Department of Commerce (DOC) Fiscal Year 2020 Agency Report

1. Please provide a summary of your agency's activities undertaken to carry out the provisions of OMB Circular A-119, "Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities" and the National Technology Transfer and Advance Act (NTTAA). The summary should contain a link to the agency's standards-specific website(s) where information about your agency's standards and conformity assessment related activities are available.

The mission of DOC is to create the conditions for economic growth, jobs creation, and opportunity within the US by ensuring fair trade nationally and internationally, providing the data necessary to support commerce and constitutional democracy, and fostering innovation by setting standards and conducting foundational research and development. In coordination with other branches of DOC, the five branches listed in this report support the strategic goals of accelerating US leadership, enhancing job creation, strengthening US economic and national security, fulfilling constitutional requirements, and delivering excellent customer service. The following report compiles information received by these five branches of DOC on how they engaged in international voluntary consensus standards and conformity activities during FY2020.

The **US Census Bureau (Census Bureau)** is completing the 2020 Census and will be delivering the small area geography and "basic tabulations of population" to each state as required by P.L. 94-171. Since the first Census Redistricting Data Program (RDP), conducted as part of the 1980 Census, the Census Bureau has included summaries for the major race groups as specified by the Statistical Program and Standards Office of the US Office of Management and Budget (OMB) in Directive 15 (as issued in 1977 and revised in 1997). During the 1990 Census RDP, voting age population (18 years and over) was added to the cross-tabulation of race and Hispanic origin. Programs and activities designed for the dissemination and analysis of statistical and geospatial data are being used in support of this effort.

Partnerships with tribal, state, county, and local governments, other federal agencies, commercial organizations, non-profit and academic institutions assisted in the collection and analysis of data for geographic programs such as the 2020 Boundary and Annexation Survey (BAS) and the 2020 Participant Statistical Areas Program (PSAP). Standards from organizations such as the International Organization for Standardization (ISO), the Open Geospatial Consortium (OGC), the Federal Geographic Data Committee (FGDC) and others that were developed through ANSI's voluntary consensus standards process, were applied in the Census Bureau's statistical surveys, economic analysis, and geographic programs.

The Census Bureau led the development of ISO 19160-3, Addressing – Part 3: Quality management for address data, and is actively involved in the development of ISO 19160-2, Addressing - Part 2: Assigning and maintaining addresses for objects in the physical world (see item 3 below). These standards and programs, in addition to ongoing research and innovation activities, were designed to improve public access, discoverability, integration, and data sharing, and to support the open government initiative and the provisions of OMB Circular A-119.

In 2020, the following activities exemplified the Census Bureau's application of VCS. The Census Bureau applied the International Committee for Information Technology Standards (INCITS) data standards for the criteria in their contribution to the National Spatial Data Infrastructure (NSDI). Census Bureau staff

participated in the FGDC's development of the National Geospatial Data Assets (NGDA) Baseline Standards Inventory Survey as a requirement of the Federal Data Strategy, Action 10, and the Geospatial Data Act of 2018 to query all covered agencies on their use of standards. The Census Bureau's leadership in the development and publication of two international standards for Addressing (ISO 19160-3 and 19160-2) continued in 2020.

The Census Bureau maintained 34 datasets considered NGDAs using standards developed by INCITS.

1. The Census Bureau's NGDA datasets represent a federal portfolio of geospatial datasets that meet specific requirements outlined in the 2018 Geospatial Data Act and are considered capital assets for decision making and public use. Derived from the Topologically Integrated Geographic Encoding and Referencing (TIGER) System, the Census Bureau's TIGER/Line shapefiles for these NGDAs are accessible by the public and discoverable on the Census.gov website (https://www.census.gov/), the Federal Geographic Data Committee's Geospatial Platform (GeoPlatform) (https://www.geoplatform.gov/), and Data.gov (https://www.data.gov/). The Census Bureau maintained 34 NGDA datasets in 2020 to support the FGDC Governmental Units, and Administrative and Statistical Boundaries Theme (33 NGDAs), and the FGDC Transportation Theme (1 NGDA). Federal agency respondents were asked to identify open standards to enhance the use of and access to these datasets in support of the NSDI, as outlined in the OMB Circular A-16 Supplemental Guidance (https://www.whitehouse.gov/wp-content/uploads/2017/11/Circular-016.pdf). The Census Bureau submitted responses to the FGDC for the NGDA Baseline Standards Inventory Survey in October 2020 and is currently maintaining licensed subscriptions to twelve ISO standards through the ANSI. The list of standards that the Census Bureau consulted for their NGDAs baseline are listed below:

