

Request for Statements of Interest
Funding Opportunity Announcement

Federal Awarding Agency:

U.S. Army Corps of Engineers,
Engineer Research and Development Center
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

Funding Opportunity No: W81EWF-20-SOI-0028

CFDA No: 12.630

Statutory Authority: 10 USC 2358

Project Title: Investigating Uncertainty Associated with the Great Lakes
Water Balance

Announcement Type: Initial announcement

Issue Date: 4 June 2020

Statement of Interest/Qualifications Due Date: 3 July 2020, 1PM CDT

Full Application Package Due Date, if Invited: 31 July 2020, 1PM CDT

Estimated Award Ceiling: \$85,000 per single award excluding any options.

Estimated Total Program Funding: \$325,000 for entire announcement
(Base and all options).

Expected Number of Awards: **1**

Section I: Funding Opportunity Description

Background:

The scope of these projects focuses on fundamental research that answers critical questions related to uncertainty associated with Great Lakes basin hydrologic, hydraulic, and climate science. The results of the research are intended to serve the public, and it is expected that the research tasks will be conducted in close involvement with federal government representatives including (but not limited to) scientists and engineers from USACE, National Oceanographic Atmospheric Administration, Environment Climate Change Canada, nonprofit public interest groups and other members of the public.

Brief Description of Anticipated Work:

The proposed project would focus on conducting research related to exploring alternative approaches for incorporating various models of Great Lakes connecting channel flows, evaporation and run-off into the large lake statistical water balance model (link below). In some instances, the government will be responsible for generating associated models for uncertainty analysis in the large lake statistical water balance model. The government will provide a team member and fulfill required, parallel tasks in order to advance this research.

The water balance model is open source and has been used to investigate evaporation and channel discharge as case studies in the Great Lakes. The USACE would like to expand some of these case studies and initiate new studies.

https://deepblue.lib.umich.edu/data/concern/data_sets/2514nk609?locale=en

The initial phase for this project will focus on quantifying variability and uncertainty over time in Detroit River and St. Clair River discharge estimates.

- 1) Extend the case study of the Detroit River by Quinn, Clites and Gronewold (2020) through 2019.
- 2) Expand above case study to the St. Clair River through 2019.
- 3) Encode conventional SFD models into L2SWBM using prior parameter distributions from external independent regression analysis (developed and supplied by the government)

Option 1: St. Clair and Detroit Rivers

- 1) Assimilate ADVN-based estimates of flow into L2SWBM as a separate data source (developed and provided by the government)
- 2) Do not assimilate values from the Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data (i.e. official 'coordinated' values) but use as a basis for comparison
- 3) Assimilate and assess by comparison estimates from up to five USACE machine learning algorithms for each channel, St. Clair River and Detroit River. These will be developed and supplied by the government)
- 4) Incorporate an estimate (into L2SWBM) based on transfer factors (developed in conjunction with the government)

Quinn, Frank H, Anne H Clites, and Andrew D Gronewold. 2020. "Evaluating Estimates of Channel Flow in a Continental-Scale Lake-Dominated Basin." *Journal of Hydraulic Engineering* 146 (3).
[https://doi.org/10.1061/\(ASCE\)HY.1943-7900.0001685](https://doi.org/10.1061/(ASCE)HY.1943-7900.0001685).

Option 2:

Research alternative approaches to estimating flows from the Niagara River and the St. Marys River. The following is a summary of tasks expected to be completed as an option:

- 1) Encode an SFD model into the L2SWBM for the Niagara River using the Buffalo and Fort Erie rating equations, and determine if parameter values need to change from historical SFD models in the L2SWBM in order to close the water balance.
- 2) Ensure that the Welland Canal is accurately represented in the L2SWBM.
- 3) Reconcile regional power plant estimates of flow near the Niagara River
- 4) Incorporate ADVN estimates of Niagara Flow near its discharge into Lake Ontario
- 5) Assimilate ADVN-based estimates of Niagara flow from the Canadian federal government (collected starting in 2009; may need to encode explicit bias, or higher level of uncertainty).

Encode gate equations along the St. Marys River into the L2SWBM, including other estimates of St. Marys River flow components.

Option 3:

Investigate the effect of including large scale distributed hydrologic models into the water balance. These models include but are not limited to the United States National Water Model (WRF-Hydro), a similar Canadian model GEM-Hydro and their derivative products.

Option 4:

Extending the historical Great Lakes water balance record back to 1900 using the L2SWBM. This approach may include use of conventional water balance records, but may also include new estimates of lake evaporation using the NOAA GLERL large lake thermodynamics model. This model, though somewhat outdated relative to state-of-the-art hydrodynamic models, requires a very simple suite of meteorological forcing variables that are available through new reanalysis products (including ERA 20C). Additional sources of information for precipitation would need to be explored, and perhaps new simulations of historical runoff would need to be generated.

