

**ADVERTISEMENT FOR ENGINEERING AND RELATED SERVICES**  
**May 15, 2019**

**CONTRACT NO. 4400017067**  
**LOUISIANA WATERSHED INITIATIVE (LWI) MODELING CONTRACT**  
**REGION NO. 1**

**DBE Goal = 2%**

Under the authority granted by Title 48 of Louisiana Revised Statutes, the Louisiana Department of Transportation and Development (DOTD) hereby issues this advertisement for consulting firms to provide engineering and related services. **Consultants who are a Louisiana or foreign LLC or corporation should be appropriately registered with the Louisiana Secretary of State, as contemplated by Title 12 of the Louisiana Revised Statutes, and with the Louisiana Professional Engineering and Land Surveying (LAPELS) Board under its rules for firms. If a consultant is not in good standing in accordance with those provisions, it may be subject to consequences contemplated in Title 12 and/or the LAPELS rules. All requirements of LAPELS must be met at the time the proposal is submitted. Prime consultants must be registered with the Federal Government using SAM.gov prior to contract execution.**

One (1) proposal will be selected for each contract solicited per this advertisement. Only one (1) DOTD Form 24-102 proposal is required for this advertisement, and it represents the prime consultant's qualifications and those of any and all sub-consultants proposed to be used for the referenced contract(s). All identifying contract number(s) should be listed in Section 2 of the DOTD Form 24-102.

Any questions concerning this advertisement must be sent in writing to [DOTDConsultantAds80@la.gov](mailto:DOTDConsultantAds80@la.gov) no less than 48 hours (excluding weekends and holidays) prior to the proposal deadline.

**SCOPE OF SERVICES**

The general tasks that the consultant may be required to perform are described more specifically in Attachment A, which is incorporated herein by reference. The selected consultant will perform the specific services covered in an Indefinite Delivery/Indefinite Quantity (IDIQ) contract as detailed in individual Task Orders (TOs), which will specify TO-specific scope of services, contract time, and compensation.

The consultant shall perform the work in accordance with the requirements of this advertisement, the resulting contract, and any TOs issued thereunder. Deliverables shall be in such format as required in Attachment A, unless otherwise specified in an individual TO. The work performed by the consultant shall be performed in a manner consistent with that degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances.

## MINIMUM PERSONNEL REQUIREMENTS (MPRs)

The requirements set forth in Attachment B must be met at the time the proposal is submitted.

### EVALUATION CRITERIA

The criteria to be used by DOTD in evaluating responses for the selection of a consultant to perform these services are listed below:

#### **TIER I Evaluation:**

1. consultant's firm experience on similar projects, weighting factor of three (5.5);
2. consultant's staff experience on similar projects, weighting factor of four (6.5)

#### **TIER II Evaluation:**

1. consultant's Interview/Presentation.

**TIER I Evaluation:** Consultants will be evaluated as set forth in the "Evaluation Criteria" section of this advertisement. The evaluation will be by means of a point-based rating system. Each of the above criteria will receive a rating on a scale of one (1) through five (5). The ratings will then be multiplied by the corresponding weighting factor. The firm's rating for each category will then be added to arrive at the consultant's final Tier I rating.

**TIER II Evaluation:** The highest rated consultants on the TIER I shortlist (maximum of three (3) if qualified) shall attend an Interview/Presentation within three (3) weeks of the notification/announcement of the shortlist from the TIER I evaluation. The presentation will, at DOTD's discretion, become part of the contract. During the presentations, each Consultant will be given up to 90 minutes for their presentation followed by a question and answer session. The schedule of presentations will be announced subsequent to the posting of the TIER I shortlist.

The presentation will include an outline of the following factors (Each factor's weight to the overall presentation is shown in parentheses):

1. Consultant's plan on how to timely deliver all the requirements and deliverables identified in the scope of services which will reasonably allow DOTD to assess Consultant's ability to successfully complete this project and the capacity to model multiple HUC-8 watersheds concurrently (1)
2. Consultant's demonstrated experience, knowledge, expertise and methodology to perform the work on the following areas: (1.5)
  - a. Develop and demonstrate a proposed tiered modeling approach for the multiple HUC-8 watersheds in the particular region of the contract
  - b. Develop and demonstrate a data gap analysis plan including but not limited to: a review of existing models, survey data, high water marks and gauges
  - c. Develop and demonstrate a stakeholder communication and engagement plan
3. Consultant's detailed description of the procedures and/or plans used to ensure good quality assurance and quality control is maintained throughout the contract term (0.5).
4. Use of key personnel and their roles and responsibilities (1)

The Interview/Presentation evaluation will be based on a numerical rating process (1-10). Each member of the evaluation team will individually rate each evaluation factor listed above as weighted.

The scores for each individual factor will be averaged and the corresponding value will then be multiplied by the factor’s weight. The final interview/presentation score will be the sum of all of the factors’ weighted scores.

DOTD’s Project Evaluation Team will be responsible for performing the above described evaluations. The TIER I score in combination with the TIER II score will be used to develop the final shortlist. A final shortlist of the three (if three are qualified) highest rated Consultants will be submitted to the Secretary for final selection.

If any sub-consultants are proposed to be used for the referenced contract(s), then Section 11 must represent the percentage of overall work that will be done by each firm.

