



NASA OFFICE OF INSPECTOR GENERAL

OFFICE OF AUDITS
SUITE 8U71, 300 E ST SW
WASHINGTON, D.C. 20546-0001

September 4, 2024

TO: Jim Free
Associate Administrator

SUBJECT: Final Memorandum, *NASA's Compliance with the Geospatial Data Act for Fiscal Year 2024* (IG-24-017; A-24-02-00-MSD)

The Geospatial Data Act of 2018 (GDA) seeks to foster efficient, government-wide management of geospatial data—information identifying the geographic location and characteristics of natural or constructed features and boundaries on Earth.¹ The Act codifies committees, processes, and tools in support of the National Spatial Data Infrastructure.² It also formalizes governance processes related to geospatial data, provides policy and guidance for the use of geospatial data and technology, and facilitates cooperation between the private and public sectors.

In addition, the Act requires Inspectors General to audit the collection, production, acquisition, maintenance, distribution, use, and preservation of geospatial data by covered agencies—including NASA—at least once every 2 years.³ Specifically, the Act requires a review of agency compliance with (1) the geospatial data standards established under Section 757, (2) the 13 agency responsibilities listed in Section 759(a), and (3) the limitation on the use of federal funds in Section 759A.

¹ The Geospatial Data Act of 2018 became law on October 5, 2018, as a component of the FAA Reauthorization Act of 2018 (Pub. L. No. 115-254, Subtitle F). Geospatial data is a type of spatial data that directly or indirectly references a specific geographical area or location related to the Earth. According to the U.S. Geological Survey, the terms “spatial” and “geospatial” are equivalent.

² The National Spatial Data Infrastructure is the technology, policies, standards, and human resources necessary to acquire, process, store, distribute, and improve utilization of geospatial data. Further, it promotes geospatial data sharing throughout federal, state, tribal, and local governments, and the private sector including non-profit organizations and institutions of higher education.

³ A covered agency is one that collects, produces, acquires, maintains, distributes, uses, or preserves geospatial data on paper or in electronic form to fulfill the agency’s mission, either directly or through a relationship with another organization. Under the GDA, covered agencies include 15 executive departments, the U.S. Environmental Protection Agency, and NASA, but excludes the U.S. Department of Defense and any element of the intelligence community.

The Council of the Inspectors General on Integrity and Efficiency (CIGIE) convened a working group to coordinate a government-wide approach for the fiscal year (FY) 2024 geospatial data audit.⁴ The group notified relevant congressional committees that the audit would primarily focus on covered agencies' progress toward compliance with the 13 responsibilities listed in Section 759(a) of the Act since geospatial data standards had not yet been established. See Enclosure I for details on the audit's scope and methodology and Enclosure II for a copy of the letter CIGIE sent to Congress.

Similar to our past two audits, we evaluated the extent to which NASA is managing its geospatial data in accordance with the Act. In addition, we evaluated the Agency's implementation of recommendations made in our previous FY 2020 and FY 2022 GDA assessments (see Enclosure III).⁵ Moving forward, we anticipate geospatial data strategies, standards, and criteria will be further clarified for agencies' use in implementing the Act, and we will examine these topics in subsequent audits.

Background

Since 1990, the federal government has recognized the need to organize and coordinate the collection and management of geospatial data. Specifically, the Office of Management and Budget's (OMB) Circular A-16 provided guidance on the coordination of federal surveying, mapping, and related spatial data activities and established the Federal Geographic Data Committee (FGDC).⁶ In 2002, OMB revised the circular to promote the coordinated use, sharing, and dissemination of geospatial data nationwide, including incorporating the National Spatial Data Infrastructure into the circular and establishing the FGDC as the interagency coordinating body for National Spatial Data Infrastructure-related activities.⁷ The GDA and OMB Circular A-16, coupled with the broader Open, Public, Electronic, and Necessary Government Data Act of 2019, created a regulatory framework to address sharing geospatial data.⁸

Geospatial data generally combines location information (usually coordinates of latitude and longitude), attribute information (characteristics of the object, event, or phenomenon concerned), and temporal information (time or lifespan at which the location and attributes exist). With geospatial data, location information can be static or dynamic. Examples of static data include the location of a road and earthquake event; dynamic data include the location of a moving vehicle and pedestrian or the spread of an infectious disease like COVID-19.

Geospatial data is collected in a number of ways, with the Global Positioning System (commonly known as GPS)—which uses satellite and ground instruments to provide users with accurate position, navigation, and timing information worldwide—being the most familiar. Another example is remote sensing systems that measure (via satellite, airplane, or balloon) emissions and reflections from the

⁴ CIGIE is an independent entity within the executive branch made up of Inspectors General whose offices are established under the Inspector General Act of 1978, and those appointed by the President and confirmed by the Senate or appointed by agency heads. CIGIE addresses integrity, economy, and effectiveness issues that go beyond individual government agencies.

⁵ NASA Office of Inspector General, *Audit of NASA's Compliance with the Geospatial Data Act* ([IG-21-001](#), October 2, 2020) and *NASA's Compliance with the Geospatial Data Act for Fiscal Year 2022* ([IG-23-001](#), October 5, 2022).

⁶ OMB Circular No. A-16 Revised, *Coordination of Surveying, Mapping, and Related Spatial Data Activities* (October 19, 1990). The FGDC acts as the lead entity in the executive branch for the development, implementation, and review of policies, practices, and standards relating to geospatial data.

⁷ OMB Circular No. A-16 Revised, *Coordination of Geographic Information and Related Spatial Data Activities* (August 19, 2002).

⁸ Open, Public, Electronic, and Necessary Government Data Act, as enacted by the Foundations for Evidence-Based Policymaking Act of 2018, Pub. L. No. 115-435 (2019).

Earth and its atmosphere.⁹ The data is stored using a variety of methods, such as in a Geographic Information System, which analyzes and displays geographically referenced information. Maps are the most common way of presenting geospatial data. Maps with geospatial data can provide evidence for decision-making, serve as teaching tools, and improve our understanding of natural and human-made phenomena. The power of geospatial data lies in the ability to derive new information from relationships between various data layers (e.g., an ice thickness data layer over ice coverage locations).

