USGS Agreement #7998

MEMORANDUM OF UNDERSTANDING
BETWEEN
THE NATIONAL IMAGERY AND MAPPING AGENCY
AND
THE U.S. GEOLOGICAL SURVEY
FOR THE DELIVERY, DISSEMINATION, AND ARCHIVING OF SHUTTLE RADAR TOPOGRAPHY MISSION (SRTM) PUBLIC DATA

1. **Purpose:** This Memorandum of Understanding (MOU) establishes implementation procedures under which the National Imagery and Mapping Agency (NIMA) provides public SRTM Digital Terrain Elevation Data (DTED®) to the U.S. Geological Survey (USGS) Earth Resources Observation Systems (EROS) Data Center for processing, public dissemination, and archiving.

2. **Background:** The Shuttle Radar Topography Mission successfully collected Interferometric Synthetic Aperture Radar (IFSAR) data over 80 percent of the landmass of the Earth between 60 degrees North and 56 degrees South latitudes in February 2000. The mission was co-sponsored by the National Aeronautics and Space Administration (NASA) and NIMA. SRTM data will be made available to the public in accordance with a June 1996 Memorandum of Understanding between NASA and NIMA (reference 8.a.), and July 2002 production procedures agreed to by NIMA and NASA for public access to SRTM data (reference 8.b.). NASA's Jet Propulsion Laboratory (JPL) performed preliminary processing of SRTM data. After this processing, JPL forwarded partially finished data directly to NIMA contractors for final data finishing and subsequent delivery to NIMA's Digital Products Data Warehouse (DPDW). The contractors will deliver SRTM data to NIMA monthly between December 2002 and September 2004. All the data products delivered by the contractors will conform to the NIMA SRTM Data Products Specification (reference 8.c.) and the NIMA Digital Terrain Elevation Data (DTED®) specification (reference 8.d.). The DPDW ingests the SRTM data products, checks them for formatting errors, and if acceptable, loads the products into the NIMA data distribution system, at which point the public SRTM DTED® is shipped to USGS EROS Data Center (EDC).

3. **Scope:** The authority for this MOU is the 1998 "MOU between USGS and NIMA for Coordination and Cooperation Pertaining to Geospatial Data and Remote Sensing" (reference 8.e.). This MOU exercises the option in paragraph 3.d. of reference 8.e., that USGS and NIMA may expand the dissemination and sale of NIMA products by mutual agreement to include the sale of other NIMA products developed in the future. SRTM DTED® is to be disseminated to the public as noted in reference 8.a. SRTM DTED® 1 (nominal post spacing of 90 meters or 3 arc seconds) will be available over the entire SRTM collection area. SRTM DTED® 2 (nominal post spacing of 30 meters or 1 arc second) will be available over the United States and its territories within the SRTM collection area. This MOU authorizes the USGS to receive these two SRTM datasets from NIMA, reproduce them in the medium of choice for the public,

disseminate them under a fee schedule determined by USGS, and archive those datasets as permanent records of the United States Government.

4. **Policy:**

4.1. The USGS EDC shall be the primary distribution point for public access SRTM DTED®.

4.2. NIMA shall provide USGS EDC with finished SRTM DTED® 1 over the entire mission collection area and finished SRTM DTED® 2 over U.S. territory in standard DTED® format. Note: For cells along U.S. borders, where part of a cell contains non-U.S. territory, the affected SRTM DTED® 2 cells have been sub-divided into 15'x15' segments (sub-cells) for purposes of public release. Those 15'x15' segments that contain one or more U.S. elevation posts will be publicly released at the one arc second (30 m) resolution, while those segments with no U.S. data will be released only at the three arc second (90 m) resolution.

4.3. If USGS EDC utilizes commercial or proprietary data formats instead of NIMA's SRTM DTED® format, the end product shall state that the data are derived from SRTM DTED®, and that "the use of this format does not constitute an endorsement of any commercial product by NIMA." USGS EDC shall adhere to any labeling and documentation requirements as specified by NIMA for the public sale of SRTM DTED® data products within the scope of this agreement.

5. **Responsibilities:**

5.1. NIMA shall provide the SRTM DTED® to USGS EDC in standard DTED® format and according to the media specifications detailed in Appendix A. NIMA will send the SRTM data to USGS EDC once per month, beginning in August 2003, until such time that all the data have been transferred.

5.2. USGS EDC shall distribute certain SRTM DTED® (see paragraph 3) to the public at large. USGS EDC shall provide customers with the option of obtaining SRTM DTED® products in the original form or in reformatted versions of NIMA's SRTM DTED® labeled as SRTM terrain elevation data.

In any alternative formats offered by USGS EDC for NIMA's DTED®, USGS EDC shall preserve the original data values and horizontal resolution of the terrain elevations. Distribution of higher spatial resolution products generated, for example, by interpolation or filtering from the U.S. 1 arc second or worldwide 3 arc second SRTM DTED®, is not permitted.

USGS EDC shall be responsible for archiving all of the data covered by this MOU.