Option 5:

Exploring spatial and temporal autocorrelation within Great Lakes hydrometeorological data. It is almost certain that several time series data sets for water balance components within the Great Lakes are correlated across space and time. Correlation is not, however, explicitly quantified in the L2SWBM; providing an explicitly representation of correlation could significantly reduce uncertainties in historical estimates, particularly those prior to 1950 when data records are relatively sparse.

Option 6:

Assess improvements to seasonal and multi-year water balance and water level forecasting. The team will explore how newly-generated historical L2SWBM-based water balance sequences propagate through lake-to-lake water level routing equations and into seasonal and multi-year forecasts. It is expected that the new estimates may provide a broader range of potential future outcomes, given that the L2SWBM generates thousands of correlated iterations for each monthly water balance component. This task will also explore how utilizing a subset of L2SWBM outcomes (based on climate projections) might better reflect future hydrologic conditions. This task will also include an assessment of how future water levels might be expected to change under different water supply scenarios.

Public Benefit:

Reducing uncertainty in water balance components enables water managers to issue more reliable water level forecasts and outflow regulation decisions. These decisions can have implications for the navigability of the Great Lakes connecting channels and alter commercial navigation decisions such as, but not limited to, load level or safety of navigation in particular sections of rivers. Water management decisions have an effect on emergency operations such as advising sand bagging or not and where to sand bag. Water level forecast and outflow decisions play a role in short-and-long-term hydropower production and planning of distribution systems.

Section II: Award Information

Responses to this Request for Statements of Interest will be used to identify potential investigators for studies to be sponsored by the Detroit District and the Engineer Research and Development Center to provide uncertainty estimates for components of the Great Lakes water balance. The estimated level of funding for FY20 is approximately \$85k. Additional funding for 4 optional years may be available, providing the potential funding of \$325k over 5 years to the successful Recipient/Awardee.

Government Involvement:

The government will partner on this project by providing recently developed models (Thompson et al. 2020) for analysis in the large lake statistical water balance model. The government will also develop new machine learned estimates of discharge in the Great Lakes Connecting Channels for assimilation into the water balance model. Results from this research will help identify periods of bias in the coordinated discharge record and provide an opportunity to reevaluate discharge estimates as in Quinn, Clites, and Gronewold (2020). These records are provided by the federal governments of the United States and Canada to interested parties for their own investigations into Great Lakes processes and projects.

Quinn, Frank H, Anne H Clites, and Andrew D Gronewold. 2020. "Evaluating Estimates of Channel Flow in a Continental-Scale Lake-Dominated Basin." *Journal of Hydraulic Engineering* 146 (3).
[https://doi.org/10.1061/\(ASCE\)HY.1943-7900.0001685](https://doi.org/10.1061/(ASCE)HY.1943-7900.0001685).

Thompson, Aaron F, Sandrina N Rodrigues, Jeanette C Fooks, Kevin A Oberg, and Timothy J Calappi. 2020. "Comparing Discharge Computation Methods in

Great Lakes Connecting Channels.” *Journal of Hydraulic Engineering* 25 (6): 05020007.

Section III: Eligibility Information

1. Eligible Applicants – This opportunity is restricted to non-federal partners of the Great Lakes-Northern Forests Cooperative Ecosystems Studies Unit (CESU).
2. Cost Sharing – This action will be 100% funded by USACE.

Section IV: Application and Submission Information – Two Phase Process

Phase I: Submission of a Statement of Interest/Qualifications.

1. Materials Requested for Statement of Interest/Qualifications:
 - a. Please provide the following via e-mail attachment to:
Chelsea.M.Whitten@usace.army.mil
(Maximum length: 2 pages, single-spaced 12 pt. font).
 1. Name, Organization and Contact Information
 2. Brief Statement of Qualifications (including):
 - Biographical Sketch,
 - Relevant past projects and clients with brief descriptions of these projects,
 - Staff, faculty or students available to work on this project and their areas of expertise,
 - Any brief description of capabilities to successfully complete the project you may wish to add (e.g. equipment, laboratory facilities, greenhouse facilities, field facilities, etc.).

Note: A proposed budget is NOT requested at this time.

The administrative point of contact is Chelsea Whitten, 601-634-4679;
Chelsea.M.Whitten@usace.army.mil

2. Statement of Interest/Qualifications shall be submitted NO LATER THAN 3 July 2020, 1PM CDT.

Based on a review of the Statements of Interest received, an investigator or investigators will be invited to move to Phase II which is to prepare a full study proposal. Statements will be evaluated based on the investigator's specific experience and capabilities in areas related to the study requirements.

Phase II: Submission of a complete application package to include a full technical proposal including budget, if invited.

1. Address to Request Application Package

The complete funding opportunity announcement, application forms, and instructions are available for download at Grants.gov.

The administrative point of contact is Chelsea Whitten, 601-634-4679;
Chelsea.M.Whitten@usace.army.mil

2. Content and Form of Application Submission

All mandatory forms and any applicable optional forms must be completed in accordance with the instructions on the forms and the additional instructions below.

