The Modernized U.S. National Spatial Reference System – Aligning National Geospatial Data to the Globe

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FIG 2023 Working Week
Orlando, FL
NOAA and NGS
Our Nation’s First Civilian Science Agency

1807 - Survey of the Coast established

1836 - U.S. Coast Survey

1878 - U.S. Coast and Geodetic Survey

1970 - NOAA is established
Benefits of Modernizing the NSRS

Why Modernize?

- **Current Datums** were defined *before* GPS technology and rely on physical survey marks in the ground

Modernization will:

- Improve *accuracy, access, and alignment* of our positioning systems
- Changes coordinates up to 1-2 meters, depending on location
Global Alignment of the NSRS

• Governance (United Nations)
• Standards (ISO)
• Infrastructure (IAG and IERS)
International Alignment per the United Nations

Global Geodetic Reference Frame

United Nations Resolution 69/266

ggim.un.org/knowledgebase/KnowledgebaseArticle50334.aspx
International Geospatial Standards

- Technical Committee 211  
  Standardization of digital geographic data
- Many standards apply to all users ISO 19161 has specific application to NOAA’s NGS
- Nations align national spatial reference systems to the International Terrestrial Reference System (ITRS)
International Terrestrial Reference System

- A world spatial reference system co-rotating with the Earth
- Maintained by the International Association of Geodesy (IAG) and the International Earth Rotation and Reference Systems Service (IERS)
- An ITRF is a realization of that system at a given epoch
- Current realization is ITRF2020
- Provides a reference for GNSS satellite and receiver locations
NSRS Modernization

• Four terrestrial reference frames
• Geopotential datum
• Time-dependent coordinates
• Updated products and tools
Terrestrial Reference Frames

Tectonic plate based:

- North America
- Mariana
- Pacific
- Caribbean
Geopotential Datum

+ Guam/CNMI

+ American Samoa
Federal Governance and Coordination

- Federal Geographic Data Committee (FGDC)
- Organized structure of Federal geospatial professionals and constituents
- Executive direction and oversight for Federal geospatial decisions and initiatives
- Geospatial Data Act of 2018 (GDA)
- Codifies the FGDC duties into law
- Stipulates adoption of international standards such as the ITRS
Supports Safe and Efficient Commerce
Improves Resilience

Land Surveying

Disaster Response

Levee Construction

Inundation Modeling
Empowers Growth

- Drone Package Delivery
- Precision Navigation
- Precision Agriculture
- Autonomous Vehicles
- High Speed Rail
Informs Decision Making

- Align critical geospatial data assets within global data inventories
- Enable improved analysis and modeling of climate changes and impacts to society and the environment
NGS@FIG Day Agenda

May 31 Technical Sessions

11:30 - 13:00 Practical implications of National Spatial Reference System (NSRS) Modernization
- Practical impacts of the modernized NSRS
- Canada’s implementation of the modernized frames
- Changes Afoot: State Plane 2022 and Retirement of the U.S. Survey Foot
- Preparing for the Modernization of the NSRS
- Q&A

14:30 - 16:00 Update on the NOAA CORS Network and OPUS
- The NOAA CORS Network (NCN) Services
- Updating OPUS-S to Support Multi-GNSS
- OPUS-Projects 5: Supporting RTK for Establishment of Geodetic Control
- OPUS-Projects for Manager’s Training - Transitioning from Instructor-led to Online, Self-paced instruction
- Augmenting Data exchange formats for OPUS of the future
- Q&A

16:30 - 18:00 Case studies of Surveys NGS does now and how they will change
- Implementing NGS OPUS Projects’ GVX feature to align RTK vectors to the NSRS to establish Geodetic Control for FirstNet Indoor Mapping.
- IGLD: A case study for leveraging digital tools to enhance QA/QC on large scale static GNSS observation campaigns
- Geodetic Leveling in the Modernized NSRS
- NGS Field Operations: Modernizing in Many Ways
- Q&A
- Closing Remarks by Director of National Geodetic Survey

June 22 Webinar 14:00 - 15:30 NGS Partner Panel Session: Discussion of the Benefits and Challenges of Transitioning to the Modernized NSRS
(geodesy.noaa.gov/web/science_edu/webinar_series/Webinars.shtml)