



BOARD OF SUPERVISORS AGENDA ITEM REPORT
AWARDS / CONTRACTS / GRANTS

Award Contract Grant

Requested Board Meeting Date: 11/07/23

* = Mandatory, information must be provided

or Procurement Director Award:

***Contractor/Vendor Name/Grantor (DBA):**

Insight Hydrology, LLC

***Project Title/Description:**

Rating Curve Development for Pima County Flood Warning Gauges

***Purpose:**

The District operates more than 150 real-time flood warning sensors to monitor both precipitation and stream discharges. Precise calibration between flow depth and stream discharge enhances the reliability of Pima County's advanced flood alert system. This improvement empowers emergency coordinators to make well-informed choices during flooding incidents. Additionally, calibrating models in these zones could benefit future flood predictions made by the District. This could lead to lower flood insurance costs for homeowners and more accurately pinpoint areas at high risk for flooding.

***Procurement Method:**

Direct Select per Board of Supervisors Policy D29.6, III-C

***Program Goals/Predicted Outcomes:**

Insight Hydrology will provide Digital Elevation Models for three (3) ALERT sites, orthophotos of each site, 2D flow models, rating curve specific to each ALERT gage, observed discharge measurements, documentation of all model inputs for future replication.

***Public Benefit:**

Enhancing the precision of state-of-the-art flood alert sensors offers emergency managers and first responders access to more reliable data, enabling better decision-making. Such improvements also hold the potential for re-evaluating FEMA-designated Special Flood Hazard Areas, which could ultimately lower insurance costs for homeowners by more accurately identifying floodprone regions

***Metrics Available to Measure Performance:**

Deliverables for rating curve development for three ALERT sites in Pima County.

***Retroactive:**

No.

To: COB 10-13-23(1)
vers: 1
pgs: 14

THE APPLICABLE SECTION(S) BELOW MUST BE COMPLETED

Click or tap the boxes to enter text. If not applicable, indicate "N/A". Make sure to complete mandatory (*) fields

Contract / Award Information

Document Type: CT Department Code: FC Contract Number (i.e., 15-123): 24*143
Commencement Date: 11/07/23 Termination Date: 11/06/24 Prior Contract Number (Synergen/CMS):
Expense Amount \$ 45,000 * Revenue Amount: \$

*Funding Source(s) required: Flood Control Ops

Funding from General Fund? Yes No If Yes \$ %
Contract is fully or partially funded with Federal Funds? Yes No
If Yes, is the Contract to a vendor or subrecipient?
Were insurance or indemnity clauses modified? Yes No
If Yes, attach Risk's approval.
Vendor is using a Social Security Number? Yes No
If Yes, attach the required form per Administrative Procedure 22-10.

Amendment / Revised Award Information

Document Type: Department Code: Contract Number (i.e., 15-123):
Amendment No.: AMS Version No.:
Commencement Date: New Termination Date:
Prior Contract No. (Synergen/CMS):
Expense Revenue Increase Decrease
Amount This Amendment: \$
Is there revenue included? Yes No If Yes \$

*Funding Source(s) required:

Funding from General Fund? Yes No If Yes \$ %

Grant/Amendment Information (for grants acceptance and awards)

Award Amendment

Document Type: Department Code: Grant Number (i.e., 15-123):
Commencement Date: Termination Date: Amendment Number:
Match Amount: \$ Revenue Amount: \$

*All Funding Source(s) required:

*Match funding from General Fund? Yes No If Yes \$ %

*Match funding from other sources? Yes No If Yes \$ %

*Funding Source:

*If Federal funds are received, is funding coming directly from the Federal government or passed through other organization(s)?

Contact: Alireza Arabzadeh (M. Guzman 4-4611 for P/U)

Department: Regional Flood Control District

Telephone: 724-4620

Department Director Signature: Date: 10/11/2023
Deputy County Administrator Signature: Date: 10/12/2023
County Administrator Signature: Date: 10/12/2023

DATE: September 25, 2023

TO: Jan Leshar
County Administrator

FROM: Eric Shepp, P.E.
Director



SUBJECT: Insight Hydrology, LLC for "Rating Curve Development for Pima County Flood Warning Gauges" --
Direct Selection of Professional Services Request for Approval

Pursuant to Board of Supervisors Policy D29.6 III.C – Direct Selection and Procurement Procedure No. PO-50, the Regional Flood Control District (District) seeks approval to select Insight Hydrology to provide modeling and calibration services of Pima County Automated Evaluation in Real Time (ALERT) flood warning gauges.

