

Calculation and Ingestion of Great Lakes Spike Reading

Procedure Number: SOP # 6.3.4.2

Created: March 1, 2016

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1. **Title:** Calculation and Ingestion of Great Lakes Spike Reading

2. **Purpose**

This SOP was developed to standardize the procedure to calculate and ingest into the OceanData database the water level reading(s) performed by Great Lakes field crews from the spike during the time the sump is being worked on as part of the Annual Inspection. Calculating and ingesting the value(s) into the OceanData database instead of manually adding the value to the water level product table ensures the value is retained in the event the data products are needed to be redone.

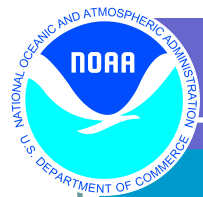
3. **Background/History**

The majority of the water level stations in the Great Lakes contain a six (6) or eight (8) foot sump to house the floats attached to the Shaft Angle Encoder (SAE) sensors. The sump with an attached intake serves to dampen the movement of the water preventing the float and tape from jumping off the sensor wheels. As a result of the sump structure, the water does not fully changeover frequently throughout the year. During the annual inspection, the field crew is required to close off the intake and drain the sump. While the sump is drained, it provides the field crew the time to clean it out and inspect it for any potential issues with the structure. As the crew reopens the intake valve, they are able to monitor the water quality and strength of it refilling to determine if there is a potential clog in the intake by monitoring how clean the water is reentering the sump as well as if it is refilling at a rapid pace or a slow pace. The crew may decide to close/choke the intake valve again and drain the sump again to allow more water exchange through the intake in an effort to clean out the intake.

A spike reading must be taken at the top of each hour the sump is empty and during the time the sump is not filled 100% with the floats back in the water. Great Lakes data products are determined using the hourly data values. There are no predictions and processing procedures do not allow the filling of data gaps through inferred values or from neighboring stations, hence spike readings must be taken to ensure that no hourly data values are missed.

The spike is a temporary bench mark that is located near the water level surface in an area that the field crew can perform a tape down water level reading to derive the water level elevation at the top of the hour. The preferred location for the spike is directly above the intake to the sump, if it is available, but safety and availability of taking the

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reading must also be factored into the location of the spike. Some stations have spikes that are permanent, while some stations' spikes are set and removed during each annual inspection. The spike must be included in the level run.

4. **Scope/Applicability**

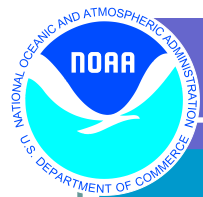
This SOP describes the procedure performed by the Configuration and Operational Engineering Team (COET) of the Engineering Division and the Data Processing Team (DPT) of the Oceanographic Division to determine if the spike reading value provided by the Great Lakes field crew is accurate and to ingest the value into the OceanData database using DMS Excel or WALL.

5. **Main Processes**

1. Determine if the time of the spike reading(s) provided by field crew are accurate.
2. Request ISD delete the bad sensor data.
3. Calculate the hourly height value(s) of the water level.
4. Create a data file and ingest the calculated hourly height value(s) in the OceanData database.

6. **Detailed Sub-Processes/Checklists**

1. Open DMS excel or WALL and create a plot of the day in question. Identify the time period in question, where the floats were tied off and the sump was drained, by reviewing the data looking for a potential spike in the data followed by a series of flat data points. Verify that the hourly data point in question matches what the field crew provided in their email and wasn't provided in the wrong time zone (GMT, standard time vs daylight time). Contact the field crew party chief, if the time cannot be validated or determined to be the correct time.
2. Submit a Database (DMS) Jira ticket with the station information, sensor information, and date and time of data that needs to be deleted from the sensor table. This ticket request requires a branch chief to comment in the ticket approving of the data deletion prior to ISD performing the request. All bad data should be removed from the OceanData database, not just the hourly value. Send an email to DPT requesting them to delete the same timeframe from the product dataset and inform them that a spike reading was performed.
3. Calculate the water level value by the following steps:
 - a. Convert the reading from feet to meters.
$$\text{Spike reading in feet} * 0.3048 = \text{Spike reading in meters}$$
 - b. Acquire the elevation difference between the spike and the ETG from the level run performed during the AI.



Elevation difference between spike and ETG = ETG elevation – Spike elevation

- c. Add the spike reading to the elevation difference to determine the reading from the ETG elevation.

Spike reading from ETG = Spike reading in meters + elevation difference

- d. Subtract the reading from the ETG elevation from the Accepted Datum Offset to determine the water level.

Water level = Accepted datum offset – spike reading from ETG

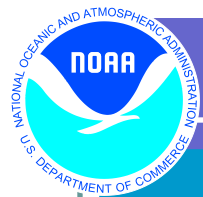
- e. Check the value against values immediately before/after the data gap to determine if the value is acceptable. Request input from DPT if unsure.

4. Ingest the water level value by the following steps:

- a. Convert the time of the hourly spike reading to GMT.
- b. Create a Xpert data file with datum offset, sensor offset, and spike reading from the ETG at the time frame in GMT. One additional line from the next 6 minute time stamp is needed for ingestion to know that all pertinent information is included. The additional line can be either the datum offset or sensor offset. If multiple spike readings were performed at the same station, they all can be included in the same data file. The data file should be saved as the station number ending with a 1 to signify the DCP that the data should be loaded on (ex. XXXXXX1). An example of single and multiple spike reading data files can be seen in Appendix A.
- c. Ingest the data file through DMS excel or WALL.
- d. Verify that the data point(s) in question is loaded after approximately 30-60 minutes.
- e. Inform DPT that the spike reading has been ingested into the OceanData database.

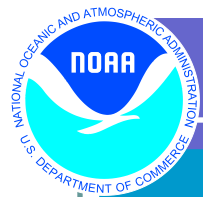
7. Quality Assurance/Control

COET is responsible for checking with the field crew if they believe a spike reading was taken but not submitted during the review of the annual inspection documentation. DPT is responsible for validating the ingested spike reading is good data.



8. Management/Responsibility

The field crew is responsible for taking accurate spike readings. COET is responsible for calculating hourly water level values from the spike reading. COET is responsible for ingesting the spike reading calculated water level values into the OceanData database. COET is responsible for updating this SOP.



Appendix A

Below are examples of the spike reading Xpert data files. Note that each example has the final additional line of the DAT for the next 6 minute to show that the previous timestamp section is complete. A DAT, SNS, and SAE line must be present for each hourly value in order for ingestion to properly accept the data file.

Single spike reading data file example:

```
02/18/2016,07:00:00,SNS,0.000,N/A,G
02/18/2016,07:00:00,DAT,178.182,N/A,G
02/18/2016,07:01:40,SAE,2.649,NA,G
02/18/2016,07:06:00,DAT,178.182,N/A,G
```

Multiple spike reading data file example:

```
02/05/2016,12:00:00,SNS,0.000,N/A,G
02/05/2016,12:00:00,DAT,179.804,N/A,G
02/05/2016,12:01:40,SAE,3.074,N/A,G
02/05/2016,13:00:00,DAT,179.804,N/A,G
02/05/2016,13:00:00,SNS,0.000,N/A,G
02/05/2016,13:01:40,SAE,3.074,N/A,G
02/05/2016,14:00:00,DAT,179.804,N/A,G
02/05/2016,14:00:00,SNS,0.000,N/A,G
02/05/2016,14:01:40,SAE,3.074,N/A,G
02/05/2016,14:06:00,DAT,179.804,N/A,G
```