NASA's stewardship of geospatial data aligns with its Earth science goals to observe our planet's oceans, land, ice, and atmosphere; study Earth's interconnected systems; and build long-term data records of how our planet evolves. Scientists and policymakers depend on the continuous flow of geospatial information from NASA—such as data on natural disasters, the global water cycle, weather modeling, air quality, predictive models for fire behavior, ice sheet observations, and ozone trends—to inform their decision-making. This information is generated through numerous NASA and partner satellite missions and field research campaigns. For more than 25 years, NASA has made its data available at no cost to research communities, academia, private industry, and the public.

To enable the efficient production, archiving, and delivery of data, NASA participates in government-wide efforts to develop data standards, create and curate metadata, and build tools to enable search and discovery, all of which help ensure interoperability with other systems, agencies, and organizations.¹⁰ NASA is a leader in the amount of geospatial data collected, cataloged, and shared with private and public entities.

Data Generation and Use

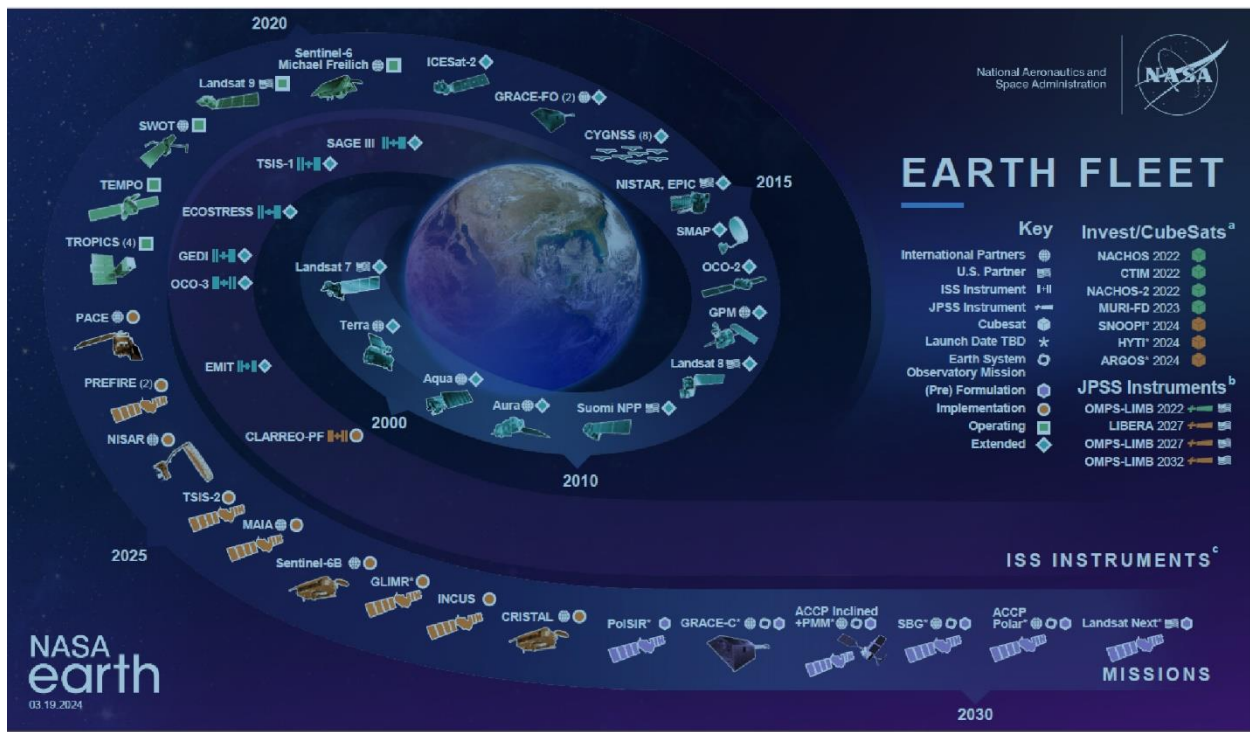
NASA has one of the world's largest repositories of Earth science data, with more than 18,000 unique data products. This data is acquired, processed, archived, and distributed by the Agency's Science Mission Directorate (SMD). SMD collects, maintains, disseminates, and preserves petabytes of geospatial data through its fleet of satellites and the Earth Observing System Data and Information System, which is composed of 12 Distributed Active Archive Centers organized by specific science disciplines.¹¹ Raw data is collected through NASA's satellite and Earth-based instruments and then distributed to processing facilities where additional layers of data are correlated. Figure 1 depicts NASA's fleet of Earth-observing satellites used for the collection of geospatial data.

⁹ Remote sensing is the process of detecting and monitoring the physical characteristics of an area by measuring its reflected and emitted radiation at a distance. Special cameras, typically on satellites and aircraft, collect remotely sensed images to help researchers "sense" things about the Earth such as temperature changes in oceans, changes in farmland or forests over several years, and tracking of clouds to predict weather.

¹⁰ According to OMB A-16, metadata is information about data and geospatial services, such as content, source, vintage, spatial scale, accuracy, projection, method of collection, and other descriptions. Reliable metadata, structured in a standardized manner, is essential to ensuring that geospatial data is used appropriately and any resulting analysis is credible.

¹¹ Some estimates hold that a single petabyte is the equivalent of 20 million tall filing cabinets or 500 billion pages of standard printed text. Located at NASA Centers, universities, and other federal agencies, Distributed Active Archive Centers are operated collaboratively by NASA and contractor staff and are responsible for processing, archiving, and distributing NASA's Earth science data.

Figure 1: NASA's Earth-Observing Satellite Fleet (as of March 2024)



Source: NASA Earth Science Division.

^a In-Space Validation of Earth Science Technologies (InVEST) projects have validated new instruments and information systems by installing small satellite platforms on bread loaf-sized CubeSats (research nanosatellites).

