3D Hydrography Program (3DHP): A New Model for the Nation’s Hydrography
3D National Topography Model (3DNTM)

Integrates elevation and hydrography datasets to model the Nation's topography in 3D

- **3D Hydrography Program (3DHP)**
  - Hydrography derived from/integrated with 3D Elevation Program data
  - Connections to groundwater, wetlands, and engineered hydrography
  - 3DHP Infostructure for data sharing as part of the Internet of Water

- **“next gen” 3D Elevation Program (3DEP)**
  - New quality levels and refresh cycles
  - Integration of inland bathymetry
  - 3DEP Ecosystem for data and resource sharing
  - Continual improvement with new technologies and approaches

- **Future Integrated 3D Model**
  - Research and develop a 3D data model to fully integrate 3DHP and next gen 3DEP
  - Integrate other data from The National Map
The National Hydrography Dataset (NHD) portfolio of datasets is the most comprehensive and current data of the Nation’s surface waters:

- 9.4 million miles stream of network, including 8 million waterbodies and over 130,000 nested hydrologic units
- Based on 1:24,000-scale maps

NHD and Watershed Boundary Dataset (WBD) leverage local knowledge and updates through a stewardship program with participants from 41 states and Washington DC.

Updates are not uniform:
- Some areas have been updated; others untouched and based on older information – sometimes 40+ years old
- National consistency of data quality has decreased over time
- NHD surface water features don’t align well with highly accurate 3D Elevation Program data
Hydrography Derived from Elevation Offers a Solution!

Introducing the 3D Hydrography Program (3DHP)

- 3DHP will provide national consistency while meeting local needs
- Goal to acquire new hydrography standardized to align vertically, horizontally, and temporally with 3DEP data, as well as other improvements
  - Supports national and regional-level issues like flooding, contaminant spills, water quality and quantity, drought, climate change, etc.
  - Supports more accurate, updated modeling and analysis capabilities
  - Supports sharing of water data as the geospatial framework underpinning the internet of water
- Building on decades of work and concepts from current hydrography products
Benefits to updating National Hydrography Datasets

- **Hydrography Requirements and Benefits Study (HRBS; 2016)** documented 420 mission critical business uses with 23 Federal agencies, 50 states, 8 Tribal governments and 3 national associations.

- HRBS found that hydrography data are essential to a broad range of critical applications and the current program provides $538M annual benefits.

- A modernized 3D-enabled hydrography program could provide up to $1.14 billion annually in benefits if all user requirements are met.
Building 3D Hydrography Program

3DHP will follow 3DEP

- Establish **3DHP governance** to develop and coordinate partnerships and acquisition plans
- Seek funding **partnerships in the broad community** through an organized partnership process
- **Contract acquisition** of 3DHP data primarily through the USGS Geospatial Products and Services Contracts (GPSC)
- Allow for co-operative data acquisition and contributed data
- Provide specifications
The 3DHP Data Lifecycle

- **Planning**: Federal, state, tribal, local or private entities partner on an area of interest.
- **Acquisition**: Contractors acquire and process data.
- **Validation**: USGS validates data & produces standard 3DHP data products.
- **Publication**: USGS makes 3DHP data publicly available on The National Map & via services in the Cloud.
- **Access**: Users can download analysis ready data or access via map services.

Over $1B in annual benefits to the Nation if hydrography data needs are met (HRBS, 2016)
Coordination is Key

- Coordination at all levels and across sectors is crucial
- Work to align goals
- Identify requirements and find areas of overlap
- Eliminate duplicated effort
- Pool resources
Federal Acquisition Strategies - 3DHP Governance

3DHP Working Group - multi-agency federal coordination

- Twelve member agencies working to move forward together with common purpose
- Goal to improve the currency and accuracy of National hydrography mapping through the 3DHP
- Develop and execute acquisition strategies that maximize available funding to support national and agency-specific goals for 3DHP
- Part of an envisioned 3DNMT joint governance in support of 3D Nation and 3DNMT goals
3DHP State Coordination

Coordination with state stakeholders

- Collaboration with National States Geographic Information Council to engage with state GIos and key stakeholders
- USGS National Geospatial Program has a network of National Map Liaisons who lead outreach and coordination for 3DHP in their respective states and regions
- Keeping key stakeholders informed helps align data acquisition goals between federal and non-federal partners
State Acquisition Strategies

