STATE OF TEXAS TWDB Contract No. 1800012227

COUNTY OF TRAVIS General Revenue
HDR Engineering, Inc.

This Contract, (hereinafter "CONTRACT"), between the Texas Water Development Board (hereinafter "TWDB") and **HDR Engineering, Inc.** (hereinafter "CONTRACTOR"), is composed of two parts, SECTION I. SPECIFIC CONDITIONS AND EXCEPTIONS TO THE STANDARD AGREEMENT and SECTION II. STANDARD AGREEMENT. The terms and conditions set forth in SECTION I will take precedence over terms and conditions in SECTION II.

SECTION I. SPECIFIC CONDITIONS AND EXCEPTIONS TO STANDARD AGREEMENT

ARTICLE l. DEFINITIONS

For the purposes of this CONTRACT, the following terms or phrases shall have the meaning ascribed therewith:

1. TWDB – The Texas Water Development Board, or its designated representative

2. CONTRACTOR – HDR Engineering, Inc.

3. EXECUTIVE ADMINISTRATOR – The Executive Administrator of the TWDB or a designated representative

4. PARTICIPANT(S) – None

5. SERVICES – Updating the Uniform Costing Model for Regional Water Planning

6. DELIVERABLES – ELECTRONIC UPDATED COSTING TOOL and manual

7. DEADLINE FOR CONTRACT EXECUTION –March 16, 2018

8. CONTRACT START DATE – February 14, 2018

9. DRAFT DELIVERABLES DATE – July 31, 2018

10. CONTRACT EXPIRATION DATE – December 31, 2018

11. TOTAL COST OF SERVICES – $40,000.00

12. TWDB SHARE OF THE SERVICES – the lesser of $40,000.00 or 100.00 percent of the SERVICES or individual payment submission

13. PAYMENT SUBMISSION SCHEDULE – Monthly

14. OTHER SPECIAL CONDITIONS AND EXCEPTIONS TO STANDARD AGREEMENT OF THIS CONTRACT – None

SECTION II. STANDARD AGREEMENT

ARTICLE I. RECITALS

Whereas, on November 30, 2017, TWDB staff determined that the CONTRACTOR was the top ranked submission in response to RFQ 580-18-0056;

Whereas, the CONTRACTOR is the entity who will act as administrator of the TWDB's research grant and will be responsible for the execution of this contract;

Now, therefore, the TWDB and the CONTRACTOR, agree as follows:

ARTICLE II. PROJECT DESCRIPTION AND SERVICES TO BE PERFORMED

1. The TWDB enters into this CONTRACT pursuant to Water Code §15.404 as appropriate; Exhibit A, Statement of Qualifications, which is incorporated herein and made a permanent part of this CONTRACT; and this CONTRACT.

2. The CONTRACTOR will conduct these SERVICES, as delineated and described in Exhibit A, according to the Scope of Work contained in Exhibit B.

3. A progress report, including results to date, will be provided to the EXECUTIVE ADMINISTRATOR monthly, based on the State's Fiscal Year, throughout the project. Special interim reports on special topics and/or results will be provided as appropriate. Instructions for the progress report are shown in Exhibit E, TWDB Guidelines for a Progress Report.

ARTICLE III. CONTRACT TERM, SCHEDULE, REPORTS, AND OTHER PRODUCTS

1. The CONTRACTOR has until the DEADLINE FOR CONTRACT EXECUTION to execute this CONTRACT or the TWDB's SHARE OF THE SERVICES will be rescinded.

2. The CONTRACTOR shall begin performing its obligations hereunder on the CONTRACT START DATE and the CONTRACT shall expire on the CONTRACT EXPIRATION DATE. DELIVERABLES accepted by the TWDB prior to the CONTRACT EXPIRATION DATE shall constitute completion of the terms of this CONTRACT.

3. The CONTRACTOR will complete the Scope of Work and will deliver five (5) double-sided copies of the draft final product to the EXECUTIVE ADMINISTRATOR no later than the DRAFT DELIVERABLES DATE. The draft final product will include the draft final Uniform Costing Model (electronic Microsoft Excel copy) and the Uniform Costing Model User's Guide. The final product should be prepared according to Exhibit D, Guidelines for Authors Submitting Contract Reports to the Texas Water Development Board. After a 45-day review period, the EXECUTIVE ADMINISTRATOR will return review comments to the CONTRACTOR.

4. The CONTRACTOR will consider incorporating comments from the EXECUTIVE ADMINISTRATOR and other commentors on the draft final product into a final product. The CONTRACTOR will include a copy of the EXECUTIVE ADMINISTRATOR's comments in the final product.

5. Please do not include the TWDB logo on any of your deliverables. The CONTRACTOR will submit five (5) copies of the final product. The final product will include the final Uniform Costing Model (electronic Microsoft Excel copy) and the Uniform Costing Model User's Guide (five bound double-sided copies and one electronic PDF copy). The final product will be delivered to the EXECUTIVE ADMINISTRATOR no later than one hundred and twenty (120) days after the DRAFT DELIVERABLES DATE. In compliance with Texas Administrative Code Chapters 206 and 213 (related to Accessibility and Usability of State Web Sites), the digital copies of the final product will comply with the requirements and standards specified in statute. After a 30-day review period, the EXECUTIVE ADMINISTRATOR will either accept or reject the final product. If the final product is rejected, the rejection letter sent to the CONTRACTOR shall state the reasons for rejection and the steps the CONTRACTOR need to take to have the final product accepted and the retainage released.

5. The CONTRACTOR will submit the most recent progress report with submittal of payments according to the PAYMENT SUBMISSION SCHEDULE. Progress reports shall be in written form and shall include a brief statement of the overall progress made since the last status report; a brief description of any problems that have been encountered during the previous reporting period that will affect the study, delay the timely completion of any portion of this CONTRACT, inhibit the completion of or cause a change in any of the study's products or objectives; and a description of any action the CONTRACTOR plans to take to correct any problems that have been encountered.

6. The EXECUTIVE ADMINISTRATOR can extend the DRAFT DELIVERABLES DATE and the CONTRACT EXPIRATION DATE upon written approval. The CONTRACTOR should notify the EXECUTIVE ADMINISTRATOR in writing within ten (10) working days prior to the DRAFT DELIVERABLES DATE or thirty (30) days prior to the CONTRACT EXPIRATION DATE that the CONTRACTOR is requesting an extension to the respective dates.

ARTICLE IV. COMPENSATION AND REIMBURSEMENT

1. The TWDB agrees to compensate and reimburse the CONTRACTOR in a total amount not to exceed the TWDB's SHARE OF THE SERVICES for costs incurred and paid by the CONTRACTOR pursuant to performance of this CONTRACT. The TWDB shall reimburse the CONTRACTOR for one hundred percent of each invoice up to ninety percent of the TOTAL COST OF SERVICES. Pending the CONTRACTOR's performance, completion of a Final Report, and written acceptance of said Final

Report by the EXECUTIVE ADMINISTRATOR, at which time the TWDB shall pay the retained ten percent (10%) to the CONTRACTOR.