^b The Joint Polar Satellite System (JPSS) is composed of polar-orbiting environmental satellites that provide full coverage of Earth, meteorological data, and observations of the atmosphere, oceans, and lands.

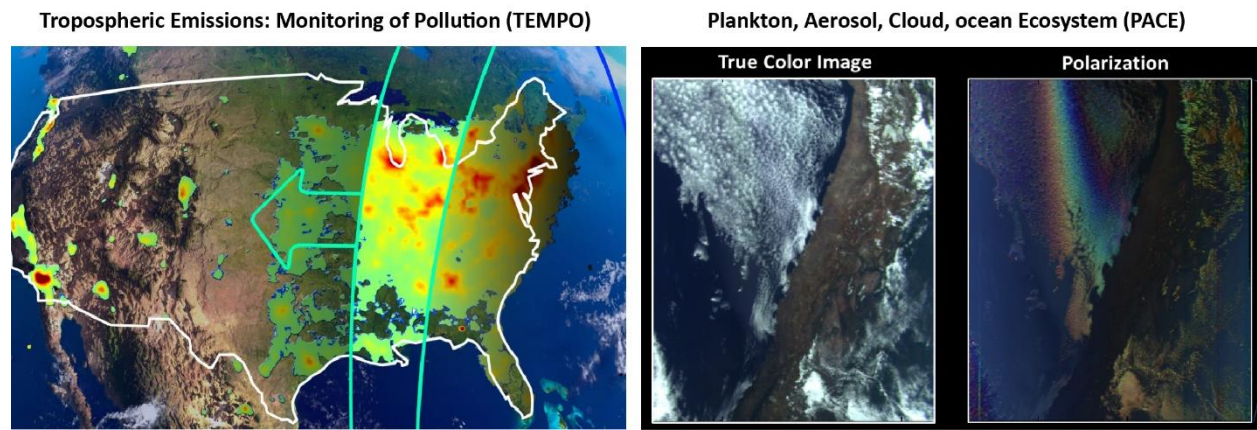
^c International Space Station (ISS) instruments focus on such topics as the Earth's changing climate, vegetation measurements, carbon dioxide distribution, and the Sun's energy input to Earth.

NASA archives Earth science mission data to ensure long-term usability and promote widespread usage by scientists, educators, decision-makers, and the public. According to NASA officials, three data feeds derived from NASA's Earth-observing satellite fleet—two from the Terra mission and one from the Aqua mission—have been officially designated as National Geospatial Data Assets by the FGDC and are managed jointly with the U.S. Geological Survey.¹² The FGDC's portfolio of National Geospatial Data Assets is currently broken down into 18 data themes, or primary topics, to coordinate the development, maintenance, and dissemination of geospatial data. The Terra and Aqua data feeds help derive numerous higher-level datasets that fall under the Imagery data theme—which are georeferenced images of the Earth's surface collected via aerial photography or satellite data—as identified in OMB's 2002 Circular A-16 and the National Spatial Data Infrastructure.

¹² Terra, launched in 1999, observes the Earth's atmosphere, oceans, land, snow and ice, and energy budget to provide insight into how the Earth system works and is changing. Aqua, launched in 2002, collects information about the Earth's water cycle and measures radiative energy fluxes; aerosols; vegetation cover on the land; phytoplankton and dissolved organic matter in the oceans; and air, land, and water temperatures. A National Geospatial Data Asset is a geospatial dataset designated by the FGDC that meets at least one of the following criteria: (1) used by multiple agencies or with agency partners such as state, tribal, and local governments; (2) applied to achieve presidential priorities as expressed by OMB; (3) required to meet shared mission goals of multiple federal agencies; or (4) required by statutory mandate.

The Terra and Aqua derived datasets are just a small fraction of the geospatial data NASA collects through its fleet of Earth-observing satellites. Newer additions to the fleet continue to collect data and contribute to scientific advancement. For example, the Tropospheric Emissions: Monitoring of Pollution (TEMPO) mission, launched in 2023, sits in geostationary orbit 22,000 miles above the Earth's equator and provides hourly measurements of ozone, nitrogen dioxide, and other key elements of air pollution over its entire field of view from the Atlantic Ocean to the Pacific Ocean. In addition, the Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) mission, launched in 2024, studies the Earth's aquatic ecology and chemistry and addresses the uncertainty in our understanding of how clouds and small airborne particles called aerosols affect Earth's climate. Figure 2 shows geospatial data visualizations produced from the TEMPO and PACE missions.