BACKGROUND

The District maintains over 150 real-time flood warning sensors monitoring both precipitation and stream discharge. Accurately calibrating water depth with stream discharge will improve the accuracy of Pima County's advance flood warning emergency notification system allowing emergency managers to make informed decisions during flood events. Model calibration in these areas also has the potential to improve future flood modeling conducted by the District potentially reducing flood insurance expenses for homeowners and better identifying areas of critical flood hazard.

Insight Hydrology LLC is uniquely qualified to model and calibrate rating curves for existing warning gauges. Insight Hydrology utilizes a state-of-the-art process combining drone procured video and photogrammetry, 2-D modeling, and particle flow-tracking to accurately predict stream discharge. This US Geological Survey developed, and peer reviewed technique is not currently utilized by any other academic or industry institution.

REQUESTED ACTION

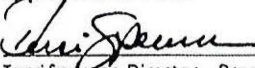
The District is requesting Insight Hydrology LLC be selected for "Rating Curve Development for Pima County Flood Warning Gauges" with a not to exceed amount of \$45,000 for a contract term of one (1) year. The District would like to include Extension Options of up to four (4) additional periods of one (1) year each.

ES/tj

Attachments

c: Carmine DeBonis, Deputy County Administrator – Public Works
Terri Spencer, Director – Procurement Department
Brian Jones, Deputy Director – Regional Flood Control District

Approved as to Form:



Terri Spencer, Director – Procurement Department

9/25/2023

Date

CONCUR



Carmine DeBonis, Deputy County Administrator – Public Works

9/25/2023

Date

Direct Select Approved:



Jan Leshar, County Administrator

9/26/2023

Date

Pima County Regional Flood Control District

Project: Rating Curve Development for Pima County Flood Warning Gauges

Contractor: Insight Hydrology, LLC

Amount: \$45,000

Contract No.: CT-FC-24-143

Funding: Flood Control Ops

PROFESSIONAL SERVICES CONTRACT

1. Parties and Background.

1.1. Parties. This Contract is between Pima County Regional Flood Control District, a body politic and corporate of the State of Arizona ("District"), and Insight Hydrology, LLC ("Contractor").

1.2. Authority. District selected Contractor pursuant to and consistent with Board of Supervisors Policy D29.6.

2. Term.

2.1. Initial Term. The term of this Contract commences on November 7, 2023 and will terminate on November 6, 2024 ("Initial Term"). "Term," when used in this Contract, means the Initial Term plus any exercised extension options under Section 2.2. If the commencement date of the Initial Term is before the signature date of the last party to execute this Contract, the parties will, for all purposes, deem the Contract to have been in effect as of the commencement date.

2.2. Extension Options. District may renew this Contract for up to four (4) additional periods of up to 1 year each (each an "Extension Option"). An Extension Option will be effective only upon execution by the Parties of a formal written amendment.

3. **Scope of Services**. Contractor will provide District with the services described in **Exhibit A – Proposal and Scope of Work** (4 pages), at the dates and times described on **Exhibit A** or, if **Exhibit A** contains no dates or time frames, then upon demand. The Services must comply with all requirements and specifications in the Solicitation.

4. **Key Personnel**. Contractor will employ suitably trained and skilled professional personnel to perform all consultant services under this Contract. Prior to changing any key personnel, especially those key personnel District relied upon in making this Contract, Contractor will obtain the approval of District. The key personnel include the following staff:

Christopher F. Smith

5. **Compensation and Payment.**

- 5.1. Rates; Adjustment. District will pay Contractor at the rates set forth in **Exhibit A** (4 pages). Those rates will remain in effect during an Extension Option period unless Contractor, at least 90 days before the end of the then-existing Term, or at the time the District informs Contractor that the District intends to extend the Term, if that is earlier, notifies District in writing of any adjustments to those rates, and the reasons for the adjustments.
- 5.2. Maximum Payment Amount. District's total payments to Contractor under this Contract, including any sales taxes, may not exceed \$45,000 per year (the "NTE Amount"). The NTE Amount can only be changed by a formal written amendment executed by the Parties. Contractor is not required to provide any services, payment for which will cause the District's total payments under this Contract to exceed the NTE Amount; if Contractor does so, it is at the Contractor's own risk.
- 5.3. Sales Taxes. The payment amounts or rates in **Exhibit A** do not include sales taxes. Contractor may invoice District for sales taxes that Contractor is required to pay under this Contract. Contractor will show sales taxes as a separate line item on invoices.
- 5.4. Timing of Invoices. Contractor will invoice District on a monthly basis unless a different billing period is set forth in **Exhibit A**. District must receive invoices no more than 30 days after the end of the billing period in which Contractor delivered the invoiced products or services to District. District may refuse to pay for any product or service for which Contractor does not timely invoice the District and, pursuant to A.R.S. § 11-622(C), will not pay for any product or service invoiced more than 6-months late.
- 5.5. Content of Invoices. Contractor will include detailed documentation in support of its invoices and assign each amount billed to an appropriate line item.
- 5.6. Invoice Adjustments. District may, at any time during the Term and during the retention period set forth in Section 22 below, question any payment under this Contract. If District raises a question about the propriety of a past payment, Contractor will cooperate with District in reviewing the payment. District may set-off any overpayment against amounts due to Contractor under this or any other contract between District and Contractor. Contractor will promptly pay to District any overpayment that District cannot recover by set-off.

6. **Insurance.** Contractor will procure and maintain at its own expense insurance policies (the "**Required Insurance**") satisfying the below requirements (the "**Insurance Requirements**") until all its obligations under this Contract have been met. The below Insurance Requirements are minimum requirements for this Contract and in no way limit Contractor's indemnity obligations under this Contract. The District in no way warrants that the required insurance is sufficient to protect the Contractor for liabilities that may arise from or relate to this Contract. If necessary, Contractor may obtain commercial umbrella or excess insurance to satisfy the Insurance Requirements.

- 6.1. Insurance Coverages and Limits: Contractor will procure and maintain, until all its obligations have been discharged, coverage with limits of liability not less than those

stated below. Coverage must be placed with insurers acceptable to Pima County with A.M. Best rating of not less than A-VII, unless otherwise approved by Pima County.

- 6.1.1. Commercial General Liability (CGL) – Occurrence Form with limits not less than \$2,000,000 Each Occurrence and \$2,000,000 General Aggregate. Policy shall include coverage for liability arising from premises, operations, independent contractors, personal injury, bodily injury, broad form contractual liability and products-completed operations. Any standard coverages excluded from the CGL policy, such as products/completed operations, etc. shall be covered by endorsement or separate policy and documented on the Certificates of Insurance.
- 6.1.2. Business Automobile Liability – Coverage for bodily injury and property damage on any owned, leased, hired, and/or non-owned autos assigned to or used in the performance of this Contract with minimum limits not less than \$1,000,000 Each Accident.
- 6.1.3. Workers' Compensation and Employers' Liability – Statutory coverage for Workers' Compensation. Workers' Compensation statutory coverage is compulsory for employers of one or more employees. Employers Liability coverage with limits of \$1,000,000 each accident and \$1,000,000 each employee – disease.
- 6.1.4. Professional Liability (E & O) Insurance – This insurance is required for work from professionals whose coverage is excluded from the above CGL policy. The policy limits shall be not less than \$2,000,000 Each Claim and \$2,000,000 Annual Aggregate. The insurance shall cover professional misconduct or negligent acts of anyone performing any services under this contract.

6.2. Additional Coverage Requirements:

- 6.2.1. Claims Made Coverage: If any part of the Required Insurance is written on a claims-made basis, any policy retroactive date must precede the effective date of this Contract, and Contractor must maintain such coverage for a period of not less than three (3) years following Contract expiration, termination or cancellation.
- 6.2.2. Additional Insured Endorsement: The General Liability, Business Automobile Liability and Technology E&O Policies shall each be endorsed to include Pima County, its departments, districts, officials, agents, and employees as additional insureds with respect to liability arising out of the activities performed by or on behalf of the Contractor.
- 6.2.3. Subrogation Endorsement: The General Liability, Business Automobile Liability, Workers' Compensation and Technology E&O Policies shall each contain a waiver of subrogation endorsement in favor of Pima County, and its departments, districts, officials, agents, and employees for losses arising from work performed by or on behalf of the Contractor.
- 6.2.4. Primary Insurance Endorsement: The Required Insurance policies must

stipulate that they are primary and that any insurance carried by Pima County, or its agents, officials, or employees, is excess and not contributory insurance.

