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**Subject:** Update for GNSS Observations on passive Wisconsin Height Modernization (Wi-HMP) Stations September, 2023  
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Please share as appropriate

Date: 9/1/2023

We began to collect GPS on BM observations in June of 2020 and now it appears that we are reaching the end of this phase. We are now down to the **FINAL 30 days** for observations to be collected and shared via OPUS Share. The deadline is September 30, 2023. More information is available at <https://www.ngs.noaa.gov/GPSonBM/>

Wisconsin led the nation in August, 2023 shared observations!!! Great job at continuing to add data to the collection.

In early April, WisDOT created a list of stations where we determined that we would like an additional GPS on BM observation in 2023 for certain stations based on the following criteria. 1) Horizontal Wisconsin Height Modernization (WI-HMP) stations with no GPS on BM observations or were part not of an NGS bluebooked project since 2013. 2) Single observations of horizontal stations where the difference between the OPUS Share results and the published data was outside of our tolerances. 3) A station with multiple GPS on BM observations where the horizontal difference between observations was outside of our tolerances regardless of how it compares to the published coordinates.

There are about 500 stations on the list. The list was shared with agencies and individuals who have contributed GPS on BM observations in the past, and all committed to getting another observation on a station on the list by the deadline. As of September 1, 2023, 373 stations are processed and no further work on these stations should be needed with many more observations completed, but not yet processed.

Those not assigned 2023 reobservations are always encouraged to obtain GPS on BM observations on non WI-HMP NGS stations, WI-HMP vertical stations and new stations that you would like to add to the NGS database for local use. Contact me for further guidance.

A link to the WisDOT GPS on BM status Map:  
<https://wisdot.maps.arcgis.com/apps/webappviewer/index.html?id=9f00da9c32da4e519bd035591abc09c9>

In the Wisconsin Height Modernization (WI-HMP) Program, there are approximately 5,288 Vertical only stations and 3,553 stations with a Horizontal component for a total of 8841 stations

Many observations have been done that do not yet appear on the NGS OPUS share

map nor GPS on BM PRIORITY MARK LIST below

**OPUS Share 2023 Reobservations** (It was determined that 498 stations needed a 2023 Reobservation) A completed reobservation is a Shared OPUS observation where the results of multiple observations of a station match each other or a single observation matches NGS published values

Date	Reobservations Completed	% Completed
6/1/23	85	17.1
7/5/23	141	28.3
8/1/23	245	49.2
9/1/23	373	74.9

**OPUS Share Solutions per NGS OPUS share Dashboard** (Based on Observation Date)

Shared Observations prior to January, 2021	488
Shared Observations 2021	3448
Shared Observations 2022	1001
Shared Observations 2023 as of 9/1/23	521

Total 5458

**OPUS Share Solutions per NGS OPUS share Dashboard** (Based on Date observation was accepted by NGS)

Shared Observations prior to January, 2021	345
Shared Observations 2021	3292
Shared Observations 2022	1216
Shared Observations 2023 as of 9/1/23	605

Total 5458

**Notes**

- All shared observations by WisDOT and Partners
- Includes non-WI-HMP stations

Date	Total Shared Observations Based on NGS accepted date
September 8, 2020	66
December 3, 2020	157
May 1, 2023	4954
June 1, 2023	5034
July 4, 2023	5101
August 1, 2023	5217
September 1, 2023	5458

## 10 Km NGS GPSONBM Hexagons Completed

NGS has divided the entire nation into a series of 10 Km hexagons. One goal of the WisDOT's GNSS Observation on passive stations project is to get one observation in every Wisconsin 10 KM hexagon. There are 1843 hexagons in Wisconsin. Hexagons that are DONE are a result of either an OPUS share station observation or a station submitted to NGS via Bluebooking within a hexagon.

Date	10 KM Hexagons Completed	% Completed	10 Km Hexagons Remaining
September 8, 2020	447	24.3%	
May 1, 2023	1779	96.5%	64
June 1, 2023	1779	96.5%	64
July 4, 2023	1779	96.5%	64
September 1, 2023	1779	96.5%	64

Note: All remaining hexagons contain non-Wisconsin Height Modernization NGS stations, vertical only benchmarks or are have stations that are not GPSable.

## GPS on BM PRIORITY MARK LIST (NGS)

NGS has produced a prioritized list of bench marks where additional GPS data would be helpful to help define the new 2022 Geoid model. Providing GPS on stations with leveled elevations will help to relate the GPS derived ellipsoid height with the leveled elevation of these marks. The stations on the Priority List are chosen by computer generated algorithms based on station location and metadata without regard to its status as a WI-HMP station. Currently, there are about 15,000 NGS benchmarks (both WI-HMP stations and non WI-HMP) in Wisconsin. Most non WI-HMP stations have relatively little current survey value, but may have important older surveys tied to them.

Date	Number of stations on list	Number of stations Completed	Percent of NGS Priority Marks Completed	Approximate % of 3553 Horizontal WI-HMP Stations
9/8/2020	2968	674	22.7%	19.0%
1/31/23	5812	3509	60.4%	98.8%
5/1/23	5813	3511	60.4%	98.8%
6/5/23	5815	3534	60.8%	99.5%

Not updated since 6/5/23

As you can see, there are not many horizontal WI-HMP stations remaining that do not have a GPS on BM observation. As part of the 2023 reobservation plan, we will get a GPS on BM observation on all horizontal Wisconsin Height Modernization stations or confirm that they are not GPSable

### Notes

- In an effort to make sure GPS on BM observations are spread out throughout a region, NGS designates only one 'completed' station in every NGS 2 Km hexagon, not matter how many station are in the hexagon

- Not all Wi-HMP stations are currently on the BM PRIORITY MARK LIST
- The vast majority of observations are on WI-HMP horizontal stations, but not all.
- NGS adds additional stations to the BM PRIORITY MARK LIST after certain stations are observed
- More stations will be completed

**ORIGINAL HARN STATIONS (OR REPLACEMENTS) DONE** One goal of the WisDOT's GNSS Observation on passive stations project is to get two observations on all original HARN stations or their replacements in Wisconsin. There are 80 Stations in total. The original HARN stations are a higher accuracy station and provided the initial control from which all other horizontal stations in Wisconsin were surveyed from.

Date	HARN Stations Completed	% Completed
March 1, 2022	79	98.8%

Remaining (0): MILWAUKEE GPS has been destroyed.

### List of Non-WisDOT Partners (that I am aware of) that have or are planning to submit OPUS Share observations

J.W. Austin Associates of Minocqua, Vernon County, LaCrosse County, Dodge County, Dunn County, Brown County, Sheboygan County, Washington County, Burnett County, Manitowoc County, Jackson County, Clark County, Sawyer County, Fond du Lac County, Oneida County, Washburn County, Lincoln County, Rock County, Oconto County, City of Madison, Landtech Surveying of Oconomowoc, Seiler Instruments, Leica Geosystems, Milwaukee Metropolitan Sewerage District, DJ Henkel and Associates, LLC, Northeast Wisconsin Technical College (NWTC), Ayres and Associates, Christopher J. Gregory, PLS

THANK YOU ALL,  
Mick

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