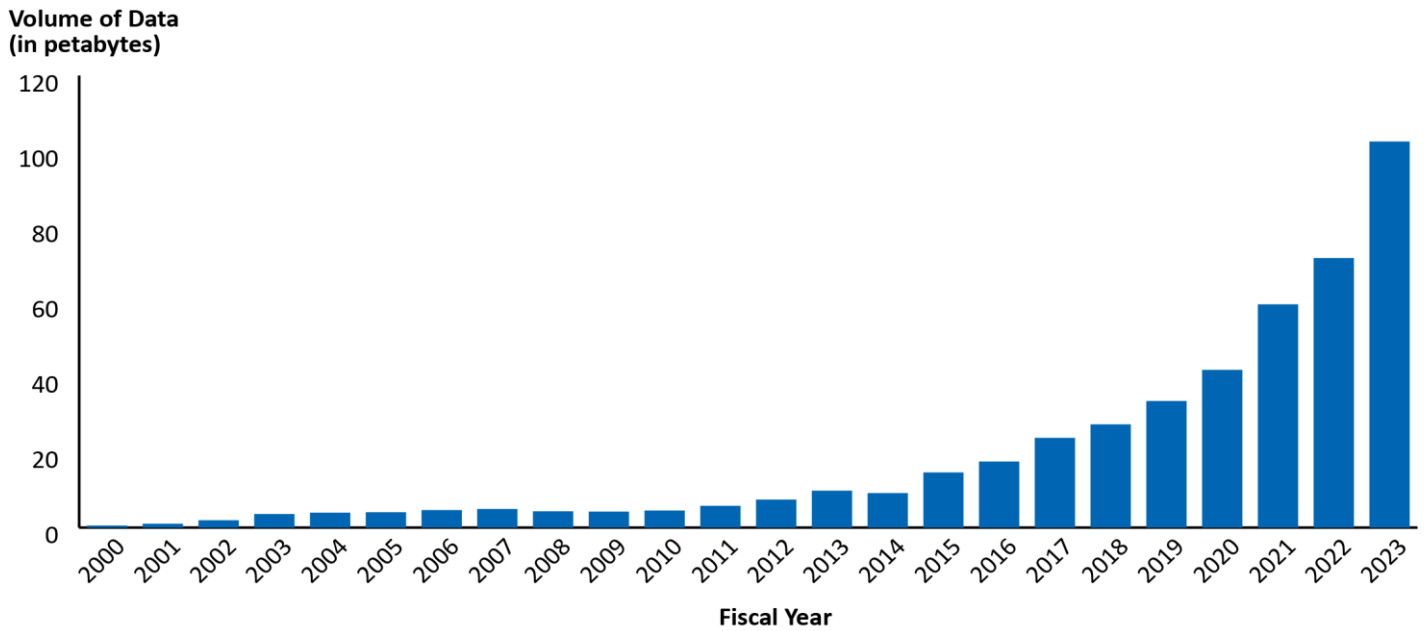
Figure 2: TEMPO and PACE Geospatial Data Visualizations



Source: NASA.

The addition of Earth-observing satellites to NASA's fleet coupled with advancements in instrumentation have resulted in exponential growth of Earth science and geospatial data archived at the Agency over the last decade. Since 2013, missions such as the Surface Water and Ocean Topography satellite, which launched in 2022 to study the world's oceans and terrestrial surface waters, have produced approximately 20 terabytes of science data per day and steadily increased the volume of NASA's Earth science and geospatial data by nearly 10 times. This trend is expected to continue as missions such as the NASA Indian Space Research Organisation Synthetic Aperture Radar, which is expected to launch in late 2024 to observe Earth's land and ice-covered surfaces, come online and produce up to an additional 80 terabytes of data per day. Figure 3 illustrates NASA's data growth over the past two decades.

Figure 3: Growth of Earth Science Data in NASA’s Archive from 2000 to 2023



Source: NASA Office of Inspector General (OIG) presentation of data from NASA’s Earth Observing System Data and Information System Fiscal Year 2023 Annual Metrics Report.

Roles and Responsibilities

Broadly, NASA divides geospatial data and records management responsibilities among four groups:

- The Office of the Chief Information Officer (OCIO) is responsible for the Agency’s Records Management Program and compliance with federal regulations and requirements. Within the OCIO, the Chief Data Officer (CDO) and Records Officer direct records management, including preservation.
- NASA’s History Division and its Chief Archivist provide archival and technical guidance for the management and preservation of historical records.
- The Earth Science Data Systems Program within SMD oversees the life cycle of NASA’s Earth science data from acquisition through processing and distribution. The Program oversees NASA’s 12 Distributed Active Archive Centers and recently created an Earth Data Officer position to bring a greater focus to the Agency’s Earth science data.
- The Office of Strategic Infrastructure collects, sustains, and utilizes geospatial data to support facilities, logistics, and environmental planning and management functions at NASA Centers and field locations.

Records Preservation

Geospatial data, like other data captured and produced by the federal government, can have historical significance that requires preservation. The National Archives and Records Administration (NARA) and NASA share responsibilities for management of Agency records. NARA has general oversight responsibilities for preservation of permanent records documenting the activities of the federal government while NASA is responsible for identifying and submitting lists of its records with a proposed disposition schedule to NARA. Representatives from both NARA and NASA develop a disposition schedule to ensure all NASA records are retained for the appropriate length of time. While NARA provides authoritative instructions for the retention, destruction, and retirement of records held by NASA, it is only at the conclusion of this process that a final NASA records schedule is approved by the Archivist of the United States.

Preserving any type of information necessitates retaining both the information itself and sufficient context surrounding the information to render it understandable in the future. Importantly, as the information's present context changes over time as technology changes, the preserved context can be referred to by future custodians. For geospatial data, capturing and preserving enough of the data's context is especially challenging. In simpler contexts, knowledge of the format (for instance, a PDF document) is sufficient to support future usability of data. Geospatial data, however, tends to require much more complex contextual information. For example, understanding remote sensing imagery in a scientific model requires detailed knowledge of the specific vehicle used and the sensor's characteristics, and in many cases, calibration and processing steps as well. It is only in combination with this contextual information—also known as metadata—that geospatial data can be rendered useful for scientists and the public.

NASA CONTINUES EFFORTS TO COMPLY WITH THE GDA BUT PROGRESS IS STILL NEEDED TO MEET KEY RESPONSIBILITIES

Since our FY 2022 audit, NASA has continued efforts towards fully implementing the GDA’s 13 covered agency responsibilities and addressing our previous recommendations. We previously found that NASA met GDA expectations for 5 of the 13 responsibilities related to coordinating with other federal agencies and the private sector, making data accessible, and ensuring high-quality data is obtained and protected. During this current audit, we found that NASA met expectations in one additional responsibility area, progress is still needed in six areas, and one responsibility is not applicable. See Table 1 for a list of GDA Section 759(a) responsibilities and our FY 2022 and FY 2024 assessments of NASA’s progress in each of those areas.