2. The CONTRACTOR shall submit payments and documentation for reimbursement billing according to the PAYMENT SUBMISSION SCHEDULE and in accordance with the approved task and expense budgets contained in Exhibit C to this CONTRACT. The CONTRACTOR has budget flexibility within task and expense budget categories to the extent that the resulting change in amount in any one task or expense category does not exceed 35% of the total authorized amount by this CONTRACT for the task or category. Larger deviations shall require approval by EXECUTIVE ADMINISTRATOR or designee which will be documented through an Approved Budget Memorandum to the TWDB contract file. The CONTRACTOR will be required to provide written explanation for the overage and reallocation of the task and expense amount.

   For all reimbursement billings including any subcontractor's expenses, the EXECUTIVE ADMINISTRATOR must have determined that the contracts or agreements between the CONTRACTOR and the subcontractor are consistent with the terms of this CONTRACT. The CONTRACTOR is fully responsible for paying all charges by subcontractors prior to reimbursement by the TWDB.

3. The CONTRACTOR and its subcontractors shall maintain satisfactory financial accounting documents and records, including copies of invoices and receipts, and shall make them available for examination and audit by the EXECUTIVE ADMINISTRATOR. Accounting by the CONTRACTOR and its subcontractors shall be in a manner consistent with Generally Accepted Accounting Principles.

4. By executing this CONTRACT, the CONTRACTOR accepts the authority of the State Auditor's Office, under direction of the legislative audit committee, to conduct audits and investigations in connection with any and all state funds received pursuant to this contract. The CONTRACTOR shall comply with and cooperate in any such investigation or audit. The CONTRACTOR agrees to provide the State Auditor with access to any information the State Auditor considers relevant to the investigation or audit. The CONTRACTOR also agrees to include a provision in any subcontract related to this contract that requires the subcontractor to submit to audits and investigation by the State Auditor's Office in connection with any and all state funds received pursuant to the subcontract.

   The CONTRACTOR shall submit a signed and completed payment request using the current spreadsheet located at: : http://www.twdb.texas.gov/about/contract_admin/index.asp or you can contact Contracts@twdb.texas.gov for a personalized payment request spreadsheet and along with a progress report as described in Article II, Item 3.
   If no costs are incurred during a reporting period, the CONTRACTOR shall submit a progress report indicating that zero work was performed.

In addition, the following documentation which documents the SERVICES for the reporting period for reimbursement by the TWDB to the CONTRACTOR for the TWDB's SHARE OF THE SERVICES shall be submitted by the CONTRACTOR to the EXECUTIVE ADMINISTRATOR for reimbursement billing:

A. A completed Payment Request Checklist, or an invoice which includes the following information:
   (1) TWDB Contract Number;
   (2) Billing period; beginning (date) to ending (date);
   (3) Total Expenses for this period;
   (4) Total In-kind services, if applicable;
   (5) Total TWDB's share of the SERVICES for the billing period;
   (6) Total costs to be reimbursed by the TWDB for the billing period; and
   (7) Certification, signed by the CONTRACTOR authorized representative, that the expenses submitted for the billing period are a true and correct representation of amounts paid for work performed directly related to this CONTRACT.

B. Using the "Current Reimbursement" Worksheet, post all expenses for the period on the Invoice Ledger tab and Task Ledger tab for direct expenses incurred by the CONTRACTOR.
   (1) Salaries and Wages, Fringe, Overhead, and Profit.
   (2) Other Expenses: Copies of detailed, itemized invoices/receipts for other expenses (credit card summary receipts or statements are not acceptable).
   (3) Travel Expenses: Names, dates, work locations, time periods at work locations, itemization of subsistence expenses of each employee, limited, however, to travel expenses authorized for state employees by the General Appropriations Act, Tex. Leg. Regular Session, 2017, Article IX, Part 5, as amended or superceded. Receipts required for lodging; as well as copies of invoices or tickets for transportation costs or, if not available, names, dates, and points of travel of individuals.

C. Using the "Current Reimbursement" Worksheet, post all expenses for the period on the Invoice Ledger tab and Task Ledger tab for direct expenses incurred by all subcontractors.
   (1) Salaries and Wages, Fringe, Overhead, and Profit.
   (2) Other Expenses: Copies of detailed, itemized invoices/receipts for other expenses (credit card summary receipts or statements are not acceptable).
   (3) Travel Expenses: Names, dates, work locations, time periods at work locations, itemization of subsistence expenses of each employee, limited, however, to travel expenses authorized for state employees by the General Appropriations Act, Tex. Leg. Regular Session, 2017, Article IX, Part 5, as amended or superceded. Receipts required for lodging; as well as copies of invoices or tickets for transportation costs or, if not available, names, dates, and points of travel of individuals.

5. Incomplete requests will be returned to the CONTRACTOR if deficiencies are not resolved within ten (10) business days.

6. If for some reason the reimbursement request cannot be processed due to the need for an amendment to the CONTRACT, the CONTRACTOR will be required to resubmit the Payment Request Checklist dated after the execution of the amendment.

7. The CONTRACTOR is responsible for any food or entertainment expenses incurred by its own organization or that of its subcontractors, outside that of the travel expenses authorized and approved by the State of Texas under this CONTRACT.

8. A compliance report in accordance with Texas Administrative Code (TAC) Title 1, Part 5, Chapter 111, Subchapter B, Rule §111.14: The CONTRACTOR shall maintain business records documenting its compliance with the approved Historically Underutilized Business subcontracting plan in the format prescribed by the Texas Procurement and Support Services (Exhibit F). The compliance reports must include payment information on all HUB and non-HUB subcontractors. Submittal of these monthly compliance reports is required as a condition of payment.

   The TWDB will monitor the HUB subcontracting plan monthly to ensure the value of the subcontracts meets or exceeds the HUB subcontracting provisions specified in the contract. The CONTRACTOR who fails to implement the HUB subcontracting plan in good faith will be reported to Texas Procurement and Support Services. The TWDB may revoke the contract for breach of contract and make a claim against the CONTRACTOR.

ARTICLE V. INTELLECTUAL PROPERTY: OWNERSHIP, PUBLICATION, AND ACKNOWLEGEMENT

1. For purposes of this Article, "CONTRACTOR Works" are work products developed by the CONTRACTOR and Subcontractor using funds provided under this CONTRACT or otherwise rendered in or related to the performance in whole or part of this CONTRACT, including but not limited to reports, drafts of reports, or other material, data, drawings, studies, analyses, notes, plans, computer programs and codes, or other work products, whether final or intermediate.

   a. It is agreed that all CONTRACTOR Works shall be the joint property of the TWDB and the CONTRACTOR.

   b. The parties hereby agree that, if recognized as such by applicable law, the CONTRACTOR Works are intended to and shall be works-made-for-hire with joint ownership between the TWDB and the CONTRACTOR as such works are created in whole or part.

c. If the CONTRACTOR Works do not qualify as works-made-for-hire under applicable law, the CONTRACTOR hereby conveys co-ownership of such works to the TWDB as they are created in whole or part. If present conveyance is ineffective under applicable law, the CONTRACTOR agrees to convey a co-ownership interest of the CONTRACTOR Works to the TWDB after creation in whole or part of such works, and to provide written documentation of such conveyance upon request by the TWDB.

d. The TWDB and the CONTRACTOR acknowledge that the copyright in and to a copyrightable CONTRACTOR Work subsists upon creation of the CONTRACTOR Works and its fixing in any tangible medium. The CONTRACTOR or the TWDB may register the copyrights to such Works jointly in the names of the CONTRACTOR and the TWDB.

e. The TWDB and the CONTRACTOR each shall have full and unrestricted rights to use a CONTRACTOR Works with No Compensation Obligation.