**THE FOLLOWING TABLE MUST BE COMPLETED AND INCLUDED IN SECTION 11 OF THE PRIME CONSULTANT’S DOTD FORM 24-102 PROPOSAL.**

Prime consultants who perform 100% of the work may state so in lieu of including this table. In all other cases, the prime consultant shall fill in the table by entering the name of each firm that is part of the proposal and the percentage of work of the consultant/sub-consultant.						
Identify the percentage of work for the <b><u>overall contract</u></b> to be performed by the prime consultant and each sub-consultant.						
% of Overall Contract	Prime	Firm B	Firm C	Firm D	Firm E	Firm F
100%						

If sub-consultants are used, the prime consultant must perform greater than 50% of the work for the overall contract. The prime consultant and each sub-consultant will be evaluated on their part of the contract. The individual prime consultant and sub-consultant ratings, proportional to the amount of their work, will then be added to arrive at the total consultant rating.

**RULES OF CONTACT**

These rules are designed to promote a fair and unbiased selection process. DOTD is the single source of information regarding the contract selection. Any official correspondence will be in writing, and any official information regarding the contract will be disseminated by DOTD’S designated representative via the DOTD website. The following rules of contact will apply during the contract selection process, commencing on the advertisement posting date and ceasing at the time of final contract selection. Contact includes face-to-face communication, the use of a telephone, facsimile, electronic mail (email), or formal or informal written communications with DOTD. Any contact determined to be improper, at the sole discretion of DOTD, may result in the rejection of the proposal (i.e., DOTD Form 24-102).

Consultants and consultant organizations shall correspond with DOTD regarding this advertisement only through the email address designated herein; [DOTDConsultantAds80@la.gov](mailto:DOTDConsultantAds80@la.gov) and during DOTD sponsored one-on-one meetings.

No consultant, or any other party on behalf of a consultant, shall contact any DOTD employee, other than as specified herein. This prohibition includes, but is not limited to, the contacting of: department heads, members of the evaluation teams, and any official who may participate in the decision to award the contract resulting from this advertisement.

DOTD will not be responsible for any information or exchange that occurs outside the official process specified above.

**By submission of a proposal to perform services pursuant to this advertisement, the consultant agrees to the communication protocol herein.**

No protest or appeal will be entertained unless made in accordance with the procedures found on DOTD's website, which are incorporated herein by reference and can be accessed at: [http://wwwsp.dotd.la.gov/Inside\\_LaDOTD/Divisions/Engineering/CCS/Pages/Process\\_Procedures.aspx](http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Engineering/CCS/Pages/Process_Procedures.aspx).

### **CONTRACT TIME**

The overall time for completion of the scope of services is estimated to be **five (5) years**. This IDIQ contract shall be in effect for **five (5) years**.

### **COMPENSATION**

The maximum compensation payable to the consultant under this IDIQ contract is estimated to be **\$20,000,000**. Compensation to the consultant for services rendered in connection with each TO may be made on the basis of lump sum, actual cost plus a fixed fee, cost per unit of work, or specific rates of compensation, as specified in each TO, subject to the limitation set forth in the IDIQ contract.

Compensation may be either negotiated or non-negotiated as determined by DOTD for each individual TO. When the compensation is negotiated, it will be determined by DOTD based on work hours negotiated between DOTD and the consultant. After notification of selection, a kick-off meeting will be held with the selected consultant and appropriate DOTD personnel. The selected consultant will be required to submit a work hour proposal. All negotiations must be completed within the timeframe set forth in the Consultant Contract Services Manual, unless an abbreviated timeframe is specified in writing by the PM.

### **FUNDS AVAILABILITY**

Funds are not presently available for this contract. DOTD's obligation under this contract is contingent upon the availability of funds from which payment for contract purposes can be made. No legal liability on the part of the DOTD for any payment may arise until funds are made available

to DOTD for this contract and until the Consultant receives notice of such availability, to be confirmed in writing by DOTD.

### **DIRECT EXPENSES**

To the extent that the consultant is allowed to claim reimbursement for direct expenses, all direct expense items which are not paid for in the firm's indirect cost rate and which are needed and will be consumed during the life of the contract must be identified by the consultant during contract development. Standard equipment or resources to be used in the provision of services rendered for this contract will not be considered for payment under direct expenses.

The consultant should own most of the equipment required to provide the work and services. The cost of this equipment should be included in the consultant's indirect cost rate. Equipment may be considered "specialized" if it cannot be considered standard equipment for that particular consultant's normal operating business needs. If a consultant believes special equipment is needed for the contract, the consultant must inquire through the Question and Answer process, as provided herein, whether the identified item will be considered specialized equipment for the individual contract.

To the extent that direct expenses are authorized to be compensated pursuant to a particular TO, all travel related expenses will be compensated under direct expenses, and will be in accordance with the most current Louisiana Office of State Travel regulations as promulgated in the Louisiana Administrative Code under the caption "PPM No. 49." Vehicle rental rates will require prior approval from the PM.

### **QUALITY ASSURANCE/QUALITY CONTROL**

DOTD requires the selected consultant and all sub-consultants to develop a Quality Assurance/Quality Control (QA/QC) program in order to provide a mechanism by which all deliverables will be subject to a systematic and consistent review. The selected consultant shall address in its plan the review of all sub-consultant work and deliverables. The selected consultant must submit their QA/QC plan to the DOTD PM within 10 business days of the award notification to the consultant. Consultants must ensure quality and adhere to established DOTD policies, procedures, standards and guidelines in the preparation and review of all deliverables. DOTD may provide limited input and technical assistance to the consultant. Any deliverables to be transmitted by the consultant shall be transmitted with a DOTD Quality Assurance/Quality Control Checklist, and a certification that the deliverables meet DOTD's quality standards.