Table 1: NASA’s Progress Towards Implementing GDA Section 759(a) Responsibilities (as of June 2024)

GDA Section 759(a) Responsibilities Each Covered Agency Shall—		NASA OIG FY 2022 Assessment	NASA OIG FY 2024 Assessment
1	prepare, maintain, publish, and implement a strategy for advancing geographic information and related geospatial data and activities appropriate to the mission of the covered agency, in support of the strategic plan for the National Spatial Data Infrastructure prepared under section 755(c) of this title;	P	P
2	collect, maintain, disseminate, and preserve geospatial data such that the resulting data, information, or products can be readily shared with other Federal agencies and non-Federal users;	P	P
3	promote the integration of geospatial data from all sources;	P	P
4	ensure that data information products and other records created in geospatial data and activities are included on agency record schedules that have been approved by the National Archives and Records Administration;	P	P
5	allocate resources to fulfill the responsibilities of effective geospatial data collection, production, and stewardship with regard to related activities of the covered agency, and as necessary to support the activities of the Committee;	P	P
6	use the geospatial data standards, including the standards for metadata for geospatial data, and other appropriate standards, including documenting geospatial data with the relevant metadata and making metadata available through the GeoPlatform;	N/A	ME
7	coordinate and work in partnership with other Federal agencies, agencies of State, tribal, and local governments, institutions of higher education, and the private sector to efficiently and cost-effectively collect, integrate, maintain, disseminate, and preserve geospatial data, building upon existing non-Federal geospatial data to the extent possible;	ME	ME
8	use geospatial information to—(A) make Federal geospatial information and services more useful to the public; (B) enhance operations; (C) support decision making; and (D) enhance reporting to the public and to Congress;	P	P
9	protect personal privacy and maintain confidentiality in accordance with Federal policy and law;	ME	ME
10	participate in determining, when applicable, whether declassified data can contribute to and become a part of the National Spatial Data Infrastructure;	N/A	N/A

GDA Section 759(a) Responsibilities Each Covered Agency Shall—		NASA OIG FY 2022 Assessment	NASA OIG FY 2024 Assessment
11	search all sources, including the GeoPlatform, to determine if existing Federal, State, local, or private geospatial data meets the needs of the covered agency before expending funds for geospatial data collection;	ME	ME
12	to the maximum extent practicable, ensure that a person receiving Federal funds for geospatial data collection provides high-quality data; and	ME	ME
13	appoint a contact to coordinate with the lead covered agencies for collection, acquisition, maintenance, and dissemination of the National Geospatial Data Asset data themes used by the covered agency.	ME	ME

Source: Pub. L. No. 115-254, and NASA OIG analysis of Agency data.

Note: Progress (P), N/A (Not Applicable), and Meets Expectations (ME). Progress means the agency made progress toward meeting the expectation of the responsibility, and Meets Expectations means the agency has met the expectation of the responsibility.

To date, NASA has yet to formalize roles and responsibilities to manage geospatial data, develop a comprehensive inventory of its geospatial data, or establish records schedules for geospatial data with NARA. In addition, five recommendations we made to NASA to address these areas in our FY 2020 and FY 2022 audits remain open. The GDA directs agencies to enhance its management, coordination, and preservation of geospatial data by reducing duplicative efforts and allowing for more efficient use of geospatial expertise, technologies, and services. While NASA has activities underway to formalize roles and responsibilities and develop an inventory, progress has been slow due to the absence of a designated Senior Agency Official for Geospatial Information (SAOGI), instances of siloed geospatial data across the Agency, and a lack of clear guidance on what constitutes applicable geospatial data. Without completing these efforts, NASA will continue to face challenges in enhancing its management of geospatial data as required by the Act.

NASA Continues to Meet Expectations for Many Covered Agency Responsibilities

NASA currently meets 6 of 13 covered agency responsibilities. Responsibility Nos. 7 and 13 relate to coordinating with and making geospatial data accessible to other federal agencies, institutions of higher education, and the private sector. We found that NASA has long-standing partnerships and agreements with other federal agencies, institutions of higher education, and the private sector to process, archive, and make geospatial data available to the public.

For example, under a Memorandum of Understanding (MOU) with the U.S. Geological Survey, the Agency established a point of contact for the collection, acquisition, maintenance, and dissemination of NASA’s National Geospatial Data Assets. Further, NASA’s partnership with the National Oceanic and Atmospheric Administration on the Joint Polar Satellite System continues to provide important environmental data in support of national initiatives. These include forecasting severe weather like hurricanes, tornadoes, and blizzards days in advance, and assessing environmental hazards such as droughts, forest fires, poor air quality, and harmful coastal waters. Lastly, NASA continues its relationships with institutions of higher education, such as the University of Colorado and Columbia

University, where the Agency has partnered with these schools at Distributed Active Archive Centers to process and distribute scientific data to the public.¹³

NASA also continues to meet expectations for Responsibility Nos. 9, 11, and 12 related to ensuring high-quality data is obtained and protected. The NASA OCIO requires all system, application, and information owners fully comply with NASA privacy policy and procedures and mandates privacy and cybersecurity training for all employees. In addition, NASA searches all sources to ensure non-duplication of efforts in collecting geospatial data before expending funds as required by federal regulations, NASA policy directives, and NASA procedural requirements. Further, the Agency ensures data is high quality through its various data product development guides, a data quality working group, and customer satisfaction metrics.

We found NASA met expectations for Responsibility No. 6 related to the Agency's use of geospatial data standards. While the FGDC is developing a list of established geospatial data standards (as required by Section 757 and Subsection 759(a) of the Act), the expected completion date is unknown. However, NASA is a leader in geospatial data collection and processing. The Agency's experience in this area is highlighted by its continued adherence to the FGDC's metadata conformance checklist where NASA's National Geospatial Data Asset contributions are assessed. Therefore, we do not see significant risk in NASA's ability to comply with future FGDC standards.

Responsibility No. 10 requires agencies to determine whether declassified data can contribute to the National Spatial Data Infrastructure. As NASA does not handle declassified geospatial data, Responsibility No. 10 is not applicable.