2. For purposes of this Article, "Subcontractor Works" include all work product developed in whole or part by or on behalf of Subcontractors engaged by the CONTRACTOR to perform work for or on behalf of any CONTRACTOR under this CONTRACT (or by the Subcontractors' Subcontractors hereunder, and so on). The CONTRACTOR shall secure in writing from any Subcontractors so engaged:

a. unlimited, unrestricted, perpetual, irrevocable, royalty-free rights of the TWDB (and, if desired, of the CONTRACTOR) to access and receive, and to use, any and all technical or other data or information developed in or resulting from the performance of services under such engagement, with No Compensation Obligation; and either

b. assignment by the Subcontractor to the TWDB (and, if desired by them, jointly to the CONTRACTOR) of ownership (or joint ownership with the Subcontractor) of all Subcontractor Works, with No Compensation Obligation; or

c. grant by Subcontractor of a non-exclusive, unrestricted, unlimited, perpetual, irrevocable, world-wide, royalty-free license to the TWDB (and, if desired by them, the CONTRACTOR) to use any and all Subcontractor Works, including the right to sublicense use to third parties, with No Compensation Obligation.

3. "Use" of a work product, whether the CONTRACTOR Works, a Subcontractor Works or otherwise, shall mean and include, without limitation hereby, any lawful use, copying or dissemination of the work product, or any lawful development, use, copying or dissemination of derivative works of the work product, in any media or forms, whether now known or later existing.

4. "No Compensation Obligation" shall mean there is no obligation on the part of one co-owner or licensee of a work, whether a the CONTRACTOR Works, a Subcontractor Works or otherwise, to compensate other co-owners, licensees or licensors of the work for any use of the work by the using co-owner or licensee, including but not limited to compensation for or in the form of: royalties; co-owner or licensee accounting; sharing of revenues or profits among co-owners, licensees or licensors; or any other form of compensation to the other co-owners, licensees or licensors on account of any use of the work.

5. "Dissemination" shall include, without limitation hereby, any and all manner of: physical distribution; publication; broadcast; electronic transmission; internet streaming; posting on the Internet or world wide web; or any other form of communication, transmission, distribution, sending or providing, in any forms or formats, and in or using any media, whether now known or later existing.

6. The TWDB shall have an unlimited, unrestricted, perpetual, irrevocable, non-exclusive royalty-free right to access and receive in usable form and format, and to use all technical or other data or information developed by the CONTRACTOR and Subcontractor in, or otherwise resulting from, the performance of services under this CONTRACT.

7. No unauthorized patents. The CONTRACTOR Works and Subcontractor Works or other work product developed or created in the performance of this CONTRACT or otherwise using funds provided hereunder shall not be patented by the CONTRACTOR or their Subcontractor unless the EXECUTIVE ADMINISTRATOR consents in writing to submission of an application for patent on such works; and provided that, unless otherwise agreed in writing, any application made for patent shall include and name the TWDB (and, as applicable and desired by them, the CONTRACTOR) as co-owners of the patented work:

    a. no patent granted shall in any way limit, or be used by the CONTRACTOR or Subcontractor to limit or bar the TWDB's rights hereunder to access and receive in useable form and format, and right to use, any and all technical or other data or information developed in or resulting from performance pursuant to this CONTRACT or the use of funds provided hereunder; and

    b. the TWDB (and, if applicable, the CONTRACTOR) shall have No Compensation Obligation to any other co-owners or licensees of any such patented work, unless otherwise expressly agreed in writing.

8. The CONTRACTOR shall include terms and conditions in all contracts or other engagement agreements with any Subcontractors as are necessary to secure these rights and protections for the TWDB; and shall require that their Subcontractors include similar such terms and conditions in any contracts or other engagements with their Subcontractors. For the purposes of this section, "Subcontractors"

includes independent contractors (including consultants) and also employees working outside the course and scope of employment.

9. Any work products subject to a TWDB copyright or joint copyright and produced or developed by the CONTRACTOR or their Subcontractor pursuant to this CONTRACT or using any funding provided by the TWDB may be reproduced in any media, forms or formats by the TWDB or the CONTRACTOR at their own cost, and be disseminated in any medium, format or form by any party at its sole cost and in its sole discretion. The CONTRACTOR may utilize such work products as they may deem appropriate, including Dissemination of such work products or parts thereof under their own name, provided that any TWDB copyright is noted on the materials.

10. The CONTRACTOR agrees to acknowledge the TWDB in any news releases or other publications relating to the work performed under this CONTRACT.

ARTICLE VI. AMENDMENT, TERMINATION, AND STOP ORDERS

1. This CONTRACT may be altered or amended by mutual written consent or terminated by the EXECUTIVE ADMINISTRATOR at any time by written notice to the CONTRACTOR. Upon receipt of such termination notice, the CONTRACTOR shall, unless the notice directs otherwise, immediately discontinue all work in connection with the performance of this CONTRACT and shall proceed to cancel promptly all existing orders insofar as such orders are chargeable to this CONTRACT. The CONTRACTOR shall submit a statement showing in detail the work performed under this CONTRACT to the date of termination. The TWDB shall then pay the CONTRACTOR promptly that proportion of the prescribed fee, which applies to the work, actually performed under this CONTRACT, less all payments that have been previously made. Thereupon, copies of all work accomplished under this CONTRACT shall be delivered to the TWDB.

2. The EXECUTIVE ADMINISTRATOR may issue a Stop Work Order to the CONTRACTOR at any time. Upon receipt of such order, the CONTRACTOR shall discontinue all work under this CONTRACT and cancel all orders pursuant to this CONTRACT, unless the order directs otherwise. If the EXECUTIVE ADMINISTRATOR does not issue a Restart Order within 60 days after receipt by the CONTRACTOR of the Stop Work Order, the CONTRACTOR shall regard this CONTRACT terminated in accordance with the foregoing provisions.

ARTICLE VII. SUBCONTRACTS

Each Subcontract entered into to perform required work under this CONTRACT shall contain the following provisions:

a. This subcontract does not create any debt by or on behalf of the State of Texas and the TWDB. The TWDB's obligations under this CONTRACT are

contingent upon the availability of appropriated funds and the continued legal authority of the TWDB to enter into this CONTRACT.

b. a detailed budget estimate with specific cost details for each task or specific item of work to be performed by the Subcontractor and for each category of reimbursable expenses;

c. a clause stating that the Subcontract is subject to audit by the Texas State Auditor's Office and requiring the Subcontractor to cooperate with any request for information from the Texas State Auditor, as further described in Article X, Section 1, Paragraph D hereof;

d. a clause stating that payments under the Subcontract are contingent upon the appropriation of funds by the Texas Legislature, as further described in Article X, Section 1, Paragraph A hereof;

e. a clause stating that ownership of data, materials and work papers, in any media, that is gathered, compiled, adapted for use, or generated by the Subcontractor or the CONTRACTOR shall become data, materials and work owned by the TWDB and that Subcontractor shall have no proprietary rights in such data, materials and work papers, except as further described in Article V hereof;

f. a clause stating that Subcontractor shall keep timely and accurate books and records of accounts according to generally acceptable accounting principles as further described in Article X, Section 2, Paragraph G;

g. a clause stating that Subcontractor is solely responsible for securing all required licenses and permits from local, state and federal governmental entities and that Subcontractor is solely responsible for obtaining sufficient insurance in accordance with the general standards and practices of the industry or governmental entity; and

h. a clause stating that Subcontractor is an independent contractor and that the TWDB shall have no liability resulting from any failure of Subcontractor that results in breach of CONTRACT, property damage, personal injury or death.