If Attachment A includes specific QA/QC requirements that contradict those set forth above, the requirements in Attachment A control.

### **REFERENCES**

All services and documents will meet the standard requirements as to format and content of DOTD and will be prepared in accordance with the latest applicable editions, supplements, and revisions of the following:

1. DOTD Location and Survey Manual –  
[http://wwwsp.dotd.la.gov/Inside\\_LaDOTD/Divisions/Engineering/LocationSurvey/Manuals%20and%20Forms/Location\\_and\\_Survey\\_Manual.pdf](http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Engineering/LocationSurvey/Manuals%20and%20Forms/Location_and_Survey_Manual.pdf)
2. Addendum “A” to the Location & Survey Manual –  
[http://wwwsp.dotd.la.gov/Inside\\_LaDOTD/Divisions/Engineering/LocationSurvey/Manuals%20and%20Forms/Location%20and%20Survey%20Manual%20-%20Addendum%20A.pdf](http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Engineering/LocationSurvey/Manuals%20and%20Forms/Location%20and%20Survey%20Manual%20-%20Addendum%20A.pdf)
3. DOTD Roadway Design Procedures and Details –  
[http://wwwsp.dotd.la.gov/Inside\\_LaDOTD/Divisions/Engineering/Road\\_Design/Pages/Road-Design-Manual.aspx](http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Engineering/Road_Design/Pages/Road-Design-Manual.aspx)
4. DOTD Hydraulics Manual –  
[http://wwwsp.dotd.la.gov/Inside\\_LaDOTD/Divisions/Engineering/Public\\_Works/Hydraulics/Documents/Hydraulics%20Manual.pdf](http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Engineering/Public_Works/Hydraulics/Documents/Hydraulics%20Manual.pdf)
5. Louisiana Standard Specifications for Roads and Bridges –  
[http://wwwsp.dotd.la.gov/Inside\\_LaDOTD/Divisions/Engineering/Standard\\_Specifications/Pages/Standard%20Specifications.aspx](http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Engineering/Standard_Specifications/Pages/Standard%20Specifications.aspx)
6. Manual on Uniform Traffic Control Devices (Non-DOTD Link) –  
<http://mutcd.fhwa.dot.gov/>
7. Consultant Contract Services Manual –  
[http://wwwsp.dotd.la.gov/Inside\\_LaDOTD/Divisions/Engineering/CCS/Manuals/CCS%20Manual%202017.pdf](http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Engineering/CCS/Manuals/CCS%20Manual%202017.pdf)

## CONTRACT EXECUTION REQUIREMENTS

The selected consultant will be required to execute the contract within ten (10) days after receipt of the contract.

The selected consultant will be responsible for compliance with all applicable federal, state, and local laws and regulations including, but not limited to, 24 C.F.R. 1.1, *et. seq.*, in performing the services for this project.

**DBE** - The selected consultant shall have a Disadvantaged Business Enterprise (DBE) goal of **2%** of the contract fee. DBE participation will be limited to the firms certified pursuant to the Louisiana Unified Certification Program. For convenience, DOTD provides a list on its website (<http://www8.dotd.la.gov/UCP/UCPSearch.aspx>) of firms that have been certified as eligible to participate as DBEs on US DOT assisted contracts. This list is not an endorsement of the quality of performance of any firm but is simply an acknowledgment of the listed firms' eligibility as a DBE. DOTD makes no representations of the accuracy or completeness of this list on any particular date or time. Prime consultants considering the use of a particular DBE sub-consultant are advised to obtain documentation of certification status from that sub-consultant. Credit will only be given for use of DBEs that are certified by the Louisiana Unified Certification Program.

Prime consultants must specify by firm name in Section 10 on the DOTD Form 24-102 all DBE firms which the prime intends will participate in providing services under the contract to meet the

DBE goal and indicate for each the percent of the contract fee for the services that will be performed by each specified DBE firm. If the prime did not succeed in obtaining enough DBE participation to meet the goal, it must attach to the DOTD Form 24-102, behind Section 17, documentation of its good faith efforts to meet the goal.

### **REVISIONS TO THE ADVERTISEMENT**

DOTD reserves the right to revise any part of the advertisement by issuing addenda to the advertisement at any time. Issuance of this advertisement in no way constitutes a commitment by DOTD to award a contract. DOTD reserves the right to accept or reject, in whole or part, all DOTD Form 24-102s submitted, and/or cancel this consultant services procurement if it is determined to be in DOTD's best interest. All materials submitted in response to this advertisement become the property of DOTD, and selection or rejection of a proposal does not affect this right. DOTD also reserves the right, at its sole discretion, to waive administrative informalities contained in the advertisement.

### **CLARIFICATIONS**

DOTD reserves the right to request clarification of ambiguities or apparent inconsistencies found within any proposal, if it is determined to be in DOTD's best interest.

### **PROPOSAL REQUIREMENTS**

One (1) original (**stamped "original"**) and **five (5)** copies of the consultant's response to this advertisement must be submitted to DOTD on the most current version of the DOTD Form 24-102 (available at [http://bit.ly/CCS\\_ManualsFormsAgreements](http://bit.ly/CCS_ManualsFormsAgreements)) along with an electronic copy (USB flash drive only) in a searchable Portable Document Format (PDF). All proposals must be in accordance with the requirements of this advertisement, and the Consultant Contract Services Manual. Unless otherwise stated in this advertisement, copies of licenses and certificates are not required to be submitted with the proposal.