    - INCITS 31-2009 (R2019): *Information Technology - Codes for the Identification of Counties and Equivalent Areas of the United States, Puerto Rico, and the Insular Areas*.
    - INCITS 38-2009 (R2019): *Information Technology - Codes for the Identification of the States and Equivalent Areas within the United States, Puerto Rico, and the Insular Areas*.
    - INCITS 446-2008 (R2018): *Information Technology - Identifying Attributes for Named Physical and Cultural Geographic Features (Except Roads and Highways) of the United States, Territories, Outlying Areas, and Freely Associated Areas, and the Waters of the Same to the Limit of the Twelve-Mile Statutory Zone*.
    - INCITS 454-2009 (R2019): *Information Technology - Codes for the Identification of Metropolitan and Micropolitan Statistical Areas and Related Statistical Areas of the United States and Puerto Rico*.
    - INCITS 455-2009 (R2019): *Information Technology - Codes for the Identification of Congressional Districts and Equivalent Areas of the United States, Puerto Rico, and the Insular Areas*.
    - INCITS/ISO 19110:2016 (2018): *Geographic information - Methodology for feature cataloguing*.
    - INCITS/ISO 19111:2007[R2012]: *Geographic information - Spatial referencing by coordinates*.
    - INCITS/ISO 19115-1:2014 (R2019): *Geographic information – Metadata - Part1: Fundamentals*.

- INCITS/ISO 19115-2:2019 (2019): *Geographic information - Metadata - Part 2: Extensions for acquisition and processing*.

2. The Census Bureau's 2020 TIGER/Line shapefiles complied with the ISO 19115-2 and ISO 19139-2 metadata-related standards.

3. The Census Bureau led the development of ISO *19160-3 Addressing – Part 3: Quality management for address data*, published in February 2020. The Census Bureau is now actively involved in the development of ISO *19160-2, Addressing - Part 2: Assigning and maintaining addresses for objects in the physical world*. This standard specifies how to plan, implement, and maintain addresses and corresponding address data to gain maximum benefits for governance and society. While the Census Bureau does not assign addresses within local communities, it has extensive experience in national address data management, and understands the principles and requirements necessary to create an address maintenance system. This standard will be valuable to stakeholders embarking on new addressing systems (e.g., developing countries, communities planning or considering a re-addressing initiative) as well as those that want to enhance their existing systems. Through participation in the development of ISO 19160-2, the Census Bureau gained valuable knowledge about how other nations maintain their data. This project also has the potential to help the Census Bureau's partners improve their address assignment and maintenance systems, which in turn will benefit the Census Bureau and other federal agencies seeking to obtain current, complete, and accurate address data.

The International Trade Administration (ITA) strengthens the competitiveness of US industry, promotes trade and investment, and ensures fair trade through the support of rigorous enforcement of US trade laws and agreements. Through its participation on US delegations addressing global standards development and trade-related standards issues, ITA works to improve the global business environment and helps US organizations compete at home and abroad. Information on ITA's work on standards can be found at https://legacy.trade.gov/td/standards/.

In FY2020, ITA participated in a variety of trade-related international standards activities including standards development along with engaging in policy dialogues and capacity building efforts. ITA experts participated in the US Technical Advisory Group (TAG) to ISO/TC293, Feed Machinery to support US industry's engagement through ITA's Market Development Cooperator Program (MDCP). An ITA representative also actively participated in the ISO/IEC Joint Technical Committee 1 Subcommittee 31 (JTC1/SC31), Automatic Identification and Data Capture Techniques. An ITA representative joined the US TAG for ISO/IEC JTC1 WG14 for Quantum Computing to gain greater understanding of standards development in the quantum information sciences. ITA regularly notifies relevant US stakeholders about opportunities to participate in new standards development activities that might have trade implications with the aim of heading off future market access issues for US exporters.

ITA participates in the ANSI Unmanned Aircraft Systems Standards Collaborative. An ITA specialist continues to participate in the Smart Textiles Subcommittee of ASTM International's Committee D13 on Textiles and a staff member of the Commercial Section in the US Embassy in Mexico City participates in Mexico's National Textile Standards Committee to monitor standards that could impact US textiles and apparel exporters.

In FY2020 ITA was represented on interagency teams addressing standards policy and development in the International Civil Aviation Organization (ICAO), the World Health Organization (WHO), and in Codex Alimentarius. ITA worked on standards capacity building in the Asia-Pacific Economic Cooperation (APEC) Forum and the Association of Southeast Asian Nations (ASEAN) in areas including food safety, medical devices, cybersecurity, electric vehicles, wine, and conformity assessment. ITA has joined inter-agency efforts led by the US Department of State to shape 5G and telecommunications standardization taking place at the International Telecommunications Union (ITU), including preparations for the World Telecommunications Standardization Assembly (WTSA).