Progress Remains for Key Responsibilities

Roles and Responsibilities for Managing Geospatial Data Have Not Been Finalized

NASA's status for Responsibility No. 1 remains in progress because the Agency has not finalized an implementation plan for its Geospatial Data Strategy or formally designated an existing senior agency position as the SAOGI.¹⁴ The GDA's first requirement for a covered agency, such as NASA, is to prepare, maintain, publish, and implement a strategy for advancing geographic information and related geospatial data and activities appropriate to its mission. In May 2021 NASA issued its Geospatial Data Strategy, a document that provides a broad understanding of the required goals and objectives of how the Agency plans to fulfill this GDA requirement. As part of that strategy, NASA's Acting Chief Information Officer and the Associate Administrator for SMD were to take the "immediate" step of appointing a senior agency official for geospatial information. While the Agency began drafting an implementation plan for the Geospatial Data Strategy as of our FY 2022 audit cycle, completion of that plan and assignment of personnel to key roles such as the SAOGI have not yet been finalized.

¹³ NASA's National Snow and Ice Data Center in Boulder, Colorado, operated by the University of Colorado Boulder and the National Oceanic and Atmospheric Administration, provides data and information on the interactions among snow, ice, the atmosphere, and the ocean. NASA's Socioeconomic Data and Applications Center in Palisades, New York, operated by Columbia University, synthesizes Earth science and socioeconomic data and information on such topics as human population distribution, human settlements and infrastructure, natural hazards, poverty, and air and water pollution.

¹⁴ According to OMB Memorandum M-06-07, *Designation of a Senior Agency Official for Geospatial Information* (March 3, 2006), the SAOGI oversees, coordinates, and facilitates an agency's implementation of geospatial-related requirements, policies, and activities, as well as serves on the FGDC Steering Committee.

In July 2021, the Chief Information Officer appointed the Agency's CDO to the SAOGI role. However, during our FY 2022 audit, the previous CDO was uncertain whether SMD or the OCIO had the formal responsibility or authority to strategically manage NASA's geospatial data or comply with the GDA. Therefore, we recommended the Agency formally assign a SAOGI with the responsibility and authority to strategically manage NASA's geospatial data assets. Not long after we made the recommendation, the CDO retired, and NASA did not appoint a new CDO until June 2023. Subsequently, in July 2024, the Agency requested an extension for our recommendation until January 2025. Additionally, the Agency established an Earth Data Officer within SMD—responsible for managing the bulk of NASA's geospatial data—but this position was not established until August 2023, further contributing to a lack of progress in managing geospatial data responsibilities.

As of June 2024, efforts were underway to designate a SAOGI, including the drafting of a MOU between the OCIO and SMD to delegate responsibility for NASA's geospatial data management to SMD. According to the draft MOU, the SAOGI will be designated within SMD as the majority of NASA's geospatial data, and the expertise to manage it, resides there. The CDO will manage geospatial data outside of SMD, such as data on facilities used by the Office of Strategic Infrastructure to identify and catalog the Agency's real property and environmental resources, maintain security perimeters around facilities, and manage cultural resources including historic buildings.

While a specific person has yet to be designated as the SAOGI, both the CDO and SMD officials agree with the intent of the MOU, which is expected to be completed by summer of 2024. The MOU intends to designate a senior agency position as the SAOGI as required per OMB Circular A-16 and Memorandum M-06-07. However, without taking steps to institutionalize the SAOGI role in Agency policy, such as an appropriate NASA Procedural Requirement or NASA Policy Directive, NASA is at risk of experiencing further delays and inaction relative to GDA initiatives.

Though the CDO and Earth Data Officer have been working to formally designate the SAOGI, there has been a lack of continuity in completing the Geospatial Data Strategy implementation plan to include assignment of roles and responsibilities, action items, and milestones. This is largely due to the SAOGI vacancy, which is likely to be filled in the near future. Additionally, NASA will need to align its Geospatial Data Strategy with updates to the National Spatial Data Infrastructure Strategy, currently being drafted by the FGDC, and complete its implementation plan.

NASA's Inventory of Geospatial Data Is Not Complete

NASA's inventory of its geospatial data remains incomplete because it does not include non-Earth science data assets. We recommended in our FY 2022 assessment that NASA's implementation plan for its Geospatial Data Strategy include a complete and accurate inventory of the Agency's geospatial data. The GDA's second requirement for covered agencies is to collect, maintain, disseminate, and preserve geospatial data such that the resulting data, information, or products can be readily shared with other federal agencies and non-federal users. Without a complete inventory, NASA will continue to face challenges fully meeting not only Responsibility No. 2 but also Responsibility Nos. 3, 5, and 8 as they rely on a complete geospatial data inventory.

The majority of NASA's geospatial data is Earth science data acquired, processed, archived, and distributed by SMD's Earth Science Division, which is cataloged in the Earth Science Data Systems' Common Metadata Repository and shared with the public. However, NASA officials acknowledged that an unknown number of non-Earth science geospatial data assets likely exist in other Agency organizations. For example, some geospatial datasets relate to institutional operations such as Agency

facilities that are managed by other NASA directorates. This results in an unknown number of uncatalogued geospatial datasets across the Agency that pose a challenge for NASA officials in determining which data is ultimately subject to the requirements of the GDA and other federal guidance.

The CDO intends to implement a data governance framework and define data management roles and responsibilities applicable for all NASA data. This framework will apply to the management of mission-specific data categories including geospatial data. According to the CDO, implementing the framework will result in NASA having a complete inventory of its geospatial data as well as other data holdings. Nevertheless, the FGDC, CIGIE GDA working group, and NASA stakeholders believe that additional government-wide guidance is needed to clarify the scope of geospatial data to be managed agency-wide as intended by the GDA. Until additional clarity is provided, and NASA has completed its data management processes, NASA's incomplete inventory will hinder the Agency's ability to meet Responsibility Nos. 2,3, 5, and 8.

