**Summary of the February 22, 2018**

**Federal Geodetic Control Subcommittee Meeting**

1315 East-West Hwy, Silver Spring, Maryland 20910

**Meeting Chair:** Juliana Blackwell, Director, National Geodetic Survey

**Secretariat:** Brian Shaw, National Geodetic Survey

## FGCS Membership and Attendance

**Department of Agriculture**

*US Forest Service*- [Absent]

*Farm Service Agency* – David Davis

**Department of Commerce**

*US Census Bureau* – Aaron Jenson

*National Oceanic and Atmospheric Administration*

*National Geodetic Survey* (NGS) – Juliana Blackwell, Brian Shaw, Dru Smith, Dan Roman, Kendal Fancher, Michael Dennis, Joe Evjen, Christine Gallagher, Galen Scott, Kevin Ahlgren, Kevin Choi

*Center for Operational Oceanographic Products and Services (CO-OPS)* –

Michael Michalski, Tara Johnson

**Department of Homeland Security**

*US Coast Guard*- [Absent]

*Federal Emergency Management Agency* – [Absent]

**Department of Defense**

*National Geospatial-Intelligence Agency* –

*US Army Corps of Engineers* – Mark Huber, Jim Garster
*US Naval Observatory* – [Absent]

**Department of the Interior**

*Bureau of Indian Affairs* – [Absent]

*Bureau of Land Management* – [Absent]

*Bureau of Ocean Energy, Management* – [Absent]

*Fish and Wildlife Service* – [Absent]

*National Park Service* –Neil Winn, Karl Brown

*Office of Surface Mining, Reclamation, and Enforcement* – [Absent]

*US Bureau of Reclamation* – [Absent]

*US Geological Survey* – Larry Hothem

**Department of State**

*International Boundary Commission* – [Absent]

~~I~~*nternational Boundary and Water Commission* – [Absent]

**Department of Transportation**

*Federal Aviation Administration* – [Absent]

**Independent Agencies**

*National Aeronautics and Space Administration* – Ben Phillips

*Tennessee Valley Authority* – [Absent]

*Federal Communications Commission* – [Absent]

**State**

*Caltrans* – Scott Martin

## *NGS Activities – Juliana Blackwell*

NGS will be hosting an NSRS Modernization Industry Workshop May 7tha and 8th. This will be for NGS to engage with the surveying, mapping and GIS vendors to collaborate on preparing for the new reference frames and geopotential datum.

After this initial Industry Workshop we will follow it up with a webinar to share what came out of the workshop with NGS constituents and partners.

GRAV-D is continuing collection and the map is filling in with the survey data blocks. We are currently at 65.5% collected and looking like the data will finish the final data collection in 2022.

## *International Coordination – Dan Roman*

NGS was engaged within IAG in two commissions:

Commission One is focused on the International Terrestrial Reference Frame

Commission Two is focused on the International Height Reference Frame (physical heights, geophysical heights)

NGS is working within these two commissions to make sure that the new Reference Frames and Geopotential Datum tie in to what the international community is doing.

UN-GGIM is focused on the governance piece and getting the nations to use these international global reference frames, education about them and getting nations to put laws in place to use them.

Collaborating with UN-GGIM-Americas and the UN-GGIM-Asia Pacific Group (AP) since these will be the two UN-GGIM regional groups that will be inside the new reference frames and geopotential datum.

CGU will be holding meetings with IAG and we will also be coordinating with FIG

ISO- TC 211/172 – Dan is working with Kendall Fancher who will be leading this effort with instrumentation

The Great Lakes Coordinating Committee will updating the International Great Lakes Daum (IGLD) in 2025 with an epoch of 2020.

## *NSRS Modernization – Dru Smith*

Modernizing the NSRS – Currently 2 of 3 Blueprint documents posted (add links)

1 – Blueprint for 2022, Part 1: Geometric Coordinates

2 – Blueprint for 2022, Part 2: Geopotential Coordinates

3 – Using the NSRS (planned for September 2018)

The foundation of this document will be case studies with real world examples

Direct contributions from FGCS members would be greatly appreciated

2022 Project Updates

SPCS is close to having a request for public comments

OPUS Projects

On beta you can now bluebook projects

In development: OP expansion to include RTN/K data

Planning: expansion to work with leveling data

xGEOID models

xGEOID18 will add the Guam/CNMI and American Samoa regions

You will also see Deflections of the vertical grids with the xGEOID

Global Geopotential Model with NGA

Entered into annual cyclic agreement with NGA for ingestion of GRAV-D data into a global geopotential model. NGS had been doing this in house with all available GRAV-D data and now NGA will create the global model that will then be used to help develop the xGEOID models.

MATRF2022

NGS 2017 survey yielded the world's first absolute plate rotation model for the Mariana plate based on in-situ data (JGR, submitted)

NSRS Database

Passive control GPS data being organized for massive re-processing into the IGS08 and IGS14 frames

50k to 100k occupations since 1997(4?)

CORS data into the NSRS DB

True history of CORS site will be captured…

Tracking discontinuities and different velocities over time.