ARTICLE VIII. LICENSES, PERMIT, AND INSURANCE

1. For the purpose of this CONTRACT, the CONTRACTOR will be considered an independent contractor and therefore solely responsible for liability resulting from negligent acts or omissions. The CONTRACTOR shall obtain all necessary insurance, in the judgment of the CONTRACTOR, to protect themselves, the TWDB, and employees and officials of the TWDB from liability arising out of this CONTRACT.
2. The CONTRACTOR shall be solely and entirely responsible for procuring all

appropriate licenses and permits, which may be required by any competent authority for the CONTRACTOR to perform the subject work.

3. Indemnification. The CONTRACTOR shall indemnify and hold the TWDB and the State of Texas harmless, to the extent the CONTRACTOR may do so in accordance with state law, from any and all losses, damages, liability, or claims therefore, on account of personal injury, death, or property damage of any nature whatsoever caused by the CONTRACTOR, arising out of the activities and work conducted pursuant to this CONTRACT. The CONTRACTOR is solely responsible for liability arising out of its negligent acts or omissions during the performance of this CONTRACT.

ARTICLE IX. SEVERANCE PROVISION

Should any one or more provisions of this CONTRACT be held to be null, void, voidable, or for any reason whatsoever, of no force and effect, such provision(s) shall be construed as severable from the remainder of this CONTRACT and shall not affect the validity of all other provisions of this CONTRACT which shall remain of full force and effect.

ARTICLE X. GENERAL TERMS AND CONDITIONS

1. GENERAL TERMS.

    1. No Debt Against the State. This CONTRACT does not create any debt by or on behalf of the State of Texas and the TWDB. The TWDB's obligations under this CONTRACT are contingent upon the availability of appropriated funds and the continued legal authority of the TWDB to enter into this CONTRACT.

    2. Independent Contractor. Both parties hereto, in the performance of this contract, shall act in an individual capacity and not as agents, employees, partners, joint ventures or associates of one another. The employees or agents of one party shall not be deemed or construed to be the employees or agents of the other party for any purposes whatsoever.
    3. Procurement Laws. The CONTRACTOR shall comply with applicable State of Texas procurement laws, rules and policies, including but not limited to competitive bidding and the Professional Services Procurement Act, Government Code, Chapter 2254, relating to contracting with persons whose services are within the scope of practice of: accountants, architects, landscape architects, land surveyors, medical doctors, optometrists, professional engineers, real estate appraisers, professional nurses, and certified public accountants.

    4. Right to Audit. The CONTRACTOR and its Subcontractors shall maintain all financial accounting documents and records, including copies of all invoices and receipts for expenditures, relating to the work under this CONTRACT.

The CONTRACTOR shall make such documents and records available for examination and audit by the EXECUTIVE ADMINISTRATOR or any other authorized entity of the State of Texas. The CONTRACTOR'S financial accounting documents and records shall be kept and maintained in accordance with generally accepted accounting principles. By executing this CONTRACT, the CONTRACTOR accepts the authority of the Texas State Auditor's Office to conduct audits and investigations in connection with all state funds received pursuant to this CONTRACT. The CONTRACTOR shall comply with directives from the Texas State Auditor and shall cooperate in any such investigation or audit. The CONTRACTOR agrees to provide the Texas State Auditor with access to any information the Texas State Auditor considers relevant to the investigation or audit. The CONTRACTOR also agrees to include a provision in any Subcontract related to this CONTRACT that requires the Subcontractor to submit to audits and investigation by the State Auditor's Office in connection with all state funds received pursuant to the Subcontract.

5. Force Majeure. Unless otherwise provided, neither the CONTRACTOR nor the TWDB nor any agency of the State of Texas, shall be liable to the other for any delay in, or failure of performance, of a requirement contained in this CONTRACT caused by force majeure. The existence of such causes of delay or failure shall extend the period of performance until after the causes of delay or failure have been removed provided the non-performing party exercises all reasonable due diligence to perform. Force majeure is defined as acts of God, war, strike, fires, explosions, or other causes that are beyond the reasonable control of either party and that by exercise of due foresight such party could not reasonably have been expected to avoid, and which, by the exercise of all reasonable due diligence, such party is unable to overcome. Each party must inform the other in writing with proof of receipt within two (2) business days of the existence of such force majeure or otherwise waive this right as a defense.

6. Does not Boycott Israel. As required by Texas Government Code section 2270.002, the CONTRACTOR certifies, by executing this CONTRACT, that the CONTRACTOR does not, and will not during the term of this CONTRACT, boycott Israel. The CONTRACTOR further certifies that no subcontractor of the CONTRACTOR boycotts Israel, or will boycott Israel during the term of this CONTRACT. The CONTRACTOR agrees to take all necessary steps to ensure this certification remains true during the term of this CONTRACT.

2. STANDARDS OF PERFORMANCE.

a. Personnel. The CONTRACTOR shall assign only qualified personnel to perform the services required under this CONTRACT. The CONTRACTOR shall be responsible for ensuring that any Subcontractor utilized shall also assign only qualified personnel. Qualified personnel are persons who are

properly licensed to perform the work and who have sufficient knowledge, skills and ability to perform the tasks and services required herein according to the standards of performance and care for their trade or profession.

b. Professional Standards. The CONTRACTOR shall provide the services and deliverables in accordance with applicable professional standards. The CONTRACTOR represents and warrants that he is authorized to acquire Subcontractors with the requisite qualifications, experience, personnel and other resources to perform in the manner required by this CONTRACT.

c. Antitrust. The CONTRACTOR represents and warrants that neither the CONTRACTOR nor any firm, corporation, partnership, or institution represented by the CONTRACTOR, or anyone acting for such firm, corporation, partnership, or institution has (1) violated the antitrust laws of the State of Texas under the Texas Business & Commerce Code, Chapter 15, of the federal antitrust laws; or (2) communicated directly or indirectly the proposal resulting in this CONTRACT to any competitor or other person engaged in such line of business during the procurement process for this CONTRACT.

d. Conflict of Interest. The CONTRACTOR represents and warrants that the CONTRACTOR has no actual or potential conflicts of interest in providing the deliverables required by this CONTRACT to the State of Texas and the TWDB. The CONTRACTOR represents that the provision of services under this CONTRACT will not create an appearance of impropriety. The CONTRACTOR also represents and warrants that, during the term of this CONTRACT, the CONTRACTOR will immediately notify the TWDB, in writing, of any potential conflict of interest that could adversely affect the TWDB by creating the appearance of a conflict of interest.