- a. SF 424 R&R - Application for Federal Assistance
- b. Full Technical Proposal – Discussion of the nature and scope of the research and technical approach. Additional information on prior work in this area, descriptions of available equipment, data and facilities, and resumes of personnel who will be participating in this effort should also be included.
- c. Cost Proposal/Budget – Clear, concise, and accurate cost proposals reflect the offeror's financial plan for accomplishing the effort contained in the technical proposal. As part of its cost proposal, the offeror shall submit cost element breakdowns in sufficient detail so that a reasonableness determination can be made. The SF 424 Research & Related Budget Form can be used as a guide. The cost breakdown should include the following, if applicable:
 1. Direct Labor: Direct labor should be detailed by level of effort (i.e. numbers of hours, etc.) of each labor category and the applicable labor rate. The source of labor rates shall be identified and verified. If rates are estimated, please provide the historical based used and clearly identify all escalation applied to derive the proposed rates.
 2. Fringe Benefit Rates: The source of fringe benefit rate shall be identified and verified.
 3. Travel: Travel costs must include a purpose and breakdown per trip to include destination, number of travelers, and duration.
 4. Materials/Equipment: List all material/equipment items by type and kind with associated costs and advise if the costs are based on vendor quotes and/or engineering estimates; provide copies of vendor quotes and/or catalog pricing data.
 5. Subrecipient costs: Submit all subrecipient proposals and analyses. Provide the method of selection used to determine the subrecipient.
 6. Tuition: Provide details and verification for any tuition amounts proposed.
 7. Indirect Costs: Currently the negotiated indirect rate for awards through the CESU is 17.5%.
 8. Any other proposed costs: The source should be identified and verified.

3. Application package shall be submitted NO LATER THAN 31 July 2020, PM CDT.

4. Submission Instructions

Applications may be submitted by mail, e-mail, or Grants.gov. Choose ONE of the following submission methods:

a. E-mail:

Format all documents to print on Letter (8 ½ x 11") paper. E-mail proposal to Chelsea.M.Whitten@usace.army.mil

b. Grants.gov: <https://www.grants.gov/>:

Applicants are not required to submit proposals through Grants.gov. However, if applications are submitted via the internet, applicants are responsible for ensuring that their Grants.gov proposal submission is received in its entirety.

All applicants choosing to use Grants.gov to submit proposals must be registered and have an account with Grants.gov. It may take up to three weeks to complete Grants.gov registration. For more information on registration, go to <https://www.grants.gov/web/grants/applicants.html>.

Section V: Application Review Information

1. **Peer or Scientific Review Criteria:** In accordance with DoDGARs 22.315(c), an impartial peer review will be conducted. Subject to funding availability, all proposals will be reviewed using the criteria listed below (technical and cost/price). All proposals will be evaluated under the following two criteria which are of descending importance.

a. **Technical (items i. and ii. are of equal importance):**

- i. Technical merits of proposed R&D.
- ii. Potential relationship of proposed R&D to DoD missions.

b. **Cost/Price:** Overall realism of the proposed costs will be evaluated.

2. **Review and Selection Process**

a. **Categories:** Based on the Peer or Scientific Review, proposals will be categorized as Selectable or Not Selectable (see definitions below). The selection of the source for award will be based on the Peer or Scientific Review, as well as importance to agency programs and funding availability.

i. **Selectable:** Proposals are recommended for acceptance if sufficient funding is available.

ii. **Not Selectable:** Even if sufficient funding existed, the proposal should not be funded.

Note: The Government reserves the right to award some, all, or none of proposals. When the Government elects to award only a part of a proposal, the

selected part may be categorized as Selectable, though the proposal as a whole may not merit such a categorization.

b. No other criteria will be used.

c. Prior to award of a potentially successful offer, the Grants Officer will make a determination regarding price reasonableness.

Section VI: Award Administration Information

1. Award Notices

Written notice of award will be given in conjunction with issuance of a cooperative agreement signed by a Grants Officer. The cooperative agreement will contain the effective date of the agreement, the period of performance, funding information, and all terms and conditions. The recipient is required to sign and return the document before work under the agreement commences. **Work described in this announcement SHALL NOT begin without prior authorization from a Grants Officer.**

2. Administrative Requirements

The cooperative agreement issued as a result of this announcement is subject to the administrative requirements in 2 CFR Subtitle A; 2 CFR Subtitle B, Ch. XI, Part 1103; and 32 CFR Subchapter C, except Parts 32 and 33.

3. Reporting

See 2 CFR Sections 200.327 for financial reporting requirements, 200.328 for performance reporting requirements, and 200.329 for real property reporting requirements.

Section VII: Agency Contact

Chelsea Whitten, Grants Officer

US Army Corps of Engineers, Engineer Research and Development Center

3909 Halls Ferry Road

Vicksburg, MS 39180-6199

Chelsea.M.Whitten@usace.army.mil

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