6.2.5. The Required Insurance policies may not obligate Pima County, or its departments, districts, officials, agents, and employees to pay any portion of Contractor's deductible or Self Insurance Retention (SIR).

6.2.6. Subcontractors: Contractor must either (a) include all subcontractors as additional insureds under its Required Insurance policies, or (b) require each subcontractor to separately meet all Insurance Requirements and verify that each subcontractor has done so, Contractor must furnish, if requested by Pima County, appropriate insurance certificates for each subcontractor. Contractor must obtain Pima County's approval of any subcontractor request to modify the Insurance Requirements as to that subcontractor.

6.3. Notice of Cancellation:

Contractor must notify District, within two (2) business days of Contractor's receipt of notice from an insurer, if any Required Insurance policy is suspended, voided, or cancelled for any reason. Notice must include the Pima County project or contract number and project description.

6.4. Verification of Coverage:

6.4.1. Contractor must furnish District with a certificate of insurance (valid ACORD form or equivalent approved by Pima County) for each Required Insurance policy, which must specify that the policy has all the required endorsements, and must include the District project or contract number and project description. Each certificate must be signed by an authorized representative of the insurer.

6.4.2. Pima County may at any time require Contractor to provide a complete copy of any Required Insurance policy or endorsement. Note: Contractors for larger projects must provide actual copies of the additional insured and subrogation endorsements.

6.4.3. Contractor must provide the certificates to District before work commences. Each Required Insurance policy must be in effect at least 10 days before work under this Contract commences. Contractor must provide District a renewal certificate not less than 15 days prior to a Required Insurance policy's expiration date. Failure to maintain the Required Insurance policies, or to provide evidence of renewal, is a material breach of this Contract.

6.4.4. All insurance certificates must be sent directly to the appropriate Pima County Department.

6.5. Approval and Modifications:

The Pima County Risk Manager may modify the Insurance Requirements at any point during the Term of this Contract. This can be done administratively, with written notice from the Risk Manager and does not require a formal Contract amendment. Neither the District's failure to obtain a required insurance certificate or

endorsement, the District's failure to object to a non-complying insurance certificate or endorsement, nor the District's receipt of any other information from the Contractor, its insurance broker(s) and/or insurer(s), constitutes a waiver of any of the Insurance Requirements.

7. **Indemnification.** To the fullest extent permitted by law, Contractor will defend, indemnify, and hold harmless Pima County and any related taxing district, and the officials and employees of each of them (collectively, "Indemnitee") from and against any and all claims, actions, liabilities, losses, and expenses (including reasonable attorney fees) (collectively, "Claims") arising out of actual or alleged injury of any person (including death) or loss or damage to tangible or intangible property caused, or alleged to be caused, in whole or in part, by any act or omission of Contractor or any of Contractor's directors, officers, agents, employees, volunteers, or subcontractors. This indemnity includes any claim or amount arising or recovered under the Workers' Compensation Law or arising out of the failure of Contractor to conform to any federal, state or local law, statute, ordinance, rule, regulation or court decree. The Indemnitee will, in all instances, except for Claims arising solely from the acts or omissions of the Indemnitee, be indemnified by Contractor from and against any and all Claims. Contractor is responsible for primary loss investigation, defense and judgment costs for any Claim to which this indemnity applies. This indemnity will survive the expiration or termination of this Contract.
8. **Laws and Regulations.**
 - 8.1. Compliance with Laws. Contractor will comply with all federal, state, and local laws, rules, regulations, standards and Executive Orders.
 - 8.2. Licensing. Contractor warrants that it is appropriately licensed to provide the services under this Contract and that its subcontractors will be appropriately licensed.
 - 8.3. Choice of Law; Venue. The laws and regulations of the State of Arizona govern the rights and obligations of the parties under this Contract. Any action relating to this Contract must be filed and maintained in the appropriate court of the State of Arizona in Pima County.
9. **Independent Contractor.** Contractor is an independent contractor. Neither Contractor, nor any of Contractor's officers, agents or employees will be considered an employee of Pima County for any purpose or be entitled to receive any employment-related benefits, or assert any protections, under the Pima County Merit System. Contractor is responsible for paying all federal, state and local taxes on the compensation received by Contractor under this Contract and will indemnify and hold Pima County harmless from any and all liability that Pima County, or its departments, districts, officials, agents, and employees may incur because of Contractor's failure to pay such taxes.
10. **Subcontractors.** Contractor is fully responsible for all acts and omissions of any subcontractor, and of persons directly or indirectly employed by any subcontractor, and of persons for whose acts any of them may be liable, to the same extent that the Contractor is responsible for the acts and omissions of its own employees. Nothing in this Contract creates any obligation on the part of District to pay or see to the payment of any money due any subcontractor, except as may be required by law.