If more than one (1) contract is to be selected based on this advertisement, no prime consultant is allowed to be a sub-consultant on any other consultant's 24-102. If a prime consultant is submitted as a sub-consultant on another consultant's 24-102, its proposal as a prime consultant may be deemed non-responsive.

Any consultant failing to submit any of the information required on the DOTD Form 24-102, or providing inaccurate information on the DOTD Form 24-102, may be considered non-responsive.

DOTD employees may not submit a proposal, nor be included as part of a consultant's proposal.

Any sub-consultants to be used in performance of this contract, must also submit a DOTD Form 24-102, which is completely filled out and contains all information pertinent to the work to be performed. The sub-consultant's DOTD Form 24-102 must be firmly bound to the prime consultant's DOTD Form 24-102.

Contract and/or part-time employees are allowed. Such employees should be shown in Section 12 of the DOTD Form 24-102 with an asterisk denoting their employment status.

The DOTD Form 24-102 should be identified with **contract number 4400017067**. **The proposal due date will be established by a subsequent addendum to this advertisement after selection of the LWI Region Nos. 2, 3, 5 and 7 consultants.**

Department of Transportation and Development  
Attn.: Darhlene Major  
Consultant Contract Services Administrator  
1201 Capitol Access Road, **Room 405-E**  
Baton Rouge, LA 70802

Phone: (225) 379-1025



## ATTACHMENT A – SCOPE OF SERVICES

**The home office indirect cost rate shall be applicable to all services except as otherwise designated hereafter.**

### **1. Modeling Software**

The first attached map outlines seven (7) contracting regions. Each of these regions encompass multiple HUC-8 watersheds. The second attached map outlines the contracting region related to this advertisement. The Consultant shall develop hydrologic and hydraulic numerical models of the contract area drainage basins. The Consultant shall use Hydrologic Engineering Center (HEC) suite of software for hydrology, hydraulics and consequence assessment and risk assessment. Upon selection of the Consultant, DOTD, will provide a document outlining the technical details to provide guidance and quality assurance for the tasks of model setup, calibration, linkages (among the various software components), and quality control of the deliverables.

The Consultant shall be proficient and experienced with the following modeling components and packages.

#### **1.1. Data Storage System (DSS)**

The HEC-DSS is a common database for HEC modeling applications and allows for the seamless transfer of data between applications.

#### **1.2. HEC-Statistical Software Package (HEC-SSP)**

This software allows users to perform statistical analyses of hydrologic data. HEC-SSP can perform flood flow frequency analysis based on Bulletin 17B (Interagency Advisory Committee on Water Data, 1982) and Bulletin 17C (England, et al., 2015), a generalized frequency analysis on not only flow data but other hydrologic data as well, a volume frequency analysis on high and low flows, a duration analysis, a coincident frequency analysis, and a balanced hydrograph analysis.

#### **1.3. HEC-Meteorological Visual Utility Engine (HEC-MetVUE)**

This software provides tools for processing and manipulating meteorological data to support hydrologic modeling.

#### **1.4. HEC-Hydrologic Modeling System (HEC-HMS)**

This software is designed to simulate the complete hydrologic processes of dendritic watershed systems. The software includes many traditional hydrologic analysis procedures such as event infiltration, unit hydrographs, and hydrologic routing.

#### **1.5. HEC-River Analysis System (HEC-RAS)**

This software allows the user to perform one-dimensional steady flow, one and two-dimensional unsteady flow calculations, sediment transport/mobile bed computations, and water temperature/water quality modeling.

### **1.6. HEC-Flood Impact Assessment (HEC-FIA)**

The HEC-FIA software is a tool to help identify the consequences from a single event, including loss of life and economic losses and shall be an integral part of the living model.

### **1.7. HEC-Flood Damage Reduction Analysis (HEC-FDA)**

The HEC-FDA tool calculates annualized expected damages and can support the assessment of both positive and negative impacts of proposed projects/Land Use Land Cover changes. This tool allows for analyzing variety of event types.

### **1.8. HEC-Watershed Assessment Tool (HEC-WAT)**

HEC-WAT provides an overarching interface for many of the HEC suite of software and is designed for interactive use in a multi-tasking environment to provide information for decision makers to support alternative analysis. HEC-WAT shall be used to integrate HEC tools adding a wealth of functionality to the modeling system for future analysis and research.

## **2. Modeling Approach**

DOTD will provide a comprehensive document illustrating a modeling approach to support their development of a detailed scope of work. The document provided by DOTD will provide guidance on the desired tiered approach linking the various modeling components and varying the spatial resolution in the main areas of interest. The Consultant will use the general guidelines provided by DOTD as a starting point to develop a modeling approach for each watershed. At the onset of each HUC-8 Task Order, the Consultant will develop a proposed modeling approach and coordinate with local government officials and interested parties to conduct “discovery” meetings. The Consultant will use these meetings to assist in determining unique flow characteristics of the watershed, availability of data, problem drainage areas, historical rain event information, potential multi-jurisdictional drainage projects as proof of concept projects, applicability of proposed modeling approach and more. The Consultant shall meet approximately monthly with DOTD for a modeling progress and coordination meeting.

### **2.1. DATA GAP ANALYSIS**

The purpose of this task is to identify, obtain (where made available to DOTD) and review existing model and survey data that can be leveraged for development of the models. Through numerous discovery meetings with FEMA, the U.S. Army Corp of Engineers (USACE), the Natural Resources Conservation Service (NRCS), the United States Geological Survey (USGS), local Parish and municipal engineers, the local engineering community and others, the Consultants shall identify any models currently available for any watershed in the given contract area.

