ENGINEERING AND CONSTRUCTION BULLETIN

US Army Corps of Engineers

No. 2018-7 **Issuing Office:** CECW-EC **Issued:** 06 Jun 18 **Expires:** 06 Jun 20

02 Jun 20, Rev 1 02 Jun 22

SUBJECT: Advanced Modeling Requirements on USACE Projects

CATEGORY: Directive and Policy

1. **References**:

a. H.R. 3080, "Water Resources Reform and Development Act of 2014," Section 1034. Advanced Modeling Technologies, 10 June 2014

b. Engineering and Construction Bulletin (ECB) 2016-3, Advanced Modeling Requirements on USACE Projects, Archived, 14 January 2016

c. Procurement Instruction Letter (PIL) 2013-01, "Enhanced Authority to Acquire Products and Services Produced in Iraq and Afghanistan," 16 October 2012

d. Air Force Corporate Facilities Standards, "Advanced Modeling Requirements," http://afcfs.wbdg.org/index.html

e. Engineer Regulation (ER) 1110-1-8156, Engineering and Design: Policies, Guidance, and Requirements for Geospatial Data and Systems, 1 September 2012

f. Engineer Manual (EM) 1110-1-2909, Engineering and Design: Geospatial Data and Systems, 1 September 2012

g. USACE BIM/CIM Resources, https://cadbimcenter.erdc.dren.mil/BIM

h. Architectural, Engineering, and Construction (A/E/C) Graphics Standard, https://cadbimcenter.erdc.dren.mil/CAD

i. A/E/C CAD Standard, https://cadbimcenter.erdc.dren.mil/CAD

j. Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE), http://www.sdsfie.org

k. Defense Installation Spatial Data Infrastructure (DISDI), Geospatial Metadata Profile (DGMP), http://www.acq.osd.mil/ie/bei/disdi.shtml

l. Geospatial Positioning Accuracy Standards, "Part 3: National Standard for Spatial Data Accuracy," FGDC-STD-007.3-1998, https://fgdc.gov

m. ER 1110-2-8160, Engineering and Design: Policies for Referencing Project Elevation Grades To Nationwide Vertical Datums, 1 Mar 2009

n. EM 1110-1-1003, NAVSTAR Global Positioning System Surveying, 28 Feb 2011

o. Geospatial Positioning Accuracy Standards, "Content Standard for Digital Geospatial Metadata: Extensions for Remote Sensing Metadata," FGDC-STD-012-2002

2. **Definitions.** For the purposes of this criterion, "Advanced Modeling" (ref a) refers to the use of Building Information Modeling (BIM), Civil Information Modeling (CIM), Computer Aided Design (CAD), and Geospatial Information Systems (GIS) for the development of design and construction deliverables.

3. **Purpose.** This directive renews and updates the requirements set forth in ECB 2016-3, "Advanced Modeling Requirements on USACE Projects" (ref b). The use of advanced modeling processes and related technologies for design and construction are required as described herein.

4. **Background**

a. The advanced modeling process supports collaboration amongst all project delivery team (PDT) members and stakeholders. A design generated through the use of advanced modeling tools virtually represents the physical and functional features of the project, while embedding important life-cycle information and data specific to the design.

b. The information contained in these models enables the sharing of data to make more informed decisions during the complete life-cycle of a project from inception through decommissioning. Proper utilization of advanced modeling improves design and construction processes, reduces errors and omissions, generates more complete information-loaded deliverables, and ensures higher design and construction quality.

5. **Applicability**

a. The requirements set forth in this ECB are effective immediately and apply to all USACE Commands (i.e. all Districts, MSCs, and Centers) with a mission to support CONUS and OCONUS Military Programs (e.g. Military Construction (MILCON), Sustainment, Restoration, and Modernization (SRM)), and Civil Works projects.

b. Military Programs projects executed by USACE in all locations that include more than 5000 gross square feet (GSF) of project scope and a programmed amount that exceeds $3 million must adhere to this ECB.

(1) Military Programs projects that do not exceed these thresholds are not precluded from using advanced modeling.

(2) Projects in Iraq or Afghanistan that utilize simplified acquisition strategy (ref c) are exempt from this policy.

c. Civil Works projects executed by USACE in all locations with a programmed amount that exceeds $3 million must adhere to this ECB.

6. **Policy and Implementation**

a. All Army and Air Force Civil Engineer Center (AFCEC) (ref d) design and/or construction projects, regardless of funding source or acquisition method, must utilize advanced modeling to generate design, construction, record, and space utilization drawings deliverables.

b. For in-house designed projects, Project Delivery Teams (PDT) must adhere to the same guidance as contracted designs. This includes the generation of design deliverables indicated below.

c. The Installation or stakeholder will coordinate with the District to prescribe any additional specific design guidance to be included as requirements of the final advanced modeling deliverables.

d. All other projects completed on behalf of other stakeholders (i.e. other than Army and Air Force) will include the use of advanced modeling to generate, at a minimum, design and solicitation documents (as applicable). The final deliverable of record drawings and BIM, CIM, and/or GIS files will be coordinated with the stakeholder and include their end-use requirements.

e. Projects utilizing advanced modeling must also conform to deliverable requirements described in ER 1110-1-8156 (ref e) and EM 1110-1-2909 (ref f) as applicable.

f. The USACE CAD-BIM Technology Center hosts the USACE contract language, USACE Advanced Modeling Project Execution Plan (PxP) template, and USACE Minimum Modeling Matrix (M3) requirements (ref g) that must be incorporated into all projects that meet the minimum thresholds for the use of advanced modeling described above.