ITA engaged on standards issues with the ASEAN Consultative Committee on Standards and Quality, including organizing workshops on the internet of things (IoT), additive manufacturing (aka 3D printing), and conformity assessment.

Bilateral engagement on standards issues was ongoing with various trading partners and through the US-Brazil Commercial Dialogue, the US-India Commercial Dialogue, the US-Argentina Commercial Dialogue, the US-Canada Regulatory Cooperation Council, and the US-EU Executive Working Group, among others. ITA continues to maintain Standards Attaches in Beijing, Brussels, Jakarta, Mexico City, and Sao Paulo.

ITA is a part of the US delegation headed by the Office of the US Trade Representative (USTR) to the WTO's Committee on Technical Barriers to Trade (TBT) that address specific standards-related trade concerns. Additionally, ITA coordinated several sets of US Government (USG) comments submitted to China on its standardization reform initiative and as input on the trade-related aspects of a Mexico survey on US standards. Throughout FY2020, ITA served on the USG delegations to the various trade agreement negotiations, specifically the TBT, Good Regulatory Practices (GRP), and Sectoral chapter negotiations. ITA regularly works with US industry to address issues of non-compliance with trade agreement commitments found in the WTO TBT Agreement and respective FTA TBT chapters.

Finally, ITA co-manages the Industry Technical Advisory Committee on Standards and Technical Trade Barriers (ITAC 14) with USTR which provides input to the Secretary of Commerce and USTR on standards-related policy matters.

National Institute of Standards and Technology (NIST)'s mission is to promote US innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve the quality of life. As specified in the National Technology Transfer and Advancement Act (NTTAA), in authorizing legislation, and in the Office of Management and Budget (OMB) Circular A-119, NIST, through its Standards Coordination Office (SCO), assists and guides federal agencies in leveraging voluntary consensus standards and private sector conformity assessment mechanisms into their programs, procurement and regulatory activities. NIST's SCO chairs the Interagency Committee on Standards Policy (ICSP) and works closely with federal agencies to reduce unnecessary duplication and complexity in standards and conformity assessment practices. SCO provides consultation and advice to other federal agencies in implementing conformity assessment programs, and holds leadership roles in ANSI governance, policy, and program oversight committees. SCO also hosts Standards.gov to serve as a standards and conformity assessment related resource for Federal agencies, industry, and the public.

<u>NIST response to the COVID-19 Pandemic</u>

In FY2020, the novel Corona virus, SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2), or COVID-19 created a global pandemic crisis, requiring immediate actions by US private and public sectors to contain COVID-19 and protect the US population. NIST participated in documentary standards development activities that directly addressed public health concerns. More information on NIST's response is located at https://www.nist.gov/coronavirus.

In tandem with other federal agencies and private sector standards development organizations, SCO coordinated free electronic access to over 80 international standards, developed by five organizations, that addressed critical medical and personal protective equipment (PPE). Access to these standards permitted US manufacturers to more quickly retool their production processes to meet the demand for PPE and medical equipment.

SCO led NIST's participation in ASTM International's ASTM F23 (Committee on Personal Protective Clothing and Equipment) to quickly develop the ***Standard Specification for Barrier Face Coverings*** (e.g., face masks). Over 50 organizations participated to create the specification establishing minimum design, performance, labeling, and care requirements for reusable barrier masks for use by the public. NIST helped ensure that the standard's technical requirements were appropriate yet not excessive.

A multi-disciplinary team at NIST developed a way to increase the sensitivity of the primary test used to detect the SARS-CoV-2 virus. The team used a mathematical technique for perceiving comparatively faint signals in diagnostic test data to better detect the presence of the virus. The model was able to amplify a modest signal resulting from a low number of particles in a nasal swab test so that the presence or absence of the virus could be more easily perceived.

NIST is managing the technical working group, Joint ISO/TC 212 - ISO/TC 276 WG: Quality practice for detection of SARS-CoV-2. The committee is drafting a new technical specification that will explain what to consider in designing, making, and deploying analytical tests for detecting SARS-CoV-2 using nucleic acid amplification methods. The standard can guide medical laboratories in maximizing their testing accuracy and reliability by making the best use of commercially available in-vitro diagnostics when testing for COVID-19, and when developing their own tests for detecting the virus.

NIST published an ITL Bulletin (March 2020), "Security for Enterprise Telework, Remote Access, and Bring Your Own Device (BYOD) Solutions" in response to the significant telework increase in 2020. The Bulletin provides guidelines on telework and remote access to help organizations mitigate security risks associated with the enterprise technologies used for teleworking, such as remote access servers, telework client devices, and remote access communications.

NIST and the White House Office of Science and Technology Policy (OSTP) developed a program to improve search engines for accessing COVID-19 research data. This effort used AI to improve search capabilities.