#### **2.1.1. Review Models**

The Consultant shall evaluate available models to determine what data can be leveraged for the modeling effort of their contracted region or HUC-8. Key considerations when evaluating models shall include the availability of supporting documentation including dates (of modeling and geometry data), vertical datum and spatial integrity. Additionally, the quality of the modeling shall be reviewed to ensure only defensible data is leveraged that exceeds the level of detail proposed for each flooding source.

### **2.1.2. Review Survey**

All available survey data shall be reviewed to determine whether it is suitable for incorporation into the models. Suitability is determined by conforming to FEMA standards. This shall include verifying spatial references, dates, vertical datum and comparisons with other data sources including LiDAR to ensure data ties into other data sources. Where discrepancies are found, data shall be carefully reviewed to identify suitable data.

## **2.2. HIGH-WATER MARK REVIEW**

Various sources of high-water mark (HWM) data which have been collected following previous flood events can be utilized to support calibration and validation of hydrologic and hydraulic modeling. The purpose of this task is to consolidate these data if available, review the accuracy (based on FEMA standards), and determine the potential application for calibration and verification of the numerical models.

### **2.2.1. Consolidate Data**

All available sources of HWMs and verification data pertaining to historic flood events shall be consolidated into a geodatabase. Additionally, flood photographs and videos shall be researched and spatially referenced within GIS.

### **2.2.2. Review Data**

To ensure the accuracy of the HWM data, available HWMs, images and videos captured during historic flood events shall be reviewed to verify accuracy and conformity with FEMA standards. Flood depth measurements, images and videos shall be cataloged spatially and utilized for validation purposes when recreating historical events.

## **2.3. STAKEHOLDER COMMUNICATION AND ENGAGEMENT**

The Consultant will coordinate the stakeholder engagement activities within each region. The Consultant shall participate in the stakeholder meetings and provide technical support, data, presentations, and compile feedback and input that might be of value and benefit to the overall modeling effort of their contracted region.

## **2.4. SURVEY**

The purpose of this task is to pull together the best available geometry data to develop the drainage basin numerical model. This shall include: 1) Verifying geometry data from existing sources and ensuring they meet FEMA standards; and 2) Obtaining new geometry data through ground based surveying.

### **2.4.1. Survey Scoping**

The Consultant shall identify survey needs and coordinate logistics to perform this survey. The survey shall be conducted to provide refined topography for modeling purposes and shall utilize a wide range of techniques to capture cross-sectional and topographic data of any rivers and their tributaries. New survey work shall utilize LSUC4G and GPS instrumentation. This work shall include reviewing regional vertical datum information and identifying known issues and methods for validating accuracy when performing survey. The Consultant will ensure that new survey data conforms to FEMA standards. All

survey needs shall be identified at a commensurate rate with the tiered modeling approach previously discussed.

#### **2.4.2. Perform Survey**

Survey data shall be captured to a level of accuracy suitable (meeting FEMA standards) for the proposed level of detail as identified in the modeling approach proposal.

#### **2.4.3. Channel Surveys**

Surveying work for major channels to be studied using detailed methods shall be performed utilizing traditional surveying and sonar sounding techniques established from a boat. Surveying of smaller channels and bayous shall be performed primarily by ground access in low-water conditions, as well as shallow draft boats. Channel surveys shall also be used for reviewing and validating of existing LiDAR datasets. For limited detail studies, channel surveys shall include basic measurements of channel width and depth.

#### **2.4.4. Hydraulic Structure Surveys**

Surveying work for significant hydraulic structures on rivers and bayous to be studied using detailed methods shall be performed by ground access as well as through the use of sonar techniques established from a boat. For limited detail study reaches, significant hydraulic structure surveys shall include basic measurements including opening sizes, dimensions, opening counts and materials. Surveying work shall be done within public right-of-way to the fullest extent, however, it may be required to access adjacent private property for cross-section and structure surveys. Surveying work shall include notices to land owners regarding the survey work in coordination with DOTD specific instruction. Where needed, existing data including previous study geometry, survey and DOTD bridge plans shall be verified by field reconnaissance and limited survey verification.

### **2.5. HYDRO-METEOROLOGY**

The Consultant shall investigate historical precipitation events in the watershed for calibration and hindcasting of the hydrologic and hydraulic models. The historical rainfall events should be of varying magnitude; e.g. to capture high, moderate and low flow conditions. These events shall cover, at a minimum, the following conditions:

- A variety of antecedent conditions to aid the calibration of hydrologic parameters
- A variety of peak discharges including:
  - Low-flow conditions to calibrate the contribution of groundwater (where applicable)
  - In-channel discharges to enable calibration of in-channel Manning's roughness  $n$  values
  - Bank-full discharges to enable calibration of bank-full roughness  $n$  values
  - Minor flood discharges to enable shallow overbank roughness  $n$  values to be refined
  - Major flood discharges to enable deep overbank flooding roughness  $n$  value calibration
  - Flood of record to address recent concerns from the 2016 flood (if applicable)

When selecting the historical events, preference shall be given to more recent events for which radar precipitation products (e.g., Stage IV or MRMS) is available to provide more accurate

capture of temporal and spatial storm characteristics (typically 2002-present). Care must be considered with historical events such that the appropriate land use should be taken into account to reflect the conditions at the time of a given historical event taking place.

