



TRANSNET SOC LTD

**DCT BERTHS 203 TO 205 - RECONSTRUCTION, DEEPENING AND
LENGTHENING**

PORT OF DURBAN

SPECIFICATION – WAVE, CURRENT AND TIDAL MEASUREMENTS

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1.0 SCOPE

1.1 Project

This specification is a project specific technical specification for the DCT Berths 203 to 205 Reconstruction, Deepening and Lengthening Project in the Port of Durban.

1.2 Scope

The scope of this specification covers the *Employer's* requirements for the provision and maintenance of wave, current and tidal measuring Equipment during the entire contract period as well as for the recording, processing and presentation of the data recorded.

The specification details requirements of Materials, Equipment and Procedures to be adopted by the *Contractor* to supply and maintain wave, current and tidal measuring Equipment.

Collection of data prior to the contract *works* was carried out by the CSIR and will be made available to the *Contractor*.

2.0 NORMATIVE REFERENCES

2.1 Reference Documents

The *works* shall be carried out as specified in the following documents:

- a) This Specification.
- b) Industry Codes, Standards and Specifications as listed in Section 2.2.
- c) *Employer's* Project Specific Technical Specifications as listed in Section 2.3.
- d) Method statement prepared by the *Contractor*, as described in Section 4.1.

2.2 Standard Specifications

The *Contractor* shall provide and maintain current copies of all the standard specifications referred to herein below on the site for reference by both parties.

The provision and maintenance of wave, current and tidal measuring Equipment shall comply with the following standard specification.

- a) DNV RP C205 – Environmental Conditions and Environmental Loads, April 2014.

2.3 *Employer's* Project Specific Specifications and Standards

The provision and maintenance of wave, current and tidal measuring Equipment shall comply with the following Project Specific Specifications and Standards.

- a) Project Environmental Specifications (PES) as contained in the Works Information and annexures.



3.0 DEFINITIONS

All definitions of responsibilities shall be in accordance with the NEC Engineering and Construction Contract (ECC) for the construction of the *works*.

Where the standard specifications referenced in this specification refer the "Engineer", replace this term with the term "Supervisor".

For the purpose of this specification, the following definitions shall apply:

3.1 Chart Datum Port

Chart Datum Port refers to the reference level used in the Port of Durban, which is 0,900 m below Mean Sea Level. All levels referred to in this document are relative to Chart Datum Port (CDP).

3.2 Co-ordinate System

The co-ordinate system to be used for all setting out and survey shall be World Geodetic System 1984 (WGS84), LO31, referred to as WG31.

3.3 Tidal Levels

The Astronomical Tide Predictions as defined by the SA Navy Hydrographer and Chart SAN 2006 are as follows:

Table 3.1 – Tide Data

Tide	Abbreviation	Level m, Chart Datum Port
Highest Astronomical Tide	HAT	2.287
Mean High Water Springs	MHWS	1.997
Mean Level	ML	1.097
Mean Low Water Springs	MLWS	0.197
Lowest Astronomical Tide	LAT	-0.013

3.4 Method Statements

Method statements shall be compiled by the *Contractor* for all activities. The method statements shall be submitted to the *Supervisor* for acceptance three weeks in advance of the particular activity being undertaken. Full details of all proposed Equipment (including temporary *works*) and methods shall be provided for acceptance by the *Supervisor*.

No activity shall commence until the method statement has been accepted by the *Supervisor*.

Further details of the requirements of particular method statements are provided in Section 4.



4.0 REQUIREMENTS

4.1 Method Statement

The *Contractor* shall prepare method statements that shall include, *inter alia*:

- Provision of two fully automatic remote instruments for measuring directional waves and currents.
- Provision of a Wave and Tide Recorder (WTR).
- Provision of complete and operable packages.
- Obtaining daily forecasts of wind and wave conditions, in particular those that may affect the marine aspects of the contract *works*.
- Provision of daily seven day forecasts of wind and wave conditions and in particular those that may affect the contract marine *works*.
- Provision of weekly summary reports to the *Supervisor* of the marine forecasts and the acquired data.
- Removal of all Equipment after completion of the Project.

4.2 Location

The units are to be deployed in reasonable proximity to the positions tabulated in Table 1 and plotted in Figure 1.