(1) For in-house design projects, the Advanced Modeling PxP must be included in the Design Analysis (DA).

(2) For projects designed by AEs (e.g. D-B, contracted D-B-B), the Advanced Modeling PxP is a required submittal.

g. BIM/CIM Deliverables

(1) BIM and/or CIM design models in native format (e.g. Autodesk Revit, Bentley Systems AECOsim Building Designer, Autodesk Civil 3D), utilizing appropriate USACE BIM/CIM templates and work structure (ref g).

(2) Construction drawings (PDF) produced from the BIM and/or CIM design models will adhere to A/E/C Graphics Standard (ref h).

(3) BIM/CIM-generated record drawings (PDF) and BIM and/or CIM record models through construction completion.

h. CAD Deliverables

(1) CAD files will be provided in an industry standard format (e.g. Autodesk DWG or Bentley DGN files) and will adhere to the A/E/C Graphics Standard. Requirement for adherence

of BIM/CIM-generated CAD files to the A/E/C CAD Standard (ref i) will be at the discretion of the Installation or stakeholder.

(2) For Military Programs projects, BIM-generated space utilization drawings (i.e. architectural floor plans in specified CAD format) for vertical construction features must be delivered by Beneficial Occupancy Date (BOD). These space utilization drawings must be comprised of one file per floor level and will contain:

(a) Dimensions

(b) Facility footprint polygon

(c) Room footprint polygons

(d) Door locations, sizes, types, and swings

(e) Window locations and sizes

(f) Free-standing columns

(g) Counters with annotated heights

(h) Floor openings

(i) One text node per room, centered in room, with room number, space type, and usable square footage annotated

(j) Attached exterior features such as supports, storage stairs, docks, and ramps

(k) North arrow.

(3) Any additional CAD deliverable requirements will be identified prior to design. For in-house design, these requirements will be identified in the PxP, for AE design, these will be identified in the AE scope of work (SOW) or Design Build specifications.

i. GIS Deliverables

(1) Developed GIS data must adhere to the corresponding Army or Air Force Adaptation of the Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE) (ref j) and be documented using the DISDI Geospatial Metadata Profile (DGMP) metadata standard (ref k). The electronic deliverables for GIS must be in Esri ArcGIS File Geodatabase (FGDB), Bentley Map Design File (DGN), or Hexagon GeoMedia Access (MDB) format. The coordinate system, projection, datum, and units defined for the data layers will be documented in the GIS deliverable's metadata. When applicable, the vertical coordinate information must be stored as a feature attribute and documented in the metadata.

(2) Digital elevation model (DEM) mapping accuracy for the agreed upon scales must comply with Part 3 of the FGDC Geospatial Positioning Accuracy Standards (ref l).

(3) GIS data, whether obtained via survey or any other data collection process, must be measured in either US or international feet, or meters. The vertical datum and horizontal datum will comply with the requirements specified in ER 1110-2-8160 (ref m). The specification for US State Plane Coordinate System will be provided to the contractor by the Installation. When

data is collected using Global Positioning Systems (GPS) technology, the data must comply with EM 1110-1-1003 (ref n). Quality assurance must comply with the precision and accuracy requirements specified in the applicable Quality Assurance Plan (QAP).

(4) All IGI&S data must have appropriate metadata, conformal with the DGMP. The data and metadata must conform to the current version of the respective standards. A metadata file must accompany each data set. Metadata must be delivered in XML file format compliant with the DGMP ISO 19139 Schema (available at http://www.sdsfie.org). The XML file deliverable must be readable by software applications that use the XML format standard.

(5) For Army projects, IGI&S Program Office (www.us.army.mil/suite/page/igis) will provide to the contractor, upon request, an SDSFIE Army Adaptation-compliant scheme to be used for populating the GIS deliverables required under contract. The contractor must populate the scheme according to the Army IGI&S Program QAP requirements (ref o).

(6) All raw data files collected to prepare the deliverables described in paragraph 6.e must be included with submission.

7. **Update.** All new requirements will be included in the next appropriate policy document update.

8. **Point of Contact.** HQUSACE points of contact for this ECB are Jason Fairchild, CECW-EC, (202) 761-1898 and Nancy Blyler, CECW-EC, (202) 761-7755.

//S//
STACEY K. HIRATA, P.E.
Chief, Programs Integration Division
Directorate of Military Programs

//S//
LARRY D. McCALLISTER, PhD, P.E., PMP
Chief, Engineering and Construction
Directorate of Civil Works

//S//
JOSE E. SANCHEZ, P.E.
Chief, Installation Support Division
Directorate of Military Programs

//S//
EDWARD E. BELK, JR., P.E.
Chief, Programs Integration Division
Directorate of Civil Works