## **2.6. HYDROLOGIC MODEL DEVELOPMENT**

The purpose of this task is to develop scalable HEC-HMS hydrologic models. These models will calculate and deliver runoff hydrographs to the hydraulic models. The Consultant will perform the following tasks:

### **2.6.1. Regional Gauge Analysis**

A regional analysis shall be performed on all stream flow gauges throughout the drainage basin using HEC-SSP. The methods of Bulletin 17C (England, et al., 2015) shall be applied to statistically determine various annual exceedance probability (AEP) estimates. The results of this analysis will be used as the foundation to determine suitability of the data for calibration and verification of the hydrologic and hydraulics models. It should be noted also that the Consultant will have the ability to identify additional stations that could be added to the monitoring network at a future date if identified to be beneficial to any future calibration efforts.

### **2.6.2. Delineate Hydrologic Basins**

LiDAR data shall be utilized to delineate hydrologic sub basins for the entire study area. Basin delineation points shall be determined at critical locations including confluences and at notable changes in drainage area. Basin parameters including transform and loss shall be calculated from spatial data within GIS. All data shall be stored within a hydrologic geospatial database to enable the parameters to be rapidly updated for future assessments.

### **2.6.3. Set up HEC-HMS Model**

The HEC-HMS hydrologic model shall be created in close coordination with the HEC-RAS model development to enable the HMS nodes to correspond to HEC-RAS boundaries that shall allow for delivery of flows to the hydraulic model. All geometry data shall be processed using GIS using a consistent project horizontal projection. The Consultant will review and implement the modeling approaches described in the technical document provided by DOTD.

### **2.6.4. Calibrate and Validate HEC-HMS Model**

The HEC-HMS model shall be calibrated and validated using recently collected and historical data where available. The contractor will coordinate closely with DOTD on the calibration and validation criteria and performance metrics. Key parameters to be calibrated shall include:

- Initial losses based on review of rainfall and streamflow response
- Runoff volumes for known hydrographs through the integration of hydrographs and adjustment of hydrologic loss parameters
- Basin transform through review and adjustment of timing parameters
- Channel flood routing (in conjunction with the channel/hydraulic calibration)

## **2.7. HYDRAULIC MODEL DEVELOPMENT**

The purpose of this task is to develop scalable coupled 1D-2D HEC-RAS hydraulic models. The models shall be created with multiple 1D and 2D areas which can be extracted, modified and updated to support future needs of the State.

### **2.7.1. Set up HEC-RAS Model**

The HEC-RAS model shall be set up seamlessly utilizing the tiered modeling approaches described in the technical document provided by DOTD.

#### **2.7.1.1. Existing Models**

Where available, existing models including the FEMA Base Level Engineering deemed suitable shall be incorporated either fully or partially into the HEC-RAS model to enable refined detail to be achieved in these areas.

#### **2.7.1.2. Channel (1D) Cross Sections**

Channel (1D) cross sections shall be placed at critical hydraulic locations and cut directly from the best available LiDAR data. For cross sections proposed to be modeled in high detail, new or existing survey data shall be used where available to adjust the cross section geometry to capture bathymetry. Where survey is not available, bathymetry shall be interpolated from the shape of adjacent cross sections.

#### **2.7.1.3. Overland (2D) Flow Area Mesh Development**

Overland (2D) meshes shall be developed for the 2D areas using the best available LiDAR data. Meshes shall be developed at varying resolutions which shall be further refined using break lines to better define ridges and other topographic features that control water elevations.

#### **2.7.1.4. Hydraulic Structures**

Major structures shall be coded as 1D features embedded into either the 1D or 2D domain using survey grade data. This can include new survey data or existing survey data that has been verified and adjusted. Minor structures such as private drives and other at-grade crossings shall not be included.

### **2.7.2. Develop Boundary Options**

Consultant shall interact and coordinate with DOTD and its consultants performing modeling services for adjacent watersheds to ensure consistency across the regional boundaries.

Regarding boundary conditions within each modeling region, recently collected or historical elevations of receiving waters at the downstream end of the drainage basin shall be researched and used to develop temporal stage boundary conditions to support calibration and hindcasting of the drainage basin numerical model. To further support AEP model runs and other potential boundary conditions, a comparison of historic river and stream flows and lake or surge elevations, if appropriate, shall be performed to determine the probability of coincidental lake or coastal elevations and river discharges as needed for AEP estimates. Hypothetical downstream temporal stage boundary conditions shall be developed to support both existing and future run options, which include:

- Low-flow conditions
- Typical conditions
- Representative ‘average storm’ boundary conditions for AEP simulations
- Extreme wind induced boundary conditions, if applicable
- Elevation of record boundary conditions
- Storm surge conditions, if applicable

### **2.7.3. Calibrate and Validate HEC-RAS Model**

The HMS results utilizing data collected from the monitoring stations, as well as from historical events, shall be applied to the HEC-RAS model beginning with the low-flow events. The Consultant will coordinate closely with DOTD on the calibration and validation criteria and performance metrics.

