



Leveling Frequency Requirements for Water Level Stations

Procedure Number: SOP # 3.2.3.3. (C17)

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1. **Title: Leveling Frequency Requirements for Water Level Stations**
2. **Purpose:** This SOP provides program policy on the frequency of required leveling at all water level stations, regardless of which agency or group is collecting the data. In specific, it addresses the running of a bracket set of levels after station installation to verify sensor stability. It does not address the leveling standards and specifications, which are documented in several CO-OPS manuals and in National Geodetic Survey (NGS) leveling manuals (Refer to the following references in ROS 3: 3.2.3.3 C1, C7; 3.2.3.5 E1, E2). In most all cases, field parties are encouraged to use Second Order, Class I standards since the required equipment is used nearly universally in our work involving installation, operation and maintenance, and removal of water level stations. In remote locations where logistics prohibit the transportation of three meter invar barcode rods, Third Order levels are accepted.
3. **Background/History:** The requirement for a consistent zero reference for water level measurements is a foundational element for the collection of water level data and determination of water level and tidal datums. Historically, this zero reference is referred to as Station Datum. Periodic geodetic leveling between the tide staff and station bench mark network in history up through the 1980s, or directly to the acoustic sensor, microwave radar sensor, or pressure sensor leveling point in more recent time serves to monitor the staff or sensor stability over the period of observations. This historical documentation of height differences between the sensor and station bench marks, for short or long-term data series, validates the vertical stability of the water level sensor and of the bench marks relative to Station Datum.

The rationale for documenting program policy on the frequency of required leveling at water level stations is directly related to two Oceanographic Division SOPs:

1. SOP #7.3.A.4.1 Tidal Datum Computation for Control Stations
2. SOP #7.3.A.4.2 Tidal Datum Computation for Subordinate Stations

A key requirement noted in these two documents regarding the determination of accepted water level or tidal datums, among many other details, is the need for bracketing sets of levels between the sensor and network of bench marks.

The purpose of re-leveling is to determine if there has been any undesirable vertical movement of the bench marks and of the water level measurement sensor over time (in excess of 6mm). This re-leveling also “brackets” the data from the time the station was