(See slides for some graphics starting slide 8)

Comprehensive Toolkit Improvements

VDatum and NCAT to coexist and use same exact transformations with identical I/O support (file formats)

VDatum will exist will all the other current tools

NADCON 5 is live with NCAT and soon in VDatum

VERTCON 3 is underway

Rebuild and Reconfirm the CONUS 29 to 88 grids

Build grid for Alaska (none currently exists)

Investigating grids for islands Local Tidal to:

PRVD02, ASVD02, NMVD03, GUVD04, VIVD09

Prepare software for transformation to NAPGD2022

Q: Dan Roman – What about Alaska with NAVD88 and tidal bench marks?

A: Dru – Yes Alaska we have some NGVD29 bench marks with heights that also have NAVD88 heights. We could create a transformation from them. Western Alaska does not have any NGVD29 heights but they do have local tidal heights. To mix these two disparate sources into one transformation model does not make scientific sense. It might make sense to split the state into two transformation models but he needs to analyze the data more.

Q: Mark Huber – No plans to merge NADCON and VDatum into one tool?

A: Dru – NADCON is a gear and VDatum is a machine. NADCON is currently included inside VDatum. Dru believes Mark might have meant merging NCAT and VDatum and at the moment no. If they end up having significant crossover then maybe but currently VDatum has several differences and is a cross NOS Office application. We will want to make sure all these products use the same code, file formats and exactly the same results.

## *NADCON Approval – Dru Smith*

1990 – NGS issued an FRN for NADCON but have not issued any since.

Karl Brown: Will there be version control for Esri or ERDAS to incorporate into the application?

> Dru: It will be on the vendors to incorporate it appropriately.

Karl: This topic was discussed over a decade ago in the methodologies work group. He believes it's important for NGS to set standards for how this version of the software should be used. NGS should expect the standards to be followed by the vendors to make sure they are using it correctly. At a minimum NGS should include a version number or release date so that it makes it easier for industry and vendors to know when updates have been made.

He mentions the confusion of how different vendors implemented transformation to the various realizations of NAD83. It would be useful to have standards for implementing the software to help the vendors make consistent products.

> Juliana: It is hard to determine if this is something that goes into an FRN or something that is outside the purpose of an FRN.
>
> Karl: At a minimum if there will not be a version number have release dates for when the software is updated.
>
> Dan Roman: Mentions that all NGS transformations in NADCON and others are getting uploaded to the ISO-TC211 geodetic registry which is the official repository for software vendors to go to get transformations. ISO has replaced the EPSG unofficial registry that has been used by most vendors.
>
> Dru: It is hard to get the vendors to incorporate things correctly, as Trimble knows it is doing things wrong but is not concerned about it.

Brian: Currently we have NADCON and VERTCON and they are gears in the larger machines. Do we plan to version them such as 1.1, 1.2 etc?

> Dru: Yes, the individual gears will be versioned and then integrated to the larger software packages.

Scott Martin: I am only an outsider, but that seems out of the scope and purpose of a FRN. It cannot compel or require any software developers to comply or adhere, unless perhaps if they performing work under a Federal contract.

Juliana: We will make this an action to be discussed further. We can also bring this up at the Industry Workshop to discuss with our partners.

> Karl : Tim Smith, Larry Hothem, Mike Londe and myself can be good people to include in the follow up discussion.

## *GEOID18 Update – Galen Scott*

There is a lot more data available for creating better geoid models

Lots of analysis on residuals and forensic geodesy to determine where new data will help make this model better.

August 31 is the deadline for any new GPS on BM data to be included in GEOID18

The new GPS on BM data have been helping a lot and with this year's efforts we anticipate improving the model significantly.

There was a GPS on Bench Marks webinar recorded last week. Watch the webinar to learn more about the maps and the GPS on Bench Marks effort you can watch the webinar video linked above.

The webinar covered the new prioritized list that was provided for targeted marks to the public to help improve the geoid. You can find the list here:

https://geodesy.noaa.gov/GPSonBM/prioritize.shtml

Residuals is the term for looking at how the modeled heights do not agree with the leveled heights. This can be due to bad leveling, bad ellipsoid heights, mark movement or more. Repeat observations can help us determine if it is the ellipsoid height or leveling derived height.

## *SPCS for 2022 Update – Michael Dennis*

Michael will be hosting a couple webinars over the next couple months on the State Place Coordinate System (SPCS) for 2022.

March 8 SPCS2022 webinar information

All of the information on the plan for the SPCS are currently in draft and the policy and procedures will be out for public comment for an extended period of time.

The new report has extensive information about the history of SPCS and is the only place that has such comprehensive information. This will be released soon as NOAA Special Publication NOS NGS 13: The State Plane Coordinate System. History, Policy, and Future Directions.

Deadlines for the Policy and Procedures (also to be released soon). These dates may change depending on the NGS review process but at this time are:

Comment July 31, 2018

December 31, 2019 for requests and proposals

December 31, 2020 for submitted designs

Discussion explaining linear distortion magnitudes is in the slide deck with graphical maps.