Table 1: Wave, Current and Tidal Recorder

<i>Instrument</i>	<i>Name</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Depth (m)</i>	<i>Height of Top of ADCP off bottom (mm)</i>
TRDI 600kHz ADCP	ADCP – Offshore	29°52'17"	31°42'27"	20	800
TRDI 600kHz ADCP	ADCP – Port	29°52'29"	31°3'4"	13	800
WTR	WAVE – mw	29°52'10"	31°0'55"	12	600

4.3 Equipment

- The external data acquisition Equipment shall be a proprietary system with the following or equal approved characteristics: Provide two fully automatic remote bottom mounted Acoustic Doppler Current Profilers (ADCP) with dedicated computer and software for measuring directional waves and current.
- The *Contractor* shall be solely responsible for providing complete and operable packages in full accordance with all applicable Industry Codes and Standards, Government Regulations and *Contractor* Technical Requirements.
- Wave and Tide Recorder (WTR).

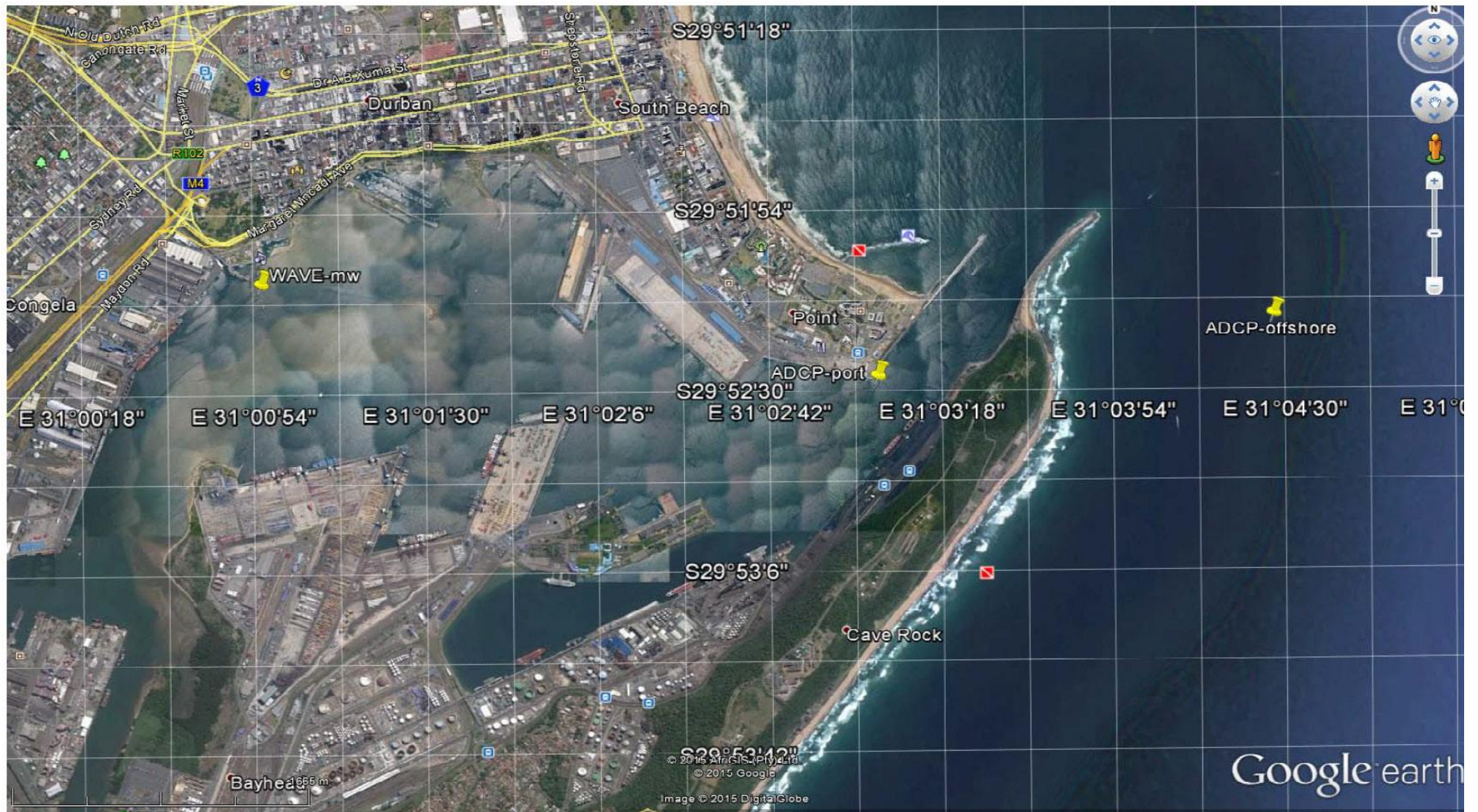


Figure 1: Wave, Current and Tidal Recorder Location



4.4 Data to be Collected

4.4.1 General

Data shall be recorded in real time and collected during recovery and redeployment of the instruments at suitable periods to suit on-board battery life and data storage capacity throughout the duration of the contract *works* and to the acceptance of the *Supervisor*.

4.4.2 Current Recordings

Current recording and analysis shall be carried out as follows:

- a) Recording shall be continuous for 50 minutes of every hour, with 10 minutes at each hour being used for data transfer.
- b) The maximum average current velocity measured over 10 minute cycles and the associated current direction shall be calculated every hour.
- c) The maximum average current velocity (over a one minute cycle) shall be calculated for every hour.
- d) Vertical directional current velocity profiles shall be calculated for the 10 minute and one minute cycles.
- e) A table and histogram of current velocity distribution for 16 directional sectors shall be produced per season and for the full data set.
- f) A current rose shall be produced per season and for the full data set.
- g) The latest recorded hourly average, 10 minute average and 1 minute maximum surface current speed and direction shall be transferred in real-time to a computer display system. All recorded data shall be stored in digital format and backed-up on a monthly basis.

4.4.3 Wave and Tidal Recordings

Wave and tide recording and analysis shall be carried out as follows:

- a) The mean water level shall be recorded at 10 minute intervals.