<u>Additional FY2020 NIST activities</u>

In addition to targeted measurement research and coordinated standards participation in response to the COVID-19 pandemic, in FY2020, more than 440 NIST staff participated formally in over 1,750 standards activities in more than 112 different organizations. In addition to participation in standards developing organizations (SDOs), NIST staff held key roles on ANSI boards and committees that oversee the US standardization system that 'accredits' SDO's and serves as the US Member body to ISO and IEC

committees. Below is a sampling of NIST's activities in the development of documentary standards addressing core issues in advanced communications, cybersecurity, AI, and privacy.

Advanced communications

NIST provides leadership and technical expertise in key advanced communications related standards bodies. Over 30 NIST experts lead and participate in global standards and specification development organizations such as 3rd Generation Partnership Project (3GPP), Institute of Electrical and Electronics Engineers (IEEE), Internet Engineering Task Force (IETF), International Telecommunication Union Radiocommunications Sector (ITU-R), Alliance for Telecommunications Industry Solutions (ATIS), ISO-IEC/JTC1, and Wireless Innovation Forum Spectrum Sharing Committee (WinnForum). In FY2020, NIST contributions to 3GPP were focused on the evaluation of key functionalities of 5G New Radio specifications in support of mission critical public safety communications. NIST has also contributed its millimeter-wave propagation measurement and models to ITU-R to extend two recommendations on outdoor and indoor propagation guidelines.

Cybersecurity

NIST's National Cybersecurity Center of Excellence (NCCoE) is a collaboration of industry organizations, government agencies, and academic institutions working together to address relevant private sector cybersecurity issues. In FY2020, NCCoE launched "5G Cybersecurity: Preparing a Secure Evolution to 5G". This project will demonstrate how commercial and open-source products can leverage cybersecurity standards and recommend practices to mitigate identified risks and meet industry sectors' compliance requirements.

NIST staff participated within a variety of international and domestic SDOs addressing cybersecurity including INCITS, ISO, IEC, IETF, World Wide Web Consortium (W3C), and IEEE to leverage NIST's technical capabilities in research and standardization processes in areas like IT security, testing and validation, biometrics, security devices, Internet of Things (IoT), cloud computing, cryptography, identity and access control, critical infrastructures and others.

NIST also supported promotion and adoption of the NIST Cybersecurity Framework (CSF) both domestically and internationally and engaged with relevant SDOs for mapping CSF cybersecurity control objectives to industry standards, guidelines, and practices designed to promote the protection of critical infrastructure. NIST was instrumental for the creation of projects like *ISO/IEC 27100 Information technology — Cybersecurity — Overview and concepts*, and *ISO/IEC CD TS 27101 Information technology — Security techniques — Cybersecurity — Framework development guidelines*, as well as the completion of *ISO/IEC TR 27103:2018 Information technology — Security techniques — Cybersecurity and ISO and IEC standards*, which leverages Version 1.0 of the Cybersecurity Framework and incorporates additional ISO/IEC JTC 1 SC 27 Information security, cybersecurity and privacy protection standards.

Artificial Intelligence (AI)

NIST research in AI is focused on the security and trustworthiness of AI systems via research and participation in international standards developing efforts such as ISO/IEC JTC 1/SC 42 Artificial Intelligence.

Privacy

In FY 2020, NIST published Version 1.0 of the NIST Privacy Framework: *A Tool for Improving Privacy through Enterprise Risk Management* (Privacy Framework). The Privacy Framework is a voluntary tool developed in collaboration with stakeholders intended to help organizations identify and manage privacy risk. The Privacy Framework can be mapped to standards supporting its implementation and identify gaps in existing guidelines, and in turn help drive the development of new or revised standards to fill those gaps.

In FY 2020 NIST also actively engaged in international standards development organizations to advance the development of risk-based standards to help organizations protect individuals' privacy. Three examples of standardization efforts that benefitted from NIST's expertise are the ISO Project Committee 317, which focuses on developing ISO 31700, *Consumer protection: privacy by design for consumer goods and services*; the ISO/IEC 27557, *Organizational privacy risk management*; and the IEEE P7002, *Data Privacy Process*.

Biotechnology

As the administrator of the US Technical Advisory Group (TAG) for the ISO Technical Committee (ISO/TC) 276 on Biotechnology, NIST coordinates US responses to the suite of international biotechnical standards developed through ISO. NIST's role is to implement the guidance of ANSI to ensure that each standard is developed through consensus, due process, and openness. The US TAG stakeholders assembled by NIST includes participating and observing member organizations representing producers, users/consumers, government, academia, and professional entities. More information may be found here: https://www.nist.gov/programs-projects/us-tag-isotc276-biotechnology .