Develop plans and best practices for key communities

- Develop state plans for 3DHP data acquisition to identify
  - Business uses at the state level
  - Funding strategies
  - Strategies for finding and engaging funding partners and users
- Development of state best practices
- Forums to help partners learn and grow through collaboration
- Facilitate strategic funding investments in 3DHP
- nsgic.org

3DHP Acquisition Plans for each State and Territory
Introducing the 3DNTM Data Collaboration Announcement

Overview

- Key elements of the 3DNTM are in place or under active development
- As part of the transition, NGP is changing its process for soliciting and selecting partnerships beginning in FY24
- The revised and streamlined structure is called the 3DNTM Data Collaboration Announcement (DCA)
- The DCA replaces the Broad Agency Announcement (BAA) and is intended to include partnerships for both 3DEP and 3DHP
Data acquisition

Data Collaboration Announcement (DCA)
www.usgs.gov/3DNTM/DCA

- The DCA is the mechanism used for non-federal entities to partner with USGS and other Federal agencies to acquire high-quality hydrography data for 3DHP
- Open to Federal agencies, State and local governments, Tribes, academic institutions and the private sector
- Applicants are encouraged to build funding coalitions to pool resources to fund 50% or more of project costs
- 3DHP “matching” funds added to cover remaining costs
Tools
NHD Update
WBD Update
NHD Utilities (6 tools)
HEM
HydroAdd
Geoconflation
Generalization
NHDPlus HR Build

Technical Goals
- Radically simplify dataset
- Make catchments integral to the system
- Use catchments to build HUs
- Simplify and accelerate the workflow
NHD data content

- Anything “watery” found a place in the NHD
  - Pipelines (22 varieties)
  - Reservoirs (24 varieties)
    - Swimming pools (FCODE 43608)
    - Treatment ponds (FCODE 43612)
    - Filtration pond (43610), Settling pond (43611)
  - Levees
  - Lock chambers
  - Rapids
  - Non-earthen shore
  - Rock

- A major burden for maintenance/use

- Not designed for data management or hydologic modeling
3DHP Data Model

- Base **3DHP data model** on international standards as directed by the Geospatial Data Act of 2018

- Open Geospatial Consortium (OGC) WaterML2 Part 3: Surface Hydrology Features (HY_Features) provides a conceptual model of hydrology features, especially catchments, and different realizations
  - Common vocabulary and terminology
  - Based on hydrologic features, as opposed to human features

- Promotes interoperability (NOAA-NWM, Canada, USGS)

- Additional data about features can be carried as addressed data, indexed to the core dataset
New Data Model

- 95 percent of the features from NHD, WBD, and NHDPlus
- 10 percent of the feature types
- Reduced repetition
- Focused on hydrologic content
Populating 3DHP Data

- Migrate 24K NHD to 3DHP schema to provide reference and connectivity
  - Limited attribution
  - Limited functionality

- Add data from Elevation-derived Hydrography projects
  - Elevation-derived Hydrography Specifications published 2020
  - Data validation prior to ingest
  - Primary path for data improvement

- Best available data all in one dataset
www.usgs.gov/3DHP
https://hydro.nationalmap.gov/arcgis/rest/services/3DHP_all/MapServer
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HUC 19050401
Pilots to Derive Hydrography from Elevation

Gaining an understanding of how to build 3DHP Datasets

- Goals of Pilot Projects
  - Build inspection procedures and assess specifications
  - Understand costs and any issues with contracting
  - Help zero in on project costs

- Started with 5 Areas across the U.S.

- Alaska Pilots - Kobuk River Basin

- Recent CONUS Pilots: Southeast TX, PA, OR
NHD vs. Hydrography derived from elevation in Pennsylvania
Key takeaways

- 3DHP is the first systematic remapping of the Nation's hydrography since the 24K maps.

- NHD, NHDPlus HR, and WBD are not going away – all will remain available for years to come.

- Final NHD linework has been transferred to 3DHP data model.

- New data acquisition will go directly to 3DHP.

- Anticipate approximately 10 years to refresh the country (contingent on funding).

- Partnerships are vital.
3DHP is a Community Investment
Built on partnerships

- Investments in 3DEP data have made it possible to derive 3DHP features for a significant portion of the Nation (3DEP costs are not included in 3DHP costs)

- Like 3DEP, the 3DHP is a community-wide goal that depends on significant investments by partner organizations to successfully meet their needs

- USGS will manage 3DHP on behalf of the broader community who would provide the majority of the funding
Thank you!

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