Clarity Is Needed to Establish Records Schedules for Geospatial Data

NASA's status for Responsibility No. 4 remains in progress as the Agency has yet to finalize records schedules with NARA. As of May 2024, NASA's Records Officer stated there had been no additional progress made towards finalizing records schedules. Further, the Records Officer advised the Agency would be requesting a one-year extension to complete our FY 2022 recommendation to coordinate with NARA to establish the appropriate level of scientific data for inclusion in NARA-approved records schedules. NARA has previously acknowledged that very large datasets pose unique challenges that require further exploration within the larger community of federal CDOs. NARA officials said they will continue to work with NASA to explore options for maintaining and preserving large bodies of scientific data. NASA's Records Officer continues to explore what level of data should be included on Agency records schedules. Until NASA and NARA can establish the appropriate level of data to include in NARA's approved records schedules, our previous recommendation will remain open and efforts to meet Responsibility No. 4 will remain in progress.

RECOMMENDATION, MANAGEMENT'S RESPONSE, AND OUR EVALUATION

To ensure geospatial data is continuously managed in accordance with the GDA and OMB requirements, we recommended NASA's Associate Administrator:

1. Formalize the designation of a SAOGI in NASA policy to institutionalize the role.

We provided a draft of this memorandum to NASA management who concurred with our recommendation and described planned actions to address it. We consider management's comments responsive; therefore, the recommendation is resolved and will be closed upon completion and verification of the proposed corrective actions.

Management's comments are reproduced in Enclosure IV. Technical comments provided by management have been incorporated as appropriate.

Major contributors to this memorandum include Tekla Colón, Mission Support Audits Director; Michael Brant, Assistant Director; Anu Bakshi; Christopher Reeves; and Andrew Wallach. Lauren Suls provided editorial and graphics support.

If you have questions or wish to comment on the quality or usefulness of this memorandum, contact Laurence Hawkins, Audit Operations and Quality Assurance Director, at 202-358-1543 or laurence.b.hawkins@nasa.gov.

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Enclosures—4

Enclosure I: Scope and Methodology

We performed this audit from January 2024 through July 2024 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Our audit objective was to evaluate the extent to which NASA fulfilled its responsibilities for managing its geospatial data in accordance with the GDA for FY 2024. Since the geospatial data standards under Section 757 have not yet been established, we followed the approach of CIGIE's working group and that of our previous FY 2020 and FY 2022 audits, which was to focus the scope of our work on NASA's progress toward compliance with the 13 responsibilities listed in Section 759(a) of the Act.

To determine whether NASA fulfilled its responsibilities under the Act, we reviewed applicable laws and regulations; examined the Agency's Geospatial Data Strategy and implementation plan; and interviewed NASA personnel including the Chief Data Officer, Earth Data Officer, Chief Historian, and Records Officer. Additionally, we held discussions with the FGDC's executive and deputy directors and the CIGIE working group. Finally, we performed the applicable audit steps outlined in CIGIE's guidance.

Assessment of Data Reliability

We did not use computer-processed data in the performance of this audit.

Review of Internal Controls

We assessed internal controls and compliance with laws and regulations necessary to satisfy the audit objective. Specifically, we assessed the control environment internal control component and the underlying principles related to establishing structure, responsibility, and authority. However, because our review was limited to these internal control components and underlying principles, it may not have disclosed all internal control deficiencies that may have existed at the time of this audit. Any internal control deficiencies identified are discussed in this report. Our recommendations, if implemented, should correct the identified control deficiencies.

Prior Coverage

During the last 5 years, the NASA Office of Inspector General and Government Accountability Office issued four reports of significant relevance to the subject of this memorandum. Unrestricted reports can be accessed at <https://oig.nasa.gov/audits/> and <https://www.gao.gov>, respectively.

NASA Office of Inspector General

NASA's Compliance with the Geospatial Data Act for Fiscal Year 2022 ([IG-23-001](#), October 5, 2022)

Audit of NASA's Compliance with the Geospatial Data Act ([IG-21-001](#), October 2, 2020)

NASA's Management of Distributed Active Archive Centers ([IG-20-011](#), March 3, 2020)

Government Accountability Office

Open Data: Agencies Need Guidance to Establish Comprehensive Data Inventories; Information on Their Progress is Limited ([GAO-21-29](#), October 8, 2020)

Enclosure II: CIGIE Letter to Congress



COUNCIL OF THE INSPECTORS GENERAL ON INTEGRITY AND EFFICIENCY

November 30, 2023

The Honorable Maria Cantwell
Chairwoman
The Honorable Ted Cruz
Ranking Member
Committee on Commerce, Science,
and Transportation
United States Senate
Washington, D.C.

The Honorable Frank Lucas
Chairman
The Honorable Zoe Lofgren
Ranking Member
Committee on Science, Space,
and Technology
U.S. House of Representatives
Washington, D.C.

Dear Chairpersons and Ranking Members:

The Council of the Inspectors General on Integrity and Efficiency (CIGIE) appreciates your leadership on geospatial data issues. The Geospatial Data Act of 2018¹ (the Act) mandates oversight through Federal Inspectors General (IG) to ensure effective implementation of the related requirements. Specifically, the Act requires biennial IG audits to evaluate the following:

1. Covered Agencies' compliance with geospatial data and metadata standards established under the Act.
2. Covered Agencies' compliance with responsibilities outlined in the Act.
3. Covered Agencies' compliance with the limitation of Federal funding for noncompliant datasets.²

We are writing this letter on behalf of CIGIE to inform you about an important timing concern related to the biennial audits conducted by the IG community. The standards required for implementation of the Act by Covered Agencies have not yet been issued by the Federal Geographic Data Committee (FGDC). As of now, there is no projected release date available. Consequently, the full implementation of the Act is delayed, which in turn limits the IG community's ability to conduct a comprehensive biennial audit in Fiscal Year 2024. We cannot assess compliance with two of the three audit requirements (specifically, audit evaluation tasks 1 and 3 listed above). To address this challenge, CIGIE has taken proactive measures to establish a consensus within the IG community on an audit approach for the Fiscal Year 2024 audits.

After careful deliberation and similar to our prior audits, the Covered Agency IG representatives have concluded that audits focused on assessing the progress of Covered Agencies toward compliance with the Act, including their adherence to the Act's requirements outlined in section 759(a), 43 U.S.C. § 2808(a), would offer the most value to the covered agencies, Congress, and the Public.