5.3. Specifications for labeling SRTM DTED® data products and for agency attribution are provided in Appendices A and B. Explanatory notes for the NIMA DTED® are provided in section 4 of Appendix A. USGS EDC shall make these available to customers on

its public sale website and as accompanying documentation with any media containing NIMA DTED® in its original or reformatted versions. NIMA and NASA shall jointly approve the label and metadata of SRTM DTED® public data disseminated by USGS EDC. NIMA and NASA shall review and jointly approve, in writing, any USGS EDC web page that describes SRTM DTED® public data. The NIMA and NASA seals (refer to Appendices A and B) shall be applied by USGS EDC to any public SRTM DTED® products it disseminates. USGS EDC will conform to the stated attribution requirements for all forms of the SRTM DTED® data disseminated to its customers. NASA/NIMA SRTM partnership acknowledgements (e.g., "SRTM is a cooperative project between NASA and NIMA") should be noted on media artwork and in the softcopy data for any public SRTM data distributed from USGS EDC. NIMA shall approve any and all use of the DTED® trademark term.

5.4. For data shipment and inquiry purposes, USGS EDC shall provide its mailing address and points of contact to NIMA.

6. **Public Requests And Inquiries:** Public requests received by NIMA for SRTM DTED® Levels 1 and 2 over U.S. territory or SRTM DTED® Level 1 outside U.S. territory products will be referred to USGS EDC for processing. Additional points of contact needed to respond to public inquiries are listed in Appendix C.

7. **Amendment, Termination, Entry into Effect and Duration:** This MOU may be amended at any time upon written agreement of NIMA and USGS. This MOU shall enter into effect upon signature by NIMA and USGS and shall remain in effect until terminated by agreement of both parties.

8 References:

a. Memorandum of Understanding Between the National Aeronautics and Space Administration and the Defense Mapping Agency (now NIMA) for a Cooperative Flight of the Shuttle Radar Topography Mission, June 1996.

b. The National Aeronautics and Space Administration (NASA) and The National Imagery and Mapping Agency (NIMA) Procedures for Limited and Broad Public Access to Shuttle Radar Topography Mission Data, July 2002.

c. SRTM Data Products Specification, v.1.3 with SCN 002D

d. MIL-PRF-89020B, Performance Specification Digital Terrain Elevation Data (DTED®), 23 May 2000.

e. Memorandum of Understanding Between the U.S. Geological Survey and The National Imagery and Mapping Agency for Coordination and Cooperation Pertaining to Geospatial Data and Remote Sensing, 1998

Roberta E. Lenozowski

28 Octobre 2003

Roberta E. Lenozowski
Technical Executive, NIMA

Date

Barbara J. Ryan

10-20-03

Barbara J. Ryan
Associate Director for Geography, USGS

Date

APPENDIX A. NIMA DATA AND LABELING SPECIFICATIONS

1. **DTED® Format:** NIMA shall provide applicable DTED® 1 and DTED® 2 to USGS EDC in standard NIMA DTED® format.

2. **Media:** DVD-R shall be the media used to send NIMA's SRTM DTED® to USGS EDC.

3. **NIMA Seal**

4. **Notes Regarding NIMA SRTM Digital Terrain Elevation Data (DTED®) Processing:**

Digital Terrain Elevation Data (DTED®) is a uniform matrix of elevation values indexed to specific points on the ground. The horizontal datum is the World Geodetic System 1984 (WGS 84) and the vertical datum is mean sea level as determined by the WGS 84 Earth Gravitational Model (EGM 96) geoid. The elevation data are with respect to the reflective surface, which may be vegetation, man-made features or bare earth. DTED® Level 2 elevation values are spaced one arc second apart between 0° and 50° latitude, and spaced one arc second apart in latitude and two arc seconds apart in longitude between 50° and 60° latitude. SRTM DTED® Level 1 values are derived from the SRTM DTED® 2 values such that the DTED® 1 values are identical to the DTED® 2 values at coincident points. However, the SRTM DTED® 1 values are spaced 3 arc seconds apart between 0° and 50° latitude, and spaced 3 arc seconds apart in latitude and 6 arc seconds apart in longitude between 50° and 60° latitude.

After NASA/JPL completes the raw data processing, NIMA performs quality assurance checks on the JPL SRTM data and then carries out several additional finishing steps. Spikes and wells in the data are detected

and voided out if they exceed 100 m compared to surrounding elevations. Small voids (16 contiguous posts or less) are filled by interpolation of surrounding elevations. Large voids are left in the data. Water bodies are depicted in the SRTM DTED®. The ocean elevation is set to 0 meters. Lakes of 600 m or more in length are flattened and set to a constant height. Rivers that exceed 183 m in width are delineated and monotonically stepped down in height. Islands are depicted if they have a major axis exceeding 300 m or the relief is greater than 15 m. The data are processed in one degree by one degree "cells." The edges of each cell are matched with the edges of adjacent cells to assure continuity.

In addition to voids due to shadows and layover and poor reflective properties of the Earth's surface, there are occasional floating islands of data, unregistered vertically, due to phase unwrapping errors. On the whole, the SRTM DTED® absolute height accuracy is significantly better than the 16 m (90% confidence) specification for the mission.

APPENDIX B. NASA SEAL

1 NASA Seal:

APPENDIX C. NIMA AND USGS EDC POINTS OF CONTACT

NIMA

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