The HEC-RAS models shall be calibrated and validated using available water level and water discharge data collected through the monitoring stations. The HEC-RAS models shall also be calibrated and validated against known HWMs incrementally and verified with additional available information including flood images and field measurements, witness accounts, emergency response records, etc. Incrementally calibrating the HEC-RAS model, from low-flow to high-flow, shall allow for the greatest level of accuracy and applicability of the models. For example, the vertical variations in Manning’s n option shall be utilized for 1D model cross sections by incrementally calibrating to known HWMs beginning with low flows and progressively calibrating to the flood of record. If necessary, seasonal variations shall also be considered and included in the HEC-RAS model. Special care shall be taken to consider the potential impacts of aggradation and degradation that occurred during the recent 2016 floods. Channel sections shall be reviewed to ensure channel routing is accurate and sufficiently represents the attenuation and celerity needed for both hydrologic and hydraulic routing.

## **2.8. CONSEQUENCE MODEL DEVELOPMENT**

The purpose of this task is to develop a scalable consequence assessment model that seamlessly integrates with the HEC-RAS model to estimate the potential economic and loss of life consequences of modeled flood events. Through full integration of the HEC-HMS, HEC-RAS, HEC-FIA, and HEC-FDA models within the HEC-WAT model, consequences shall be determined instantaneously with new model runs.

### **2.8.1. Collect and Process Asset Inventory Data**

The Consultant shall coordinate with DOTD and local communities to consolidate building level GIS, appraised value, structure and population data. These can be integrated with LiDAR to estimate lowest adjacent grade (LAG) information. DOTD will provide further guidelines for this task as part of the technical document that will be provided to the selected Consultants. As part of this task, the Consultants shall perform the following activities:

- Creation of the asset inventories defining asset location, type, use, replacement value, and other inventory characteristics to be defined with DOTD
- Develop HEC-FIA & HEC-FDA Models

- Develop HEC-WAT Modeling Framework

### **2.8.2. FLOODPLAIN MAPPING**

The Consultant shall develop probabilistic storms resulting in various AEP floods as a baseline for future analysis. A framework using RAS Mapper, shall be implemented to support both consequence assessments and floodplain delineation. The Consultant may be required to:

- Run annual exceedance probability floods.
- Delineate floodplains.
- Create additional datasets to support risk analysis.

### **3. COORDINATION WITH INDEPENDENT TECHNICAL REVIEW**

The Consultant will work collaboratively with DOTD or its designee to ensure consistency and quality of the modeling products.

DOTD will provide a detailed technical document outlining the modeling standards to provide guidance to the contractors on the model setup and calibration/validation processes.

The Consultant shall perform its own internal quality control at the modeling milestones. The Consultant shall then submit the following products for review and evaluation by DOTD or its designee:

- The hydrologic modeling (HEC-HMS) setup
- The hydrologic modeling (HEC-HMS) calibration
- The hydrologic modeling (HEC-RAS) setup
- The hydrologic modeling (HEC-RAS) calibration

### **4. COORDINATION AND MEETINGS**

#### **4.1. Meetings and Coordination**

The Consultant shall meet as needed with DOTD and LWI for modeling progress and coordination. These meetings will be attended by team leads for the Consultants selected for the seven (7) contracted regions to ensure consistency and efficient exchange of information among all teams.

The Consultants will also participate in meetings with DOTD and the eventual model host staff to coordinate the plan of the deployment of the numerical model onto the host servers. Hardware specifications, model requirements, access, and security shall be coordinated to ensure a smooth deployment, laying out the path way for long-term implementation.

#### **4.2. Deployment to model host**

DOTD or its designee will provide the Consultants with the model host information and will facilitate the coordination and communications among the Consultants (modeling teams) and the eventual host of each region. During deployment, which is expected to take place onsite over 2 days, all digital datasets associated with the study shall be provided to ensure that they



are successfully transferred to the host servers. Hands on training shall be provided on how to navigate and run the models, extract results and perform updates to geometry.

## **5. REPORTING**

The purpose of this task is to develop a technical report that shall document the development of the models and provide a training reference for future users of the models.

### **5.1. Technical Report**

A technical report shall be developed by the Consultant for each HUC-8 watershed and reviewed by DOTD. The report shall include (at a minimum) the following sections:

- Overview of the study and methodologies
- Documentation of the process used to develop the numerical model
- Backup technical data including the sources of data, GIS datasets and calculations
- Results and recommended uses of the model
- The report shall become part of a living document that shall be versioned and updated as the modeling system is upgraded, maintained, enhanced and modified

### **5.2. Training Quick Guide (QG)**

A quick guide shall be developed by the Consultant for each HUC-8 watershed and reviewed by DOTD or its designee to support the long-term implementation of the models. Guidance shall be provided for:

- Using the drainage basin numerical model
- Querying results of model runs
- Nomenclature and versioning guidance for model runs, alternatives, geometries etc.
- Procedures for extracting, updating and nesting of model regions

The quick guide shall become part of a living document that can be expanded, refined and updated as the modeling system becomes more widely implemented.

DOTD will generate an overarching QG for all seven (7) regions to ensure uniformity and consistency. The QG produced by the Consultant will be utilized as an add-on to capture the hydrologic characteristics of each individual HUC-8.

Reports shall be provided by the Consultant in draft form. The reports will be reviewed by DOTD. All comments shall be carefully reviewed by the Consultant and thoroughly incorporated into the final version of the report.

## **6. Deliverables:**

The delivery schedule for all project deliverables shall be established by DOTD and will be communicated to the Consultant through the DOTD's Project Manager with each task order.