Conformity assessment

In September 2020, NIST revised 15 CFR Part 287 *Guidance on Federal Agency Conformity Assessment Activities* - 15 CFR Part 287 *Guidance on Federal Agency Conformity Assessment Activities*. Section 12 of the NTTAA of 1995 directs NIST to "coordinate technical standards activities and conformity assessment activities of Federal, State, and local governments with private sector technical standards activities and conformity assessment activities, with the goal of eliminating unnecessary duplication and complexity in the development and promulgation of conformity assessment requirements and measures". NIST originally issued the guidance found in 15 CFR 287 on August 10, 2000 in response to OMB Circular A-119 (February 10, 1998) directing the Secretary of Commerce to issue guidance to Federal agencies to ensure effective coordination of Federal conformity assessment activities. The January 2016 revision to OMB Circular A-119 re-emphasizes NIST's role in issuing guidance to agencies as well as Federal agencies' responsibilities with respect to conformity assessment. NIST has revised this guidance to reflect development in conformity assessment concepts and evolution in Federal agency strategies and coordination in using and relying on conformity assessment.

National Oceanic and Aeronautic Administration (NOAA)

Standardization of data acquisition and data management practices are vital to **NOAA**'s mission and the effective sharing of its data for use by the public, industry, and academia. NOAA seeks to establish voluntary standards with selected industrial associations, academia, and national organizations of state and local governments (e.g., the American Association of State Climatologists), as well as through participation in professional societies (e.g., American Meteorological Society) and SDOs (e.g., Open

Geospatial Consortium). All NOAA line organizations participate in standards development activities, which are typically coordinated through NOAA's Environmental Data Management Committee (EDMC). NOAA also participates in the Commerce Data Governance Board (established in September 2019). In general, standards used in many NOAA activities are established in conjunction with other federal agencies either through joint participation in national (e.g., FGDC) and international (e.g., United Nations committee of experts on Global Geospatial Information Management) organizations or by means of bilateral and multilateral agreements with other nations. The recent implementation of the Geospatial Data Act of 2018 (GDA)) and the Digital Accountability and Transparency Act (DATA Act) bring NOAA activities into sharper focus regarding standards within the FGDC. Likewise, the adoption by the US of the UN Global Geodetic Reference Frame (UN GGRF) has affirmed US commitment to international standards. These standardization activities apply to all phases of environmental data acquisition, processing, and distribution.

- Through its Big Data Project, NOAA has signed contracts with Amazon, Google, and Microsoft to distribute NOAA's open data through those partners' cloud platforms at no cost to the data consumer. These partners and NOAA have also begun to transform data from environmental data standards (e.g., netcdf4) to more generalized and cloud-optimized standards (e.g., Cloud-Optimized GeoTIFF) of interest to the wider data science community. To date, NOAA has distributed over 80 federal datasets through the Big Data Project public-private partnership, using cloud platform standards (e.g., S3, BigQuery) for data access and dissemination.

- NOAA shares thousands of its datasets through the Environmental Research Division Data Access Program (ERDDAP) service (https://coastwatch.pfeg.noaa.gov/erddap/index.html) and the Weather and Climate Toolkit https://www.ncdc.noaa.gov/wct/) which allows for the delivery and translation of data among multiple formats. NOAA data providers use the open-standard Data Access Protocol v2.0 to support interoperable data access.

- In October 2019, NOAA's National Geodetic Survey (NGS) published a framework for defining and maintaining the State Plane Coordinate System of 2022 (SPCS2022). This standards framework is key to guide the transition from the North American Datum of 1983 (NAD 83) to the 2022 Terrestrial Reference Frames (TRFs). SPCS2022 will replace SPCS 83 (NAD 83). NGS recognizes that there is significant interest within the geospatial community as to how SPCS2022 is defined, and many wish to have a voice in the development of SPCS2022. As this framework also specifies the characteristics and requirements for SPCS2022, the intent is to define SPCS2022 such that it is a technically sound and practical projected coordinate system for the modernized National Spatial Reference System (NSRS).

- NOAA has provided leadership for the creation of the Federal Data Strategy (strategy.data.gov) and the national response to the Geospatial Data Act. Both efforts include strategic and tactical direction to Agencies to adopt data standards in the execution of their missions.

- NOAA has created and is developing an implementation for the NOAA Data Strategy. The purpose of the NOAA Data Strategy is to dramatically accelerate the use of data across the agency and with

other key partners, maximize openness and transparency, deliver on mission, and steward resources while protecting quality, integrity, security, privacy, and confidentiality. The overall strategy is designed to serve as a framework for consistency that builds upon existing laws and regulations related to how NOAA uses and manages data, while being flexible and adaptable to external influences such as new policies, Executive Orders, stakeholder input, and new technologies that drive innovation within the agency.

