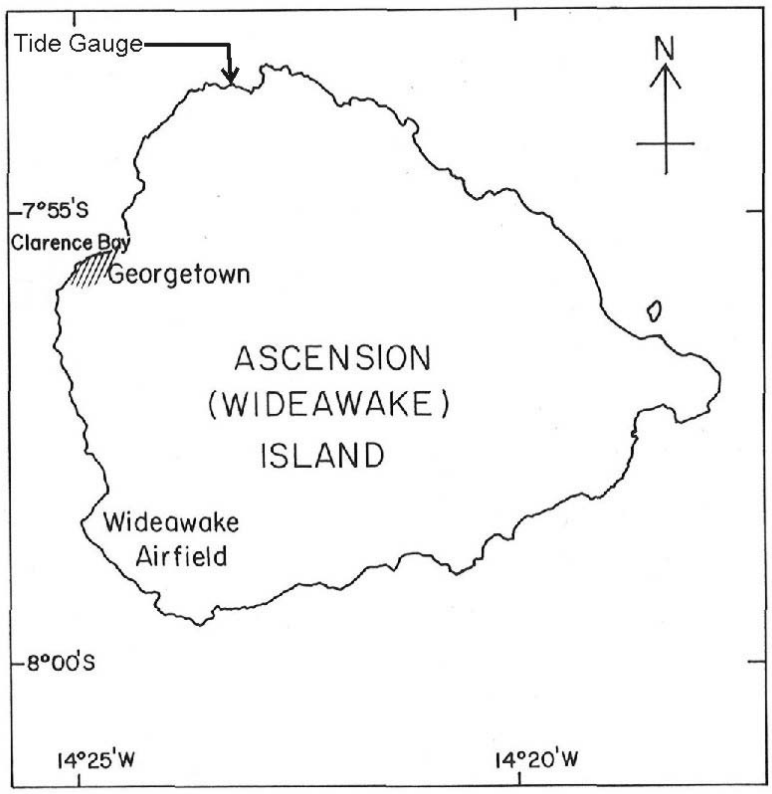
Ascension

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

Instrument type: B gauge (pressure gauge)

Site of Gauge: English Bay, Hook Jetty.

Benchmarks and Benchmark relationships:
“Ascension B-datum March 1999” is 3.176m below benchmark POL13 (POL13 BM).



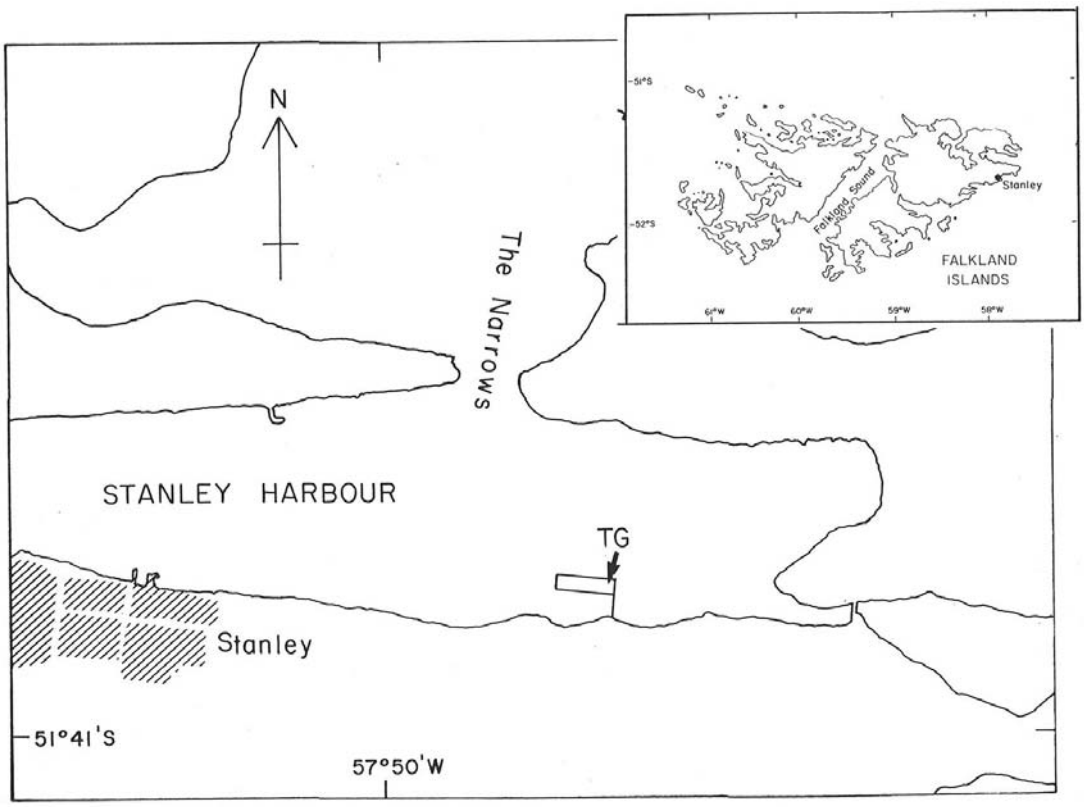
Port Stanley-B

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

Instrument type: B gauge (pressure gauge)

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).



St. Helena

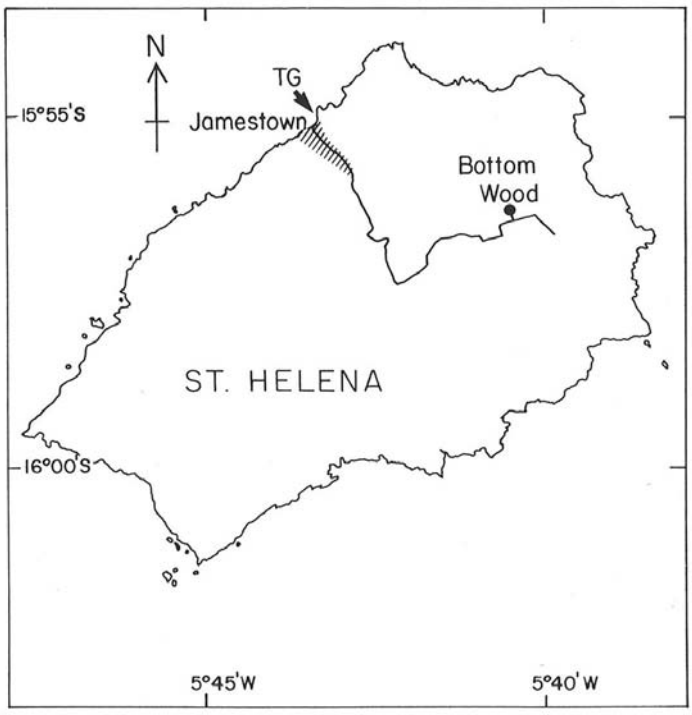
Latitude: 15° 55.0' S Longitude: 005° 43.0' W

Instrument type: B gauge (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.



Faraday / Vernadsky

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

Instrument type: Float gauge and digiquartz pressure sensor.

Site of Gauge: Located in tide gauge hut near to camp.

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