CONTRACTOR represents and warrants that neither the CONTRACTOR nor any person or entity that will participate financially in this CONTRACT has received compensation from the TWDB or any agency of the State of Texas for participation in the preparation of specifications for this CONTRACT. The CONTRACTOR represents and warrants that he has not given, offered to give, and does not intend to give at any time hereafter, any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor or service to any public servant in connection with this CONTRACT.

e. Proprietary and Confidential Information. The CONTRACTOR warrants and represents that any information that is proprietary or confidential, and is received by the CONTRACTOR from the TWDB or any governmental entity, shall not be disclosed to third parties without the written consent of the TWDB or applicable governmental entity, whose consent shall not be unreasonably withheld.

f. Public Information Act. The CONTRACTOR acknowledges and agrees that all documents, in any media, generated in the performance of work conducted under this CONTRACT are subject to public disclosure under the Public Information Act, Government Code, Chapter 552. The CONTRACTOR shall produce all documents upon request of the TWDB within two (2) business days when the documents are required to comply with a request for information under the Public Information Act.

g. Accurate and Timely Record Keeping. The CONTRACTOR warrants and represents that he will keep timely, accurate and honest books and records relating to the work performed and the payments received under this CONTRACT according to generally accepted accounting standards. Further, the CONTRACTOR agrees that he will create such books and records at or about the time the transaction reflected in the books and records occurs.

h. Dispute Resolution. The CONTRACTOR and the TWDB agree to make a good faith effort to resolve any dispute relating to the work required under this CONTRACT through negotiation and mediation as provided by Government Code, Chapter 2260 relating to resolution of certain contract claims against the state. The CONTRACTOR and the TWDB further agree that they shall attempt to use any method of alternative dispute resolution mutually agreed upon to resolve any dispute arising under this CONTRACT if this CONTRACT is not subject to Chapter 2260.

i. Contract Administration. The TWDB shall designate a project manager for this CONTRACT. The project manager will serve as the point of contact between the TWDB and the CONTRACTOR. The TWDB's project manager shall supervise the TWDB's review of the CONTRACTOR's technical work, deliverables, draft reports, the final report, payment requests, schedules, financial and budget administration, and similar matters. The project manager does not have any express or implied authority to vary the terms of the CONTRACT, amend the CONTRACT in any way or waive strict performance of the terms or conditions of the CONTRACT.

ARTICLE XI. CORRESPONDENCE

All correspondence between the parties shall be made to the following addresses:

For the **TWDB:**

Contract Issues:
Texas Water Development Board
Attention: Contract Administration
P.O. Box 13231
Austin, Texas 78711-3231
Email: contracts@twdb.texas.gov

Payment Request Submission:
Texas Water Development Board
Attention: Accounts Payable
P.O. Box 13231
Austin, Texas 78711-3231
Email: invoice@twdb.texas.gov

Physical Address:
Stephen F. Austin State Office Building
1700 N. Congress Avenue
Austin, Texas 78701

For the **CONTRACTOR:**

Contract Issues:
Peter Newell
HDR Engineering, Inc.
4401 West Gate Blvd., Suite 400
Austin, Texas 78745
Email: peter.newell@hdrinc.com

Payment Request Submission:
Peter Newell
HDR Engineering, Inc.
4401 West Gate Blvd., Suite 400
Austin, Texas 78745
Email: peter.newell@hdrinc.com

Physical Address:
HDR Engineering, Inc.
4401 West Gate Blvd., Suite 400
Austin, Texas 78745

IN WITNESS WHEREOF, the parties have caused this CONTRACT to be duly executed in multiple originals.

TEXAS WATER DEVELOPMENT BOARD

Jeff Walker
Executive Administrator

Date: 3.15.18

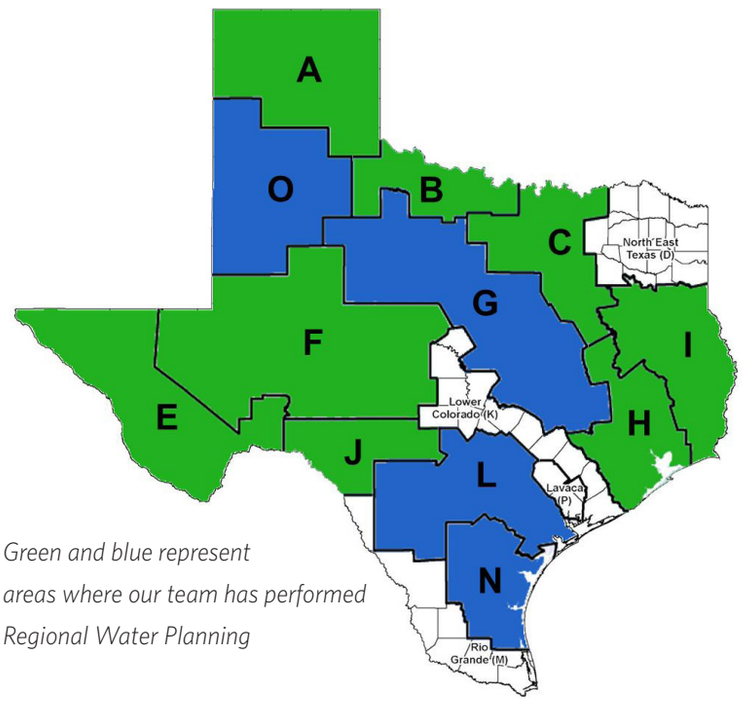
HDR ENGINEERING, INC.

Kelly J. Kaatz
Senior Vice President

Date: 3-5-18

EXHIBIT A

STATEMENT OF QUALIFICATIONS



Green and blue represent areas where our team has performed Regional Water Planning

Texas Water Development Board

Statement of Qualifications

Uniform Costing Model Update for Regional Water Planning

RFQ No. 580-18-RFQ0056

Texas Water Development Board

October 25, 2017

HDR

In association with:

FREESE AND NICHOLS

October 25, 2017

Ms. Tina Newstrom
Texas Water Development Board (TWDB)
1700 N. Congress Avenue
6th Floor Reception Desk
Austin, TX 78701

RE: Statement of Qualifications for Priority Research Topic Uniform Costing Tool for Regional Water Planning

Dear Ms. Newstrom and Selection Committee Members:

Accurate and consistent estimation of costs for implementation, operations, and maintenance of projects recommended in the regional water plans is essential for quantification of funding necessary to implement the state water plan. HDR Engineering, Inc. (HDR) and Freese and Nichols (FNI) are pleased to strengthen the Uniform Costing Model (UCM) to make sure Texans get the most benefit for the funds available. Our team offers:

Direct Experience Applying the UCM – HDR and FNI have applied the UCM in 12 of the state's 16 regions for regional water planning purposes and frequently use it in other water supply planning studies for a range of clients.

First-Hand Knowledge of the UCM – As original creators of the UCM, the HDR Team has extensive experience working with the tool, enhancing its capabilities, and maintaining its utility through periodic integration of the latest bids for construction of water supply facilities.