11. **Assignment.** Contractor may not assign its rights or obligations under this Contract, in whole or in part, without the District's prior written approval. District may withhold approval at its sole discretion.
12. **Non-Discrimination.** Contractor will comply with all provisions and requirements of Arizona Executive Order 2009-09, which is hereby incorporated into this contract, including flow-down of all provisions and requirements to any subcontractors. During the performance of this Contract, Contractor will not discriminate against any employee, client or any other individual in any way because of that person's age, race, creed, color, religion, sex, disability or national origin.
13. **Americans with Disabilities Act.** Contractor will comply with Title II of the Americans with Disabilities Act (Public Law 110-325, 42 U.S.C. §§ 12101-12213) and the federal regulations for Title II (28 CFR Part 35).
14. **Authority to Contract.** Contractor warrants its right and power to enter into this Contract. If any court or administrative agency determines that District does not have authority to enter into this Contract, District will not be liable to Contractor or any third party by reason of such determination or by reason of this Contract.
15. **Full and Complete Performance.** The failure of either party to insist, in one or more instances, upon the other party's complete and satisfactory performance under this Contract, or to take any action based on the other party's failure to completely and satisfactorily perform, is not a waiver of that party's right to insist upon complete and satisfactory performance, or compliance with any other covenant or condition in this Contract, either in the past or in the future. The acceptance by either party of sums less than may be due and owing it at any time is not an accord and satisfaction.
16. **Cancellation for Conflict of Interest.** This Contract is subject to cancellation for conflict of interest pursuant to A.R.S. § 38-511, the pertinent provisions of which are incorporated into this Contract by reference.
17. **Termination by District.**
 - 17.1. Without Cause. District may terminate this Contract at any time without cause by notifying Contractor, in writing, at least 30 days before the effective date of the termination. In the event of such termination, District's only obligation to Contractor will be payment for services rendered prior to the date of termination.
 - 17.2. With Cause. District may terminate this Contract at any time without advance notice and without further obligation to District when District finds Contractor to be in default of any provision of this Contract.
 - 17.3. Non-Appropriation. Notwithstanding any other provision in this Contract, District may terminate this Contract if for any reason there are not sufficient appropriated and available monies for the purpose of maintaining District or other public entity obligations under this Contract. In the event of such termination, District will have no further obligation to Contractor, other than to pay for services rendered prior to termination.

18. **Notice.** Any notice required or permitted to be given under this Contract must be in writing and be served by personal delivery or by certified mail upon the other party as follows:

District:

Eric Shepp, P.E., Director
201 N. Stone Ave., 9th Floor
Tucson, AZ 85701

Contractor:

Christopher F. Smith
11275 N. Shadow Vista Place
Oro Valley, AZ 85742

19. **Non-Exclusive Contract.** Contractor understands that this Contract is nonexclusive and is for the sole convenience of District. District reserves the right to obtain like services from other sources for any reason.
20. **Remedies.** Either party may pursue any remedies provided by law for the breach of this Contract. No right or remedy is intended to be exclusive of any other right or remedy and each is cumulative and in addition to any other right or remedy existing at law or at equity or by virtue of this Contract.
21. **Severability.** Each provision of this Contract stands alone, and any provision of this Contract found to be prohibited by law will be ineffective to the extent of such prohibition without invalidating the remainder of this Contract.
22. **Books and Records.** Contractor will keep and maintain proper and complete books, records and accounts, which will be open at all reasonable times for inspection and audit by duly authorized representatives of District. In addition, Contractor will retain all records relating to this Contract for at least five (5) years after its expiration or termination or, if later, until any related pending proceeding or litigation has concluded.
23. **Public Records.**
- 23.1. **Disclosure.** Pursuant to A.R.S. § 39-121 et seq., and A.R.S. § 34-603(H) in the case of construction or Architectural and Engineering services procured under A.R.S. Title 34, Chapter 6, all documents submitted in response to the solicitation resulting in award of this Contract, including, but not limited to, pricing schedules, product specifications, work plans, and any supporting documents, are public records. As such, those documents are subject to release and/or review by the general public upon request, including competitors.
- 23.2. **Records Marked Confidential; Notice and Protective Order.** If Contractor reasonably believes that some of those records contain proprietary, trade-secret or otherwise-confidential information, Contractor must prominently mark those records "CONFIDENTIAL." In the event a public-records request is submitted to District for records marked CONFIDENTIAL, District will notify Contractor of the request as soon as reasonably possible. District will release the records 10 business days after the date of that notice, unless Contractor has, within that period, secured an appropriate order from a court of competent jurisdiction, enjoining the release of the records. District will not, under any circumstances, be responsible for securing such an order, nor will District be in any way financially responsible for any costs associated with securing such an order.

24. Legal Arizona Workers Act Compliance.

24.1. Compliance with Immigration Laws. Contractor hereby warrants that it will at all times during the term of this Contract comply with all federal immigration laws applicable to its employment of its employees, and with the requirements of A.R.S. § 23-214 (A) (together the "State and Federal Immigration Laws"). Contractor will further ensure that each subcontractor who performs any work for Contractor under this Contract likewise complies with the State and Federal Immigration Laws.

24.2. Books & Records. District has the right at any time to inspect the books and records of Contractor and any subcontractor in order to verify such party's compliance with the State and Federal Immigration Laws.

24.3. Remedies for Breach of Warranty. Any breach of Contractor's or any subcontractor's warranty of compliance with the State and Federal Immigration Laws, or of any other provision of this section, is a material breach of this Contract subjecting Contractor to penalties up to and including suspension or termination of this Contract. If the breach is by a subcontractor, and the subcontract is suspended or terminated as a result, Contractor will be required to take such steps as may be necessary to either self-perform the services that would have been provided under the subcontract or retain a replacement subcontractor, as soon as possible so as not to delay project completion. Any additional costs attributable directly or indirectly to such remedial action are the responsibility of Contractor.

24.4. Subcontractors. Contractor will advise each subcontractor of District's rights, and the subcontractor's obligations, under this Section 24 by including a provision in each subcontract substantially in the following form:

"Subcontractor hereby warrants that it will at all times during the term of this contract comply with all federal immigration laws applicable to

Subcontractor's employees, and with the requirements of A.R.S. § 23-214 (A). Subcontractor further agrees that District may inspect the Subcontractor's books and records to insure that Subcontractor is in compliance with these requirements. Any breach of this paragraph by Subcontractor is a material breach of this contract subjecting Subcontractor to penalties up to and including suspension or termination of this contract."

25. **Israel Boycott Certification.** Pursuant to A.R.S. § 35-393.01, if Contractor engages in for-profit activity and has 10 or more employees, and if this Contract has a value of \$100,000.00 or more, Contractor certifies it is not currently engaged in, and agrees for the duration of this Contract to not engage in, a boycott of goods or services from Israel. This certification does not apply to a boycott prohibited by 50 U.S.C. § 4842 or a regulation issued pursuant to 50 U.S.C. § 4842.

26. **Forced Labor of Ethnic Uyghurs.** Pursuant to A.R.S. § 35-394, if Contractor engages in for-profit activity and has 10 or more employees, Contractor certifies it is not currently using, and agrees for the duration of this Contract to not use (1) the forced labor of ethnic Uyghurs in the People's Republic of China; (2) any goods or services produced by the forced labor of

ethnic Uyghurs in the People’s Republic of China; and (3) any contractors, subcontractors or suppliers that use the forced labor or any goods or services produced by the forced labor of ethnic Uyghurs in the People’s Republic of China. If Contractor becomes aware during the term of the Contract that the Company is not in compliance with A.R.S. § 35-394, Contractor must notify the District within five business days and provide a written certification to District regarding compliance within one hundred eighty days.