- b) Tidal constituent analysis shall be carried out on a six-monthly basis and the derived constituents presented to the *Supervisor*.
- c) The tidal gauge shall be calibrated on a three-monthly basis and be referenced to a known reference level on the site.
- d) Wave height and profile data shall be recorded in real time wave direction shall be recorded by immersed sensors. The ADCP's are to determine wave height, period and direction, by one or more combinations of three measurement methods: velocities, surface tracking and bottom pressures.
- e) The water level and wave data shall be displayed in real time on a computer display system. All recorded data shall be stored in digital format and backed up on a monthly basis.



5.0 REPORTING AND DISTRIBUTION

The system shall be capable of providing data recorded with the specified sensors to a central location and provide output in real time. All recorded data shall be stored on suitable digital storage media (to be accepted by the *Supervisor*) and backed-up on a monthly basis.

Data shall be presented to the *Supervisor* after each recovery in both raw data format and in graphical or similar format on CD.

At least the following data shall be provided:

- a) Significant Wave Height H_s
- b) Peak Period T_p
- c) Mean Period T_m
- d) Water Level
- e) Peak Wave Direction
- f) Mean Peak Wave Direction
- g) Long Wave Significant Wave Height
- h) Long Wave Peak Periods
- i) Current Direction – Graph
- j) Current Direction - Rose

Trend analyses shall be provided analysed into quarterly, six month and annual periods.

Early warnings shall be provided to the *Supervisor* of any wave conditions which the *Contractor* deems to be not in accordance with the baseline data or the Contract *works* data provided.

6.0 INSPECTION AND CALIBRATION

6.1 Inspection

All Equipment specifications and supporting documentation shall be supplied for acceptance by the *Supervisor* prior to ordering and deploying the Equipment.

The *Contractor* shall include a detailed description of the full monitoring system, installation procedures and operating systems with the specifications.

6.2 Calibration

Calibration certificates shall be supplied with all Equipment. After installation, a full installation and calibration report shall be provided by the *Contractor*.

Routine calibration shall be carried out on 3 monthly intervals and calibration reports supplied to the *Supervisor*. If the real time data shows that any part of the Equipment is malfunctioning, the *Contractor* shall arrange to investigate, replace and recalibrate the malfunctioning Equipment at his own cost.