Linear distortion design criterion at topographic surface, not at ellipsoid surface as had been done in the past. (grid to ground)

If states can't reach consensus NGS will go with the default designs

NGS will make designs from 50-400 ppm, if users want to go to a more low distortion projections (<50 ppm) they will need to be designed and submitted to NGS for approval.

"Special purpose" zones

Possible zones for large metropolitan cities that straddle zones or large areas like the Grand Canyon.

Mike Londe: Will new central meridians and false origins be defined for the new systems?

Michael Dennis: Yes

# *Workgroup Updates*

## Fixed Reference Stations Work Group – Kevin Choi

US CORS Network ~1900 CORS run by various agencies and research groups

There continues to be growth in the GNSS receivers and currently there are more GPS+GLONASS than just GPS.

Foundation CORS

We want to have a good geographic distribution to help us model plate movement and provide a better realization frame.

Many will be collocated with others sets of equipment (VLBI, DORIS, SLR)

Working with other agencies on incorporating the collocated sites and develop plans for installation to improve the geographic distribution. Working on MOUs with NASA, NSF, FAA, Pacific GPS Array.

Scott Martin Q: What happened to the CORS Newsletter?

Kevin: We stopped emailing the newsletter and have developed a web page to keep users informed.

## Instruments Work Group - Kendall Fancher

No updates

## Methodologies Work Group – Joe Evjen

Writing up improvement to the height mod guidelines.

Doing research to develop guidelines for ways to incorporate RTN observations into our mark recovery process.

## Spectrum Work Group – Larry Hothem (emailed since technical difficulties)

1. **GPS L1 Band (1559-1610 MHz) Adjacent-Band Compatibility (ABC) Assessment testing and study**
    A. Pending is public release of report that is presently under review by members of the Executive Committee (EXCOM), National Space-based Positioning, Navigation and Timing (PNT) Policy.
    B. Results of testing showed that ground-based transmitters become jammers for many existing GPS receivers
    C. Objective: Develop GPS/GNSS spectrum interference standards for NTIA and FCC
        a) Develop power limit criteria for transmitters proposed to operate in bands near GPS signals.
    D. Incorporated in report is a use case for millimeter-level positioning that was provided by the USGS in regards to dependency on use of GNSS in support of the Earthquake Early Warning System with an objective of zero tolerance for interference.

2. **Pending proposal at FCC from Ligado Networks (formerly LightSquared)**
    A. Ligado is pressing the FCC to lift its limitations and approve the operation of Ligado Networks ground-based communication transmitters to broadcast at a frequency within the band of 1526-1536 MHz that is adjacent to the band used for the GPS L1 signal (same band used for the BeiDou B1, Galileo E1 and QZSS L1 signals).
    B. Action by the FCC is delayed until sometime after the next meeting of the PNT EXCOM.
        a) The Ligado proposal was an agenda item for the cancelled 25 January EXCOM meeting. A date for rescheduling the EXCOM meeting has not been set. Tentative date in April 2018.
    C. Tests conducted on Ligado's proposed operation confirmed unacceptable impact on GPS/GNSS receiver operation.

3. **Assessment to Identify Gaps in Testing of Adjacent Band Interference to the GPS L1 Frequency Band**
    A. In April 2017, the NPEF and PNTAB were tasked by the PNT National Coordination Office (NCO) to identify gaps in reports from testing and studies by the NIST NASCTN (sponsored by Ligado Networks), RAA and DOT's GPS ABC Assessment.
    B. Final report (FOUO) approved for release on 20 Dec 2017.
    C. Friday, 23 February 2018, teleconference call scheduled to discuss NTIA's concern with regard to the NPEF Gap Analysis Report.

4. **Increase broadband availability for rural America – Presidential Executive Order and Memorandum issued 8 January 2018.**
    A. Memorandum to DOI Secretary to allow high-speed broadband companies to locate on Interior infrastructure.

B. Ligado Networks and similar service firms could benefit from this Presidential action.

5. **Use of Foreign RNSS Signals**
   A. Under current FCC rules, required is licensing of non-federal receive-only equipment operating with signals from foreign satellite systems
   B. In 2011, NTIA issued criteria it will apply in considering whether to recommend waiver of FCC rules.

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FCC - Federal Communications Commission; NASCTN – National Advanced Spectrum and Communication Test Network; NIST – National Institute of Standards and Technology; NPEF – National PNT Engineering Forum; NTIA – National Telecommunications and Information Administration; PNTAB – PNT Advisory Board; RAA – Roberson and Associates

## *Open Discussion*

Mike Londe: Do the work groups exist as inter-agency workgroups or have they devolved to NGS only work groups?

NGS people: A couple of the work groups are interagency but some are mostly internal NGS

Juliana: We will make an action to ask FGCS members for interest in the working groups.

Mike Londe: Is there an opportunity for FGCS members to be included in the Industry Day?

NGS: This will not have any phone or webinar components and it will be only in person.

## *Actions:*

Dru get more information on the FRN working with Karl Brown, Tim Smith, Larry Hothem and Mike Londe.

Workgroup chairs need to engage and refresh FGCS members to make the workgroups more interagency and explore new members since there has been turnover.