- 27. **Amendment.** The parties may modify, amend, alter or extend this Contract only by a written amendment signed by the parties.
- 28. **Entire Agreement.** This document constitutes the entire agreement between the parties pertaining to the subject matter it addresses, and this Contract supersedes all prior or contemporaneous agreements and understandings, oral or written.

This agreement will become effective when all parties have signed it. The effective date of the agreement will be the date this agreement is signed by the last party (as indicated by the date associated with that party’s signature).

PIMA COUNTY

CONTRACTOR

Chair, Board of Directors

Authorized Officer Signature

Date

Printed Name and Title


Date

ATTEST

Clerk of the Board

Date

APPROVED AS TO FORM



Deputy County Attorney

Kyle Johnson

Print DCA Name

10/9/2023

Date

ethnic Uyghurs in the People's Republic of China; and (3) any contractors, subcontractors or suppliers that use the forced labor or any goods or services produced by the forced labor of ethnic Uyghurs in the People's Republic of China. If Contractor becomes aware during the term of the Contract that the Company is not in compliance with A.R.S. § 35-394, Contractor must notify the District within five business days and provide a written certification to District regarding compliance within one hundred eighty days.

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PIMA COUNTY

Chair, Board of Directors

Date

ATTEST

Clerk of the Board

Date

APPROVED AS TO FORM



Deputy County Attorney

Kyle Johnson

Print DCA Name

10/9/2023

Date

CONTRACTOR



Authorized Officer Signature

Chris Smith

Printed Name and Title

10/11/2023

Date

Subject: Rating Curve Development for Pima County Flood Warning Gauges**Purpose and Overview**

Pima County manages over 150 Automated Local Evaluation in Real Time (ALERT) flood warning sensors, which monitor both stream depth and/or precipitation. In order to improve the accuracy of the advance flood warning systems, a better understanding of stream discharge in relation to measured water depth is necessary. Additionally, by better understanding channel conditions through real world data, flooding models impacting local communities may be improved. Three existing ALERT stations have been selected by Pima County Regional Flood Control District (District) for development of a calibrated rating curve.

Insight Hydrology uses three techniques developed by the USGS to increase the accuracy of streamflow gauging stations in Arizona, which include: photogrammetry, 2D flow modeling, and aerial discharge measurements. These techniques are intended to accurately measure mid to high flow conditions, which is the critical range for early flood warning detection, and assessing intermittent streamflow. This approach yields a proven and highly accurate 2D flow model of the channel reach at the gage, produces a precise rating curve for gauges and channel properties (such as Manning's n value), and provides a defensible means to assess channel changes over time.

Methods

Photogrammetry is used to measure the physical properties of a channel reach. This is accomplished by using GPS, to ground truth the elevation model by surveying targets and using a drone to capture surface elevations within the channel. The survey data along with the aerial photos are processed in photogrammetric software to produce the elevation model of the channel reach. The initial product is a point cloud made up of millions of points that capture surficial characteristics of the channel reach (i.e. x, y, z, vegetation). If necessary, accuracy can be as high as a tenth of a foot, which is dependent on ground truthing and the height of the drone during flight. As previously mentioned, channel changes can be measured by taking additional aerial surveys of the channel reach at specific time intervals to assess variances in elevation. The same approach can be applied to earthworks and land disturbance activities.

2D Flow Models requirements include point cloud data, as described above with vegetation removed, and an orthophoto. The Nays2DH 2D flow model made available by iRIC, imports the point cloud data and orthophoto to develop a 2D model. The user creates a mesh of the flow conditions including the Manning's n values and the inflow hydrograph. The Manning's n can be changed through time to reflect vegetation changes in the channel to provide a more accurate model. The inflow hydrograph is used in the model to develop an accurate rating curve for the gauge, and provides a visual tool to improve

understanding of flow conditions within the channel reach. This technique can also be used to measure flood flows after the flood event, which is currently done using the 1D slope-area method.