## **ATTACHMENT B – MINIMUM PERSONNEL REQUIREMENTS (MPRs)**

The following requirements must be met at the time the proposal is submitted:

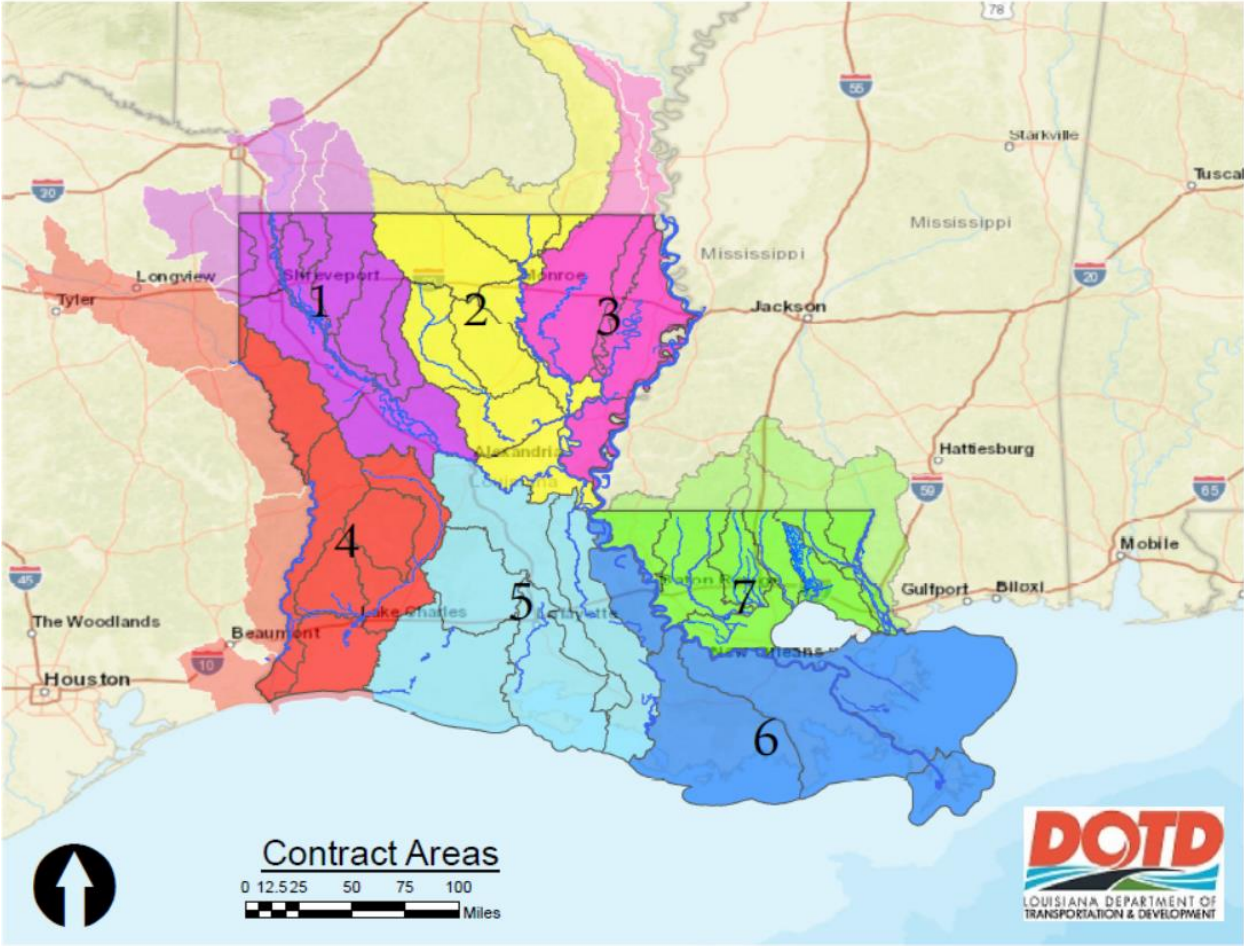
1. At least one (1) principal of the prime consultant shall be a professional engineer registered in the state of Louisiana.
2. At least one (1) principal or other responsible member of the prime consultant shall be currently registered in Louisiana as a professional engineer in civil engineering.
3. At least one (1) principal or other responsible member of the prime consultant, shall be a professional engineer, registered in the state of Louisiana and shall have a minimum of five (5) years of experience in responsible charge of hydrologic and/or hydraulic engineering.
4. At least one (1) professional engineer, registered in the state of Louisiana, shall have a minimum of five (5) years of experience in responsible charge in hydrologic and/or hydraulic engineering.
5. At least one (1) professional engineer, registered in the state of Louisiana, shall have a minimum of five (5) years of experience in hydrologic and hydraulic modeling.
6. At least one (1) professional land surveyor, registered in the state of Louisiana, with a minimum of five (5) years of experience.
7. At least one (1) individual or individuals shall have a minimum of five (5) years of experience (*unless otherwise noted*) in the following:
  - a. Discovery
  - b. Hydrology and hydraulic engineering, modeling and analysis
  - c. HEC products: HMS, RAS 1-D, 2-D, SSP, MetVUE, FIA, FDA, and WAT
  - d. Coastal modeling using ADCIRC-SWAN
  - e. Levee Analysis and Mapping Procedures (LAMP) (*minimum two (2) years of experience*)
  - f. Community outreach, training, public education, websites and notification.
  - g. Reviewing flood ordinances related to local land use

**MPR Nos. 1 through 3 may be met by one or more person(s).**

**MPR Nos. 3 and 4 may not be met by the same person.**

**MPR Nos. 4 through 7 may be satisfied through the use of a sub-consultant(s).**

All 7 Regions



# Region 1 Map