Dedicated Team, Committed to Finishing What We Started – After implementing the UCM for the 2016 Regional Water Plans, our team is ready to update the UCM to support the 2021 Regional Water Plans and 2022 State Water Plan.

The HDR Team will work in cooperation with TWDB staff to efficiently update and enhance the UCM, leveraging information gathered from the staff, consultants and stakeholders. The HDR Team will focus on: 1) updating and refining the cost tables, 2) identifying and completing necessary model enhancements, and 3) updating the user's guide. A test team will be engaged throughout the process to provide feedback on model improvements.

The HDR team has no conflicts of interest relevant to this contract. HDR and FNI look forward to updating this critical planning tool and continuing to support the TWDB's mission to conserve and responsibly develop water for Texas.

Sincerely,
HDR ENGINEERING INC.

Kelly J. Kaatz, PE
Senior Vice President

Peter Newell, PE
Project Manager

Texas Water Development Board

Addendum No.1

RFQ NO:	580-18-RFQ0056	**ADDENDUM NO. :**	1
Deadline for Submission for RFP:	Wednesday, October 25, 2017, 2:00 PM,		

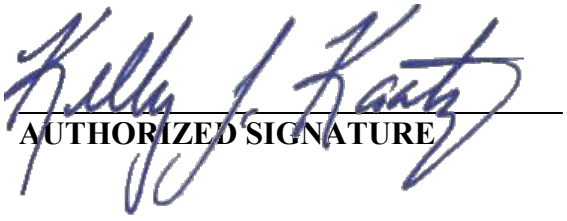
PURPOSE OF ADDENDUM

1. On Page 1 of 20 under 1.1 OVERVIEW add the following paragraph:

1.1a - Funding available for this project will not exceed and is limited to $40,000.00. The TWDB's obligations under any contract are contingent upon the continued availability of appropriated funds and the continued legal authority of the TWDB to enter into a contract.

IN THE SUBMISSION OF RFQ, RESPONDENT SHOULD ACKNOWLEDGE RECEIPT OF THIS ADDENDUM; OTHERWISE THE SUBMISSION MAY NOT BE GIVEN CONSIDERATION. RESPONDENT MAY ACKNOWLEDGE RECEIPT BY RETURNING A SIGNED COPY WITH THEIR SUBMISSION.

Kelly J. Kaatz, PE – *Senior Vice President*
RESPONDENT NAME



AUTHORIZED SIGNATURE

Contents

01 Execution of Statement of Qualifications

Texas Water Development Board
REQUEST FOR RFQ NO. 580-18-RFQ0056
UNIFORM COSTING MODEL UPDATE FOR REGIONAL WATER PLANNING

CONTENT ITEM 1

EXECUTION OF SOQ
to the
REQUEST FOR QUALIFICATIONS

Company Name: HDR Engineering, Inc.

Address: 4401 West Gate Blvd., Suite 400

Austin, Texas 78745

Phone Number: 512.912.5100

E-Mail: Peter.Newell@hdrinc.com

I, Kelly J. Kaatz, am the above-referenced company's representative and I am authorized to submit this response and sign future contract documents. By signing below, the representative certifies that if a Texas address is shown as the address, the respondent qualifies as a Texas Bidder as defined in 34 TAC Rule 20.32(68).

Authorized Signature

October 24, 2017
Date

Senior Vice President
Title:

02 Company Profile Summary& History

CONTENT ITEM 2
COMPANY PROFILE SUMMARY AND HISTORY

a. Company name, address, phone number, and legal status

HDR Engineering, Inc.
4401 West Gate Blvd., #400, Austin, TX 78745
TEL 512.912.5100
Legal Status: Corporation

b. Name and title of person submitting the SOQ with authority to bind the company

Kelly J. Kaatz, PE
Senior Vice President

c. Name, phone number, and email address of contact person for any questions

Peter Newell, PE
512.498.4703
Peter.Newell@hdrinc.com

d. Describe the general nature of previous work, the number of years in business, size and scope of operation.

For more than a century, HDR has partnered with clients to shape communities and challenge the boundaries of what's possible. Our expertise spans 10,000 employees, in more than 225 locations around the world—and counting. Our engineering, architecture, environmental and construction services bring an impressive breadth of knowledge to every project. Our optimistic approach to finding innovative solutions defined our past and drives our future.

Our major Texas offices are located in Austin, San Antonio, Dallas, Fort Worth, Houston and Corpus Christi. Our services include the planning, permitting, design, construction and management of a wide range of planning and infrastructure projects, including water, highways, rail, industrial facilities and ports.

Consistently ranked among the nation's Top 10 Water Design firms, our professionals combine the latest technical innovations with practical solutions. Our water consulting services are comprehensive and range from source water development, system master planning, and regulatory compliance services to infrastructure design, management, and sustainable operation.

Today, in response to the growing need to optimize system operations, deliver solutions that provide long-term value, and help our clients achieve exceptional customer service; our practice includes experts in:

- Integrated water planning and energy conservation
- Asset management and financial planning
- Water quality management and advanced treatment technologies
- Construction management
- Pipeline rehabilitation/replacement and tunneling
- Alternative project delivery methods

We are pleased to team with **Freese and Nichols, Inc.** (FNI) again on this project. FNI is a client-focused, regionally based firm with national expertise. Since their founding in 1894, they have made it a priority to establish long, mutually beneficial relationships with their clients, teaming partners and staff. FNI has worked with nine of the State's 16 regional planning groups — either as prime or subconsultant — to develop water supply plans mandated by SB1.

FNI has the comprehensive, in-house resources and long-time relationships to dedicate the resources needed to expedite cost-effective solutions for their clients' engineering and planning needs.

FNI's clients now benefit from access to the skills and experience of nearly 700 staff across their offices in Texas, Louisiana, Georgia, North Carolina and Oklahoma. And they approach stewardship of client and regional resources with resiliency and balance in mind.

As the first and only engineering/architecture firm to receive the Malcolm Baldrige National Quality Award, FNI remains nationally recognized for their award-winning technical solutions and commitment to performance excellence. Freese and Nichols is registered with the Texas Board of Professional Engineers (No. F 2144).

CONTENT ITEM 2
COMPANY PROFILE SUMMARY AND HISTORY

Experience, educational degrees, and any professional certifications

Please find this information about our staff in Content Item 3, as well as the Appendix of Résumés.

Texas Regional Water Plan Development Experience

HDR and FNI have been leaders in the Senate Bill 1 (SB1) regional water planning process throughout each of the first four planning cycles (2001, 2006, 2011, 2016, and we continue to serve in development of 2022 state water plan).

HDR has served as lead technical consultant for four regional water planning groups (RWPGs) — Brazos G (Region G), Coastal Bend (Region N), South Central Texas (Region L), and Llano Estacado (Region O).

FNI has served a similar role as lead technical consultant for four planning groups (Regions A, C, F & H). FNI has also served as a subconsultant for five other planning groups (Regions B, E, G, I & J).

Together, HDR and FNI have served as technical consultants for 12 of the 16 RWPGs during the development of the 2001, 2006, 2011 and 2016 Regional Water Plans. These 12 regions extend from Amarillo to Corpus Christi and El Paso to Beaumont including the most populous metropolitan areas of Houston, Dallas/Fort Worth, and San Antonio as well as 216 of the 254 counties in the State of Texas.