- NOAA has expanded its use of the international OpenSearch standard and schema.org community metadata standards to support data discovery. These standard metadata have continued to be utilized by Google in their free-text DataSetSearch capability (https://toolbox.google.com/datasetsearch) which has now become a regular Google service. NOAA has continued to provide feedback to Google on the rankings of NOAA datasets.

- NOAA's newest satellites, Geostationary Operational Environmental Satellite system (GOES) - GOES-16, GOES-17, and the polar orbiting NOAA-20, all use the open-standard Network Common Data Form (NetCDF-4) format rather than agency-developed data formats. NOAA has supported the collaborative development and is currently using standards for NetCDF-4 profile to handle in situ data from stationary and moving sensors. NOAA promotes the use of ISO-19115-2 metadata standards and encourages use of Climate and Forecast Conventions (CF) and Attribute Conventions for Dataset Discovery (ACDD) community standards for naming conventions in NetCDF file production for satellite data. NOAA's National Centers for Environmental Information (NCEI) has defined multiple NetCDF templates to guide those submitting data to NCEI in the NetCDF data format. Use of NetCDF and these templates reduces the data analysis overhead as many scientific data analysis applications readily support the NetCDF data format.

- NOAA uses the ISO 19115: “Geographic information – Metadata” family of geospatial metadata standards and participates in US representation in ISO TC211 Geographic information/Geomatics, with Census Bureau serving as the lead for DOC. NOAA continues its gradual transition to the newest version of ISO 19115.

- NOAA uses ISO 26324: “Information and documentation -- Digital object identifier system” to assign unique, resolvable, and persistent identifiers to archival datasets and technical reports.

- NOAA National Weather Service meteorological data and reports comply with World Meteorological Organization (WMO) Standards. NOAA serves as the WMO Information System (WIS) Global Information System Centres (GISC) which includes a portal to search all WMO Region IV data center metadata.

- Light Detection and Ranging (lidar) is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth. NOAA has adopted the American Society of Photogrammetry and Remote Sensing (ASPRS) Lidar Exchange Format (LAS) standard format for lidar data and the open source LAZ (laszip.org) for the compression of lidar data.

- NOAA/US Integrated Ocean Observing System (IOOS) is contributing to the Attribute Convention for Data Discovery (ACDD) via Earth Science Information Partners (ESIP), a broad-based, distributed community of data and information technology practitioners, and promulgating scientific data metadata standards via ioos.github.io/ioos-metadata. IOOS requires adherence to standards as a part of its core capabilities. This includes open data sharing via the Global Earth Observing System of Systems (GEOSS) the use of ERDDAP and Thematic Real-Time Environmental Distributed Data Services (THREDDS) servers for data discovery and access, metadata using relevant standards and the IOOS metadata profile - https://ioos.github.io/ioos-metadata/. The IOOS Catalog is the master inventory of IOOS Data Management and Communications (DMAC) datasets and data access services. Data providers are expected to register their datasets in the Catalog using standards given in https://ioos.noaa.gov/data/contribute-data/catalog-registration/. IOOS provides directions for setup and a gold standard ERDDAP at https://github.com/ioos/erddap-gold-standard. For full details in IOOS' use of standards see https://ioos.noaa.gov/data/contribute-data/

- NOAA remained a Principal Member of the OGC in FY2020, and various data providers have adopted key OGC standards, including the Catalog Service for Web (CS/W), Web Map Service (WMS), Web Coverage Service (WCS), Web Feature Service (WFS), and Sensor Observation Service (SOS). NOAA participates in OGC Working Groups to help evolve the suite of voluntary-consensus standards.

- NOAA uses GitHub to allow the standardization of NOAA code sharing with the scientific and data communities.

- NOAA has submitted data to NIH's Genbank, following established standards. GenBank is part of the International Nucleotide Sequence Database Collaboration, which comprises the DNA DataBank of Japan (DDBJ), the European Nucleotide Archive (ENA), and GenBank at the National Center for Biotechnology Information (NCBI) (https://www.ncbi.nlm.nih.gov/genbank/).

- NOAA's Office of Coast Survey (OCS) and the Center for Operational Oceanographic Products and Services (CO-OPS) represent the United States in the International Hydrographic Organization (IHO) and on several regional hydrographic commissions. OCS surveys and nautical charts are produced to IHO standards that ensure consistent nautical charts so that mariners can confidently use charts compiled by any member organization across the world. OCS engages heavily in the IHO working groups on standards for digital data formats, data display, and product authentication (https://iho.int/en/standards-and-specifications). CO-OPS adheres to IHO standards in providing water level and current information for the marine navigation community.

