OVERVIEW OF USACE CIVIL WORKS POLICY AND GUIDANCE FOR CLIMATE CHANGE ADAPTATION

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Climate variability and change impact all US Army Corps of Engineers (USACE) missions, operations, programs, projects, and systems of projects.

The objective of USACE Civil Works (CW) Climate Change Adaptation program activities is to improve the resilience and decrease the vulnerability of our missions, operations, programs, projects, and systems of projects to the effects of climate change and variability.

To achieve this objective, we produce, gather, and select climate change information to develop policy and guidance that supports mainstreaming and implementation of climate change adaptation measures.

OVERARCHING POLICY:

The USACE policy to mainstream implementation of climate change adaptation measures was released on 3 June 2011 by Assistant Secretary of the Army for Civil Works (ASA/CW) Ms Jo-Ellen Darcy. This overarching policy statement signed by Ms. Darcy calls for integrating climate change adaptation into all that we do based on the best available and actionable science. The policy establishes the ASA/CW as the Agency official responsible for ensuring implementation of all aspects of this policy. Through this Policy, USACE establishes the USACE Climate Change Adaptation Steering Committee to oversee and coordinate agency-wide climate change adaptation planning and implementation. The Steering Committee is chaired by the USACE Chief, Engineering and Construction.

SPECIFIC POLICY AND GUIDANCE

The availability, quality, and resolution of available and actionable science provide a foundation for progress on specific CW climate change adaptation policy and guidance. Since close coupling of engineering and science speeds development and implementation of policy and guidance, we create supporting tools and assessment frameworks to help characterize vulnerabilities and prioritize actions. The level of effort required by the policy and guidance is tied to the scale of the decision and its economic, safety, and environmental consequences (e.g., level of effort for screening-level assessment at project/system with low consequences is much less than for a project with high public safety consequences)

Specific USACE policy and guidance development follows a parallel process, allowing for integration when appropriate. Thus, our first efforts concentrated on instituting a consistent nationwide datum that provides a foundation for coastal and hydrologic policy and guidance. Specific coastal guidance follows, based on actionable science and considerably improved knowledge since our 1986 and 2000 guidance around sea-level change. Hydrologic policy and guidance underway relies on more recent and less-developed actionable science, as discussed in USGS Circular 1331. Coastal and hydrologic assessments, policy, and guidance will be integrated over the next several years.

All geospatial tools developed to support CW climate change adaptation are based on CorpsMap, are compliant with Spatial Data Standards for Facilities, Infrastructure & Environment (SDSFIE), and are compatible with the Defense Installation Spatial Data Infrastructure (DISDI).

DATUMS:

In 2007, USACE published Engineer Circular (EC) 1110-2-6065, *Guidance for a Comprehensive Evaluation of Vertical Datums on Flood Control, Shore Protection, Hurricane Protection, and Navigation Projects*, and provided accompanying tools to evaluate and track datum compliance. This policy and guidance was superseded in 2009 with EC 1110-2-6070[1]. An accompanying Engineer Regulation (ER), ER 1110-2-8160, Policies for Referencing Project Evaluation Grades to Nationwide

[1] ECs have a two-year life span

Vertical Datums, was published in 2009. All datum policy and guidance is compiled in Engineer Manual (EM), EM 1110-2-6056, *Standards and Procedures for Referencing Project Elevation Grades to Nationwide Vertical Datums*. An effort to bring all USACE projects into compliance with datum policy and guidance began in 2007 and is expected to be complete in 2014.

COASTAL

USACE policy and guidance related to sea-level change originated in a 21 March 1986 guidance letter about the use of historical tide levels, plus subsidence or rebound where appropriate, to project future relative sea levels. This was updated in 2000 to account for the potential for larger increases in sea level, ER 1105-2-100, *Planning Guidance Notebook*, section E-24 (k) *Sea Level Rise* (p. E-142). This policy required a sensitivity analysis to include at a minimum, the extrapolation of the local historical record of relative sea level rise and a higher level, based on potential increases due to ocean warming and accelerated ice melt.

This policy was updated in 2009 by EC 1165-2-211, *Incorporating Sea-Level Change Considerations in Civil Works Programs*, which required three scenarios of sea-level change to be considered: extrapolation of the local tide gauge record, an intermediate scenario including volume change due to warming, and a higher level based on potential increases due to ocean warming and accelerated ice melt. In 2011, this was superseded by EC 1165-2-212, *Sea-Level Change Considerations for Civil Works Programs*. A tool to help calculate sea-level change at NOAA tide gauges has also been developed.

Since that time, an interagency and international team has been developing policy and guidance for sea-level change adaptation in the form of an Engineer Technical Letter (ETL), which will have a five-year life span. This ETL (*Procedures to Evaluate Sea Level Change; Impacts, Responses and Adaptation*) will be published in 2013 as the first of a new guidance series (1100, Global Changes). The draft has undergone limited internal and external review in late FY12, and will be released for wider review in February 2013.

Also in development is an Engineering and Construction Bulletin (ECB) that provides techniques to use long-term non-NOAA tide gauges to estimate future sea level change for EC 1165-2-212 and for the draft ETL. A tool similar to the sea-level change calculator has been developed and will be made available when the ECB is released. A second ETL dealing with estimation of extreme water levels with sea-level change is planned, as is an Engineer Manual that will incorporate coastal climate change guidance to date.

As part of our comprehensive evaluation with respect to sea-level change, we have developed a tool to support initial and more detailed screening of vulnerability to coastal climate change. The initial screening assesses vulnerability based on the sea-level change scenarios of EC 1165-2-212 and the draft ECB. The detailed screening assesses vulnerability based on monthly extreme water levels and the sea-level change scenarios. The initial screening is being piloted by three USACE districts in December-January 2013, and will be updated based on their feedback. The tool will be released to all districts in February or March 2013. Results from this screening will be used to prioritize the more detailed assessments.

HYDROLOGICAL:

Less actionable science is available to support the development of policy and guidance related to climate change hydrology. USACE has worked with other water resources agencies to characterize known impacts, vulnerabilities and adaptation measures, as well as user needs, in USGS Circular 1331 and the succeeding interagency reports published in 2011 (*Addressing Climate Change in Long-Term Water Resources Planning and Management: User Needs for Improving Tools and Information*) and 2013 (*Short-Term Water Management Decisions: User Needs for Improved Climate, Weather, and Hydrologic Information*). USACE has also led or participated in other interagency efforts to develop fundamental information supporting the development of policy and guidance. As of early 2013, several efforts to develop the required policy and guidance are underway. Topics include:

- Appropriate application of paleoflood information for hydrology and hydraulics decision-making
- General guidance on considering climate change and variability in hydrological studies
- Evaluation of the nonstationarity assumption in hydrological analyses
- Appropriate application of paleohydrology in drought analyses
- Considerations of nonstationarity in CW programs
- Incorporation of climate change and variability in analyses of extreme floods.