Experience with Water Supply Project Cost Estimates

Though engineering cost estimates cannot be guaranteed, accurate predictions of cost are important for planning capital improvement programs and utility rate structures. HDR has several tools to assist us in keeping pace with cost trends and to monitor activities and supplies that might affect future pricing strategies. HDR's cost estimating department has developed standard cost estimating procedures and practices that result in less variation from initial preliminary estimate through the bid date. HDR brings this rigorous costing expertise to the UCM for use in development of water management strategies and / or project evaluation. With the information available from the UCM, our team can also provide the technical evaluations and recommendations necessary to make timely, informed, and a data-driven decisions for project evaluation. This decision support and justification for water supply strategies allows us help clients to best meet future water needs within the State.

Experience with the Uniform Costing Model

As the HDR team participated in previous Regional Water Planning cycles, we used a cost estimation and hydraulic modeling tool developed by HDR. The TWDB liked this tool and appreciated its consistency of approach and general accuracy of costs. In 2011, the TWDB decided to allocate funding to develop a Uniform Costing Model (UCM) and the HDR model then became the first version of the UCM.

Since 2001, the HDR team has used what is now known as the UCM, to evaluate the costs of water management strategies considered for recommendation in regional and other water supply plans. Our team's experience with the cost model allows us to provide significant decision support for clients and create a more standardized way to compare numerous strategies and scenarios in development of water plans.

In fact, FNI and HDR have been working together with clients to apply the UCM. FNI and HDR were asked by the Guadalupe-Blanco River Authority (GBRA) to develop many alternative project configurations and planning level cost estimates as part of the Mid-Basin Water Supply Project (MBWSP) Study. Our team excelled in providing timely technical evaluations and cost estimates resulting in identification of the most feasible alternatives due, in part, to our experience in development and application of the UCM for Regional Water Planning. Our efforts and expertise with this tool provided valuable decision support enabling GBRA to identify preferred project alternatives.

CONTENT ITEM 2
COMPANY PROFILE SUMMARY AND HISTORY

Clients have come to trust our team to clarify technical assumptions used in the UCM to provide a high level of confidence in its quality and our team's attention to detail. Due to our knowledge and expertise in application and refinement of the UCM, clients often call on us to provide technical evaluations of potential projects and develop planning level cost estimates.

By finding unique ways to apply the UCM for both regional and non-regional planning evaluations, HDR has provided decision support and justification for water supply strategies to meet future water needs of our state.

Experience with Conservation Strategies in Regional Water Plans

Members of the HDR Team are familiar with water conservation strategies and best management practices, including typical costs for their implementation across the state. In cooperation with TWDB staff economists responsible for estimating the economic impacts of not meeting projected water needs, HDR developed the innovative methodology for estimating the unique annual unit cost of drought management as a water management strategy for municipal user groups with projected needs. These annual unit costs facilitate comparison of drought management to traditional water supply enhancement projects.

HDR has developed a proprietary **Conservation Potential Assessment** model to analyze the water savings and costs from a range of water conservation measures commonly used by municipal water systems. The model uses inputs for characteristics of the utility service area such as demographics, growth rates, and prior implementation of conservation programs to customize the analysis. In addition to approximately 20 conservation measures that are pre-programmed, additional, specialized measures can be added to the model if desired. Outputs include total costs and water savings and cost per unit of water saved, for different future planning horizons selected by the client. Outputs are generated as annual totals and peak quantities.

Experience with Managing Technical Contracts

For a project to be considered a success, work must be completed on schedule, within budget, and error free. At the start of each technical contract or project, our project manager prepares a Project Management Plan (PMP) to document all information necessary to execute a successful project.

The PMP is an internal document that serves as a road map for the project team. The PMP defines project resources and includes client contact information, project description, scope of work, deliverables, budget, administration procedures, and filing requirements. It also covers communication methods, such as use of an e-Room, intranet sites, electronic documentation, written documentation, and methods of handling media requests for information. The PMP also includes a project-specific Quality Management Plan which helps maintain high levels of quality in our work efforts.

We use a combination of company-developed tools and procedures for delivering quality and consistency in our work, managing internal tasks, maintaining communication, and staying ahead of schedule and under budget. We are always willing to incorporate new methods as our clients and project work dictates.

For our Technical Contracts to be successful, we have found that our project management approach must be built on trust, a clear definition of shared goals, and a mutual understanding of the necessary steps to achieve those goals. We have assembled a team that is custom-fit to your project. Our team is bound together by a commitment to be a true partner to you on this project and beyond.

Our project management approach is reinforced through proven accountability measures, which can include co-location and design task forces to meet commitments and emphasize shared goals. Our past experience managing Technical Contracts has taught us that everything we do is a coordinated effort on your behalf to achieve our shared objectives.

03 Resumes of Individuals

CONTENT ITEM 3
RESUMES OF INDIVIDUALS

The HDR Team has the expertise, qualifications, and experience to develop and deliver an updated Uniform Cost Model because HDR and FNI developed the Model initially. Since that time, HDR and FNI have had significant experience applying and working with the model with many clients on both regional water plans and other planning level studies. We've been able to identify and address bugs, while also maintaining and enhancing the Model.

The organizational chart below illustrates the structure of the HDR Team. Descriptions of key team members follow. Résumés are included in Appendix A.

Organization Chart

Texas Water Development Board

PROJECT MANAGER	QA/QC
Peter Newell, PE	**Troy St. Tours, PE** **David Dunn, PE** **Jason Afinowicz, PE** *(FNI)*

COST TABLES	MODEL ENHANCEMENTS	USER'S GUIDE	TEST TEAM
Jeremy Rice *(FNI)* **Mark Graves** *(FNI)* **HDR Constructors** **FNI Construction**	**Bill Thaman, PE** **Grady Reed** **James Dwyer, PE** **Jon Albright** *(FNI)*	**Zach Stein, PE**	**Jeremy Rice** *(FNI)* **Jon Albright** *(FNI)* **Zach Stein, PE**

FNI = Freese & Nichols, Inc.

The HDR Team is comprised of members of the original development team for the TWDB UCM augmented by those most experienced in its application as well as experts in moving projects from conception through construction to long-term operations. Some of our key team members include:

Role: Project Manager
Industry Tenure: 18

Peter Newell, PE – will be the Project Manager for the Update to the UCM. He has been involved in cost estimating for regional planning and other studies since the 2011 RWP cycle and was a lead engineer on the development of the 2012 UCM. Since the creation of the UCM, Peter has worked closely with the TWDB, regional water purveyors, and municipalities to provide timely technical evaluations and cost estimates for multiple alternatives due, in part, to his experience in development and application of the UCM for Regional Water Planning. He is a Professional Engineer in Texas (No. 108054) and will be HDR's point of contact from development of the scope of services through delivery of the updated UCM.

CONTENT ITEM 3
RESUMES OF INDIVIDUALS

Role: QA/QC
Industry Tenure: 20

Troy St. Tours, PE – has a background in water resources, planning, hydraulic design, and construction. He also has extensive experience in the design and construction of a variety of private and municipal water treatment and supply projects, and he is skilled at leading multi-discipline teams on complex projects for traditional and alternative delivery.