- NOAA's Center for Operational Oceanographic Products and Services represents the United States on the Global Sea Level Observing System Group of Experts (GLOSS GE). This group establishes best practices and standards for the collection, processing, and dissemination of water level data for climate studies. CO-OPS transmits its long-term data sets to GLOSS data centers along with data from many of the world's water level organizations so that the climate research community has access to high quality water level records in a standard format on a single database.

- NOAA's National Geodetic Survey (NGS) represents the United States on the UN Committee of Experts on Global Geospatial Information Management (UN-GGIM)'s Subcommittee on Geodesy (UN SCoG). The Subcommittee is developing a Global Geodetic Reference Frame (GGRF) to provide a globally consistent approach to geodesy involving a common reference system, geodetic infrastructure, standards, and education/training. The UN GGRF was adopted by the US Government along with the governments of other nations. As such, the US Government has agreed to abide by these international standards - including the adoption of a modernized NSRS that is based on the International Terrestrial Reference System (ITRS) and the International Height Reference System (IHRS). NGS is working to modernize and improve the US NSRS to do just that. A new geopotential datum and four terrestrial reference frames aligned with the UN GGRF are planned for release in 2022 and will replace the current vertical and horizontal datums. NGS also participates in the UN-GGIM-Americas regional committee to ensure that the updated NSRS is regionally consistent with the Sistema de Referencia Geocéntrico para Las Américas (SIRGAS) Reference System for the Americas, which is also based on the UN GGRF.

- NGS also represents the US on the ISO TC 211 on Geographic information/Geomatics. Definitional parameters for US reference frames, datums, and geoid models were loaded into the ISO Geodetic Registry (ISOGR), guided by ISO 19127/19135. The ISOGR is intended as a tool for GIS application developers and US Government Agencies to provide look-up tables to make reference frame transformations simpler and authoritative. ISO TC 211 also authored two standards: *ISO 19111:2019 Geographic information — Referencing by coordinates* and *ISO 19161-1:2020 Geographic information — Geodetic references — Part 1: International terrestrial reference system (ITR*S). The first updates datums and reference frames to account for time-varying movement (i.e., not just earthquakes - the whole frame moves). The second specifies adoption of the International Association of Geodesy's (IAG) International Terrestrial Reference System (ITRS), which is a component of the UN GGRF. NGS also participates in ISO TC 172 WG6 on Geodetic Instrumentation standards to ensure that appropriate standards are maintained for equipment and usage of equipment to meet positional accuracy requirements desired in the NSRS. NGS also participates in the Open Geospatial Consortium (OGC) as well as ISO to ensure US FGDC standards are consistent with - if not based on entirely - internationally accepted standards following the guidance of the Geospatial Data Act of 2018 (GDA). Additionally, NGS leads efforts in the International Federation of Surveyors (FIG) to implement these standards and hold appropriate training and education seminars to effect transfer of this knowledge.

- NOAA’s National Centers for Environmental Information (NCEI) has defined multiple Network Common Data Form (NetCDF) templates to guide those submitting date to NCEI in the NetCDF data format. Use of NetCDF and these templates reduces the data analysis overhead as many scientific data analysis applications readily support the NetCDF data format.

National Telecommunications and Information Administration (NTIA) contributes to the development and application of national and international telecommunication standards by leading, participating in,

and making technical contributions to various voluntary national and international telecommunication standards committees, such as the 3GPP, ITU-R, ITU-T, IEEE Standards Association, and ATIS. In addition, NTIA's Institute for Telecommunication Sciences (ITS) founded and continues to play a significant role in the Video Quality Expert Group (VQEG), which performs technical validation that is a prerequisite to standardization. VQEG is currently focused on collaborative efforts to develop new and improved methods for subjective and objective video quality assessment.

In FY 2020, ITS staff held 28 positions in eight standards bodies, including 10 Chair/Co-chair/Vice-chair positions. ITS staff filled key leadership positions in the ITU-R, including Head of the US Delegation to Study Group (SG) 3 (Radiowave Propagation), International Chair and US Chair of SG3 Working Parties 3K and 3L (Point-to-area and ionospheric propagation), and US Chair of Working Party 3J (Propagation fundamentals). ITS staff also filled key leadership positions in the ITU-T, including Head of US Delegation to Study Group 13 (Future Networks) and Study Group 11 (Protocols and Test Specifications). ITS staff hold the Co-Chair position for the ATIS 5G Supply Chain Working Group. ITS also continued its technical leadership and contributions to communications standards for emerging 5G technologies through participation in 3GPP and in that capacity, and at the behest of the National Security Council, is responsible for driving collaboration between US Departments/Agencies participating in 3GPP. Finally, ITS provided technical leadership and contributions to IEEE standards for local/personal/metropolitan area networks (LAN/PAN/MAN) through participation in IEEE 802.