¹ Pub. L. No. 115-254, Subtitle F (2018), codified at 43 U.S.C. §§ 2801-2811.

² 43 U.S.C. § 2808(c).

In our view, this approach is appropriate due to the inherent challenges in determining the precise standards that audits should utilize to assess compliance at this time. Moreover, it is important to note that the limitation on the use of Federal funds for noncompliant geospatial data will not apply until 5 years after FGDC's establishment of standards. As such, compliance with the limitation is not yet auditable.

This approach would provide each Covered Agency IG with the flexibility to conduct additional testing as needed, depending on the geospatial footprint of the respective covered agency. The relevant IG would make this determination as they see fit.

Furthermore, among the 16 federal agencies specified under the Act, more than half of them do not accumulate or publish substantial or significant volumes of new geospatial assets on a biennial basis. Consequently, many IG audit teams are contemplating the adoption of weighted or risk-based approaches. Additionally, the CIGIE Legislation Committee has encouraged Congress to repeal the requirement that IGs conduct a biennial audit to allow IGs the flexibility to assess the risks of geospatial data at the agencies they oversee and provide a cost-effective, risk-based review if appropriate.

Should you or your staffs have any questions about our approach or other aspects of our collective Geospatial Data Act oversight activities, please do not hesitate to contact us at 202-208-5475. In the alternative, please feel free to have your staff contact Andrew Cannarsa, CIGIE's Executive Director, at 202-292-2603.

Sincerely,



Mark L. Greenblatt
Chair, Council of the Inspectors General
on Integrity and Efficiency
Inspector General
U.S. Department of the Interior



Robert P. Storch
Chair, Council of the Inspectors General on
Integrity and Efficiency, Technology
Committee
Inspector General, U.S. Department of Defense

cc: The Honorable Gary C. Peters, Chairman
The Honorable Rand Paul, Ranking Member
Committee on Homeland Security and Government Affairs

The Honorable James Comer, Chairman
The Honorable Jamie Raskin, Ranking Member
House Committee on Oversight and Accountability

The Honorable Jason Miller, Deputy Director OMB and Executive Chair, Council of the
Inspectors General on Integrity and Efficiency

The Honorable Gene Dodaro, Comptroller General GAO

Enclosure III: Status of Prior Open GDA Report Recommendations

We close recommendations from prior audits if corrective actions were completed and verified. However, if recommended or additional corrective actions are necessary, prior recommendations will remain open until evidence is provided that adequately satisfies the intent of the recommendation. Table 2 lists the recommendations we made in our prior FY 2020 and FY 2022 assessments of NASA's compliance with the GDA that remain open as of August 2024.

Table 2: Status of Prior Open GDA Recommendations

OIG Report Number	Recommendation Number	Recommendation	Fiscal Year Assessment
IG-21-001	2	Develop a unified Strategy Implementation Plan or "Roadmap" that defines detailed action items, milestones, and responsibilities for geospatial data management in support of missions across NASA.	2020
IG-23-001	1	The role of the SAOGI is strategically positioned within the Agency to have responsibility, accountability, and authority needed to meet GDA-assigned agency responsibilities.	2022
IG-23-001	2	Roles and responsibilities of the SAOGI and other key stakeholders are defined in both the Geospatial Data Strategy and its implementation plan.	2022
IG-23-001	3	The implementation plan for the Geospatial Data Strategy contains detailed action items and milestones, including those for developing a complete and accurate inventory of the Agency's geospatial data.	2022
IG-23-001	4	Continued coordination with NARA to establish the appropriate level of scientific data for inclusion in NARA-approved records schedules.	2022

Source: NASA OIG.

Enclosure IV: Management's Comments

National Aeronautics and Space Administration

Office of the Administrator
Mary W. Jackson NASA Headquarters
Washington, DC 20546-0001



August 26, 2024

TO: Assistant Inspector General for Audits

FROM: Associate Administrator

SUBJECT: Agency Response to OIG Draft Memorandum, "NASA's Compliance with the Geospatial Data Act for Fiscal Year 2024" (A-24-02-00-MSD)

The National Aeronautics and Space Administration (NASA) appreciates the opportunity to review and comment on the Office of Inspector General (OIG) draft memorandum entitled, "NASA's Compliance with the Geospatial Data Act for Fiscal Year 2024" (A-24-02-00-MSD), dated July 30, 2024.

In this draft memorandum, the OIG found NASA continues its efforts to comply with the Geospatial Data Act of 2018 (GDA), but progress is still needed to meet key responsibilities of the Act. The OIG makes one recommendation addressed to NASA's Associate Administrator to ensure geospatial data is continuously managed in accordance with the Act and Office of Management and Budget requirements.

Specifically, the OIG recommends the NASA Associate Administrator:

Recommendation 1: Formalize the designation of a Senior Agency Official for Geospatial Information (SAOGI) in NASA policy to institutionalize the role.

Management's Response: NASA concurs with this recommendation. As stated in the OIG report, the Agency is drafting a memorandum of understanding (MOU) between the Office of the Chief Information Officer and the Science Mission Directorate (SMD). This MOU will address how the parties jointly agree to achieve the requirements of the GDA, including the appointment of the NASA SAOGI in SMD's Earth Science Division. The MOU institutionalizes the roles and responsibilities to carry out GDA requirements in Agency documentation, thus mitigating the risk that NASA will experience future inaction relative to GDA initiatives.

Estimated Completion Date: October 31, 2024.

We have reviewed the draft memorandum for information that should not be publicly released. As a result of this review, we have not identified any information that should not be publicly released.

Once again, thank you for the opportunity to review and comment on the subject draft memorandum. If you have any questions or require additional information regarding this response, please contact Peter Meister at (202) 358-1557.

A handwritten signature in black ink that reads "James M. Free". The signature is written in a cursive style with a large, looping initial "J".

James M. Free

cc:

Chief Information Officer/Mr. Seaton

Associate Administrator for Science Mission Directorate/Ms. Fox