Role: QA/QC
Industry Tenure: 26

David Dunn, PE will be in the QA/QC role on this project. Throughout his career, his project experience has focused on planning and permitting of water supply systems, and he has completed numerous hydraulic and hydrologic evaluations of water supply systems. David supervised the development of the 2006, 2011 and 2016 Brazos G Regional Water Plans, and is supervising the development of the 2021 Plan.

Role: QA/QC
Industry Tenure: 13

Jason Afinowicz, PE – is a Project Manager in FNI's Water Resources Group. He has a wide variety of water resource planning experience, including management of the 2006, 2011, and 2016 Region H Water Plans, and the 2006 and 2011 Region P Water Plans. His additional experience includes cost analysis, hydraulic modeling, and TWDB planning and infrastructure funding programs.

Role: Cost Tables and Test Team
Industry Tenure: 11

Jeremy Rice *(FNI)* - is a Hydrologist with extensive water resources experience. His background includes hydrologic modeling using applications, such as the Water Rights Analysis Package (WRAP) and RiverWare. Jeremy has worked on population estimates, demand estimates, water supply analyses and strategy evaluations for Regions A and F as part of the regional water planning process. He has also participated in water supply analyses for Regions B, C, E, Brazos G, and I.

Role: Cost Tables
Industry Tenure: 21

Mark Graves, PE *(FNI)* – is a Project Manager that participated in the development of the 2006 and 2011 Region N Water Plans. His strong understanding of blending water quality issues, brackish and seawater desalination, and regulatory requirements for water treatment brings valuable experience to the project team.

Role: Model Enhancements
Industry Tenure: 22

Bill Thaman, PE – has more than 22 years of experience in data management, software design and development, and water resources engineering. His civil engineering experience includes performing water supply feasibility studies, regulatory studies, and stormwater analysis and design. In addition, Bill has designed and developed web and GIS applications for state and local government agencies, and has significant experience in GIS workflow automation, database management systems, Microsoft Excel customization, and programming.

Role: Model Enhancements
Industry Tenure: 16

Grady Reed – has a background is in hydrology and water resources planning and management. He has been involved in the development of the 2001, 2006, 2011 and 2016 Regional Water Plans for the Brazos G, South Central, Coastal Bend, and Llano Estacado Regional Water Planning areas. For these plans, his involvement has included developing population and water demand projections, water supply projections, and developing water supply plans. Grady also has experience in water loss control and water conservation studies.

Role: Model Enhancements
Industry Tenure: 32

James Dwyer, PE – has played a key role in a wide variety of groundwater related projects. His experience includes the full range of water supply development projects. He has also performed and managed numerous groundwater flow modeling efforts. James Dwyer is leading ASR projects across the state and will evaluate and update the associate ASR cost curves for the new UCM**.**

Role: Test Team
Industry Tenure: 36

Jon Albright, PE is Senior Hydrologist and Water Resources Project Manager whose experience and focus provides clients with an in-depth, accurate look at water supply opportunities and issues. He has participated in developing water supply strategies for Regions B, C, E, F, G and J. Jon has also provided water supply analysis support to Regions A, B, C, E, F, G, H, I and J using the TCEQ WAMs.

Role: User's Guide and Test Team
Industry Tenure: 11

Zach Stein, PE - Zach provided support in the development of the original TWDB unified costing model has extensive experience using the tool to develop planning level cost estimates. He was actually quite involved with Test Team and the User's Guide development during the initial UCM project and he is eager to update the TWDB's UCM. Zach participated in the 2011 & 2016 Region N, L, and G Regional Water Plans. Zach updated the 2014 Long Range Water Supply Plan for the City of Dallas utilizing Dallas' RiverWare model on the existing reservoir yields,

Real World Experience

HDR Constructors (HDRC) offers integrated design, cost estimating and construction services. We are including HDRC on our team to leverage their experience and provide input to cost tables from real world projects. The FNI Construction Services group offers similar capabilities to enhance our team in the development of cost tables for the UCM.

Full Project Descriptions of our Team's Experience

Brazos G Regional Water Plan (Region G)

The HDR team was selected as the technical consultant to develop the 2001, 2006, 2011 and 2016 Regional Water Plans for the Brazos G Area. Multiple innovative analyses were utilized to develop those Plans, including conjunctive use of groundwater and surface water at Lake Granger, aquifer storage and recovery (ASR) in a variety of settings across the region, region-wide analysis of wastewater reuse potential, analysis of supplies that could be developed by the pending BRA System Operations Permit, and assessment of the impacts of future demands on existing groundwater supply wells in the Trinity Aquifer. HDR provided guidance to the planning group and led negotiations with TWDB to revise projections for population, and municipal and steam-electric water demands. The TWDB agreed to multiple changes to population and water demand projections, resulting in the Plans more closely following actual growth patterns in the Brazos G Area and achieving wider acceptance of the projections by stakeholders in Brazos G.

- In developing the regional water plans, HDR completed water demand analyses for all retail utilities serving populations greater than 500 and for each of six water user groups (municipal, industrial, steam-electric power generation, irrigation, mining, and livestock), followed by a detailed analysis of current water supplies to determine future water needs and potential water supply shortages.
- During the public planning process, HDR interacted effectively with the diverse interest groups represented on the planning group and through the formal and informal comments received during the development of the Initially Prepared Plans and the final adopted Plans.
- HDR developed consensus with the planning group through the presentation of factual information, and leading discussions regarding specific water management strategies to recommend.
- HDR successfully assisted the planning group in drafting legislative and policy recommendations.
- HDR identified and led discussions regarding appropriate approaches to suggest to TWDB regarding population and water demand revisions and modifications to the Brazos River Basin WAM to make the model more appropriate for water supply analyses.
- HDR determined surface water supplies using the revised Brazos WAM model, and groundwater supplies using water well inventories maintained by the TCEQ and TWDB. For areas without established Desired Future Conditions and adopted Modeled Available Groundwater (MAG) supplies, HDR utilized various TWDB Groundwater Availability Models to estimate available supplies. For the 2011 Plan, HDR coordinated with the various Groundwater Management Areas affecting counties in the Brazos G Area so that HDR's estimates of available groundwater would closely match the expected MAGs.
- HDR developed a process for assessing multiple miscellaneous strategies so that smaller strategies in the plan would be specifically listed and, therefore, eligible for certain types of State funding.
- Through the course of developing multiple regional water plans over four planning cycles, HDR has developed a familiarity with TWDB planning grant administration and invoicing requirements.
- Water supply analyses and evaluation of water management strategies were performed consistent with current regulatory and environmental drivers affecting water supply development.
- HDR successfully coordinated with Regions B, C, F, H & K regarding Water User Groups and supplies shared between the regions.
- Through the course of four planning cycles, HDR has gained an unparalleled depth and breadth of knowledge of the Brazos G Area, the water resources of the region, and the unique challenges posed by such a large, diverse planning area.

Project Team: David Dunn, Grady Reed, Peter Newell, Zach Stein, Jon Albright (FNI)

Mid-Basin Water Supply Project