ITS leads US efforts at the ITU-R Study Group 3 (SG3), the technical group that focuses exclusively on radiowave propagation. At SG3, ITS contributes inputs and ensures the technical accuracy and correctness of international radiowave propagation standards. SG3 Recommendations on radiowave propagation are treaty-level agreements and play a role in international agreements on spectrum allocations and sharing scenarios, such as the on-going discussions of 5G mid-band spectrum and mmWave spectrum.

In FY 2020, ITS contributed five of the 22 US technical contributions to SG3. ITS proposed an update to Recommendation ITU-R P.528 (a propagation prediction method for aeronautical mobile and radionavigation services using the VHF, UHF and SHF bands) to support requests from the International Civil Aviation Organization (ICAO). As a result of the ITS contribution, ICAO will be able to use P.528 in their frequency management system. ITS proposed replacement software to support Recommendation ITU-R P.368 (Ground-wave propagation curves for frequencies between 10 kHz and 30 MHz), which is used to support broadcast services.

NTIA's Office of International Affairs (OIA) followed and/or provided inputs to various ITU-T Sector Study Groups, which consider "Recommendations" on such diverse subjects as M2M/IoT (Machine to Machine/Internet of Things) traffic, OTT (Over the Top), Distributed Ledger Technology (DLT), Revised Internet Network Architecture proposals (e.g., New IP, Polymorphic Networking), facial recognition, and Security by Design and Cybersecurity testing, and IoT/Smart Cities. In addition to these topics, OIA in conjunction with technical support from ITS, has been participating heavily in the ITU-T Study Groups 11 and 13 to counter regional adversary efforts to develop alternate Internet Protocol standards in the ITU rather than in more appropriate SDOs; ITS led the US delegation in those study groups. NTIA's work in ITU-T focuses on industry-led, bottom-up, consensus-based standards and appropriately working with US government colleagues to help ensure the ITU-T avoids duplication of efforts with other standards development organizations such as 3GPP.

Direct participation by NTIA in the 3GPP, the dominant cellular communications standards development organization, allows NTIA to advance US commercial, economic, and government interests by providing technical input to promote strong unbiased standards that support fair competition in next generation/5G cellular technologies. ITS attends 3GPP Working Groups for Services (SA1), System Architecture (SA2), and Security (SA3). Additionally, ITS attends the Radio Access Network Working Group 1 focused on the physical layer for LTE and 5G (RAN 1). NTIA's Office of Spectrum Management (OSM) attends 3GPP Technical Specification Group Radio Access Networks Working Groups 1 (RAN 1) and 4 (RAN 4). OSM's goals are to: gain a more in-depth understanding of 3GPP standards and models used in compatibility studies; monitor 3GPP proposals that have a potential to impact federal operations; identify 3GPP spectrum standards that could be adopted for federal systems; and verify that 3GPP standards are being properly used in domestic and international spectrum sharing studies. For a number of years, ITS has provided technical guidance to other government agencies in advocating for standardization of service features specific to public safety, emergency communications, and transportation. A continued focus in FY 2020 was to ensure that NTIA and other interested agencies obtained a comprehensive understanding of the 3GPP New Radio (5G NR — the global standard for the air interface of 5G networks) capabilities, the services 5G NR was built to deliver, and deployment scenarios in both licensed and unlicensed spectrum for the evolution to 5G. NTIA's overall goals also include monitoring regional adversary participation efforts to subvert the open consensus-based standards processes, and developing and promulgating expertise in cutting edge mobile broadband technology trends.

United States Patent and Trademark Office (USPTO) contributes to the development of international standards for patent and trademark information and documentation primarily through participation of USPTO scientific and technical experts to the Committee on WIPO Standards (CWS) of the World Intellectual Property Organization (WIPO). The standards developed are used by the USPTO and other international intellectual property organizations around the world to harmonize intellectual property information practices. The standards harmonize practices regarding electronic data processing procedures with respect to filing, examination, and publication of intellectual property data. The standards facilitate the exchange, sharing, dissemination, access and retrieval of intellectual property data and documents. USPTO staff also participate in standardization activities of the International Patent Classification (IPC) Union. The IPC provides a hierarchical system for the classification of patents according to different areas of technology. The worldwide access to patent and trademark data and documents supports US industry and organizations' knowledge of national and international intellectual property. https://www.uspto.gov/patents-application-process/patent-search/understanding-patent-classifications/international.

2. Please list the government-unique standards (GUS) your agency began using in lieu of voluntary consensus standards during FY 2020. Please note that GUS which are still in effect from previous years should continue to be listed, thus the total number in your agency's report will include all GUS currently in use (previous years and new as of this FY): 0