Aerial Discharge Measurements are computed using surface velocity measurements from drone flood videos. The RIVeR software has been developed to convert flood video into surface velocity and channel geometry to compute flow area, with the final product being discharge. Input to the RIVeR software are cross sectional geometry, stage, and video of the flood event. The cross sectional geometry along with stage provides the cross sectional area of the flood. The video is used to determine surface velocity. The surface velocity is converted to mean velocity by multiplying the surface velocity by a coefficient (0.85). The mean velocity multiplied by the cross sectional area produces discharge. The stage and discharge is then used to verify the rating curve. These discharge measurements are used to calibrate the 2D models and improve the accuracy of the gauge's rating curve. The velocity from RIVeR can be compared to velocity of the Nays2DH model. The Manning's n value can be adjusted in the flow model until the velocities agree. This process yields a highly accurate estimate of Manning's n values.

The combination of using all three of these techniques will produce accurate rating curves for gauging stations. Aerial discharge measurements along with the 2D models can yield accurate estimates of Manning's n values for the channel reach. Channel change can be documented, quantified, and validated through time along with the magnitude and frequency of the flood event that caused the channel changes.

Scope of Work

Develop rating curves for three ALERT streamflow measuring sites using the methods described above. Because streamflow is a necessary component for this analysis, sites will be chosen from among the operational ALERT sites based on the occurrence of streamflow. District staff will determine the sites to be analyzed.

Drone procured photogrammetry will be used to develop an elevation model of the channel reach of the three ALERT Station sites. The elevation models will be calibrated by ground-truthing the channel reaches using GPS surveyed targets and check measurements. Nays2DH software will be used to create the 2D flow model. The model will be used to produce a rating curve for the flood warning gauge at all sites.

Drone measurements made during the monsoon season will be used in the RIVeR program to produce discharge measurements. Measurements made on 7/14/2021 of the Canada del Oro wash, as well as 9/24/2019 and 8/17/2021 of the Brawley wash will be utilized. These discharge measurements will be used in two ways: 1) use the measurements directly to verify the rating curve for the flood warning gauge 2) calibrate the 2D flow model by establishing more accurate estimates of Manning's n values in the model.

Deliverables:

Task 1:

- Bare-earth digital elevation model of channel reach
- Orthophotos of channel reach
- Documentation of site-specific photogrammetry process

Task 2:

- 2D flow model of the reach
- Rating curve for the ALERT flood warning gauge
- Documentation of the 2D model inputs and methods

Task 3:

- Discharge measurements produced by the RIVeR software
- Documentation of RIVeR model inputs and methods

Deliverables will normally be made available within 2-3 months after the initial channel survey. Due to the nature of measuring floods, not all tasks can be completed until after the monsoon season or when adequate flood flows are measured. As such, delay in provided the deliverables may be necessary to fulfill the contract.

Budget

This budget is considered as time and materials not to exceed the total amount shown. The actual cost might be lower than the estimated amounts. Invoices will be sent after the completion of each task.

ALERT Site 1			
Personal	Rate (\$/hr)	Hours	Fee
Task 1: Photogrammetry			
Chief Hydrologist	100.00	70	\$7,000
Task 2: 2D Flow Model			
Chief Hydrologist	100.00	30	\$3,000
Task 3: Model Calibration			
Chief Hydrologist	100.00	50	\$5,000
Sub-Total			\$15,000
ALERT Site 2			
Personal	Rate (\$/hr)	Hours	Fee
Task 1: Photogrammetry			
Chief Hydrologist	100.00	70	\$7,000
Task 2: 2D Flow Model			
Chief Hydrologist	100.00	30	\$3,000
Task 3: Model Calibration			
Chief Hydrologist	100.00	50	\$5,000
Sub-Total			\$15,000

ALERT Site 3			
Personal	Rate (\$/hr)	Hours	Fee
Task 1: Photogrammetry			
Chief Hydrologist	100.00	70	\$7,000
Task 2: 2D Flow Model			
Chief Hydrologist	100.00	30	\$3,000
Task 3: Model Calibration			
Chief Hydrologist	100.00	50	\$5,000
Sub-Total			\$15,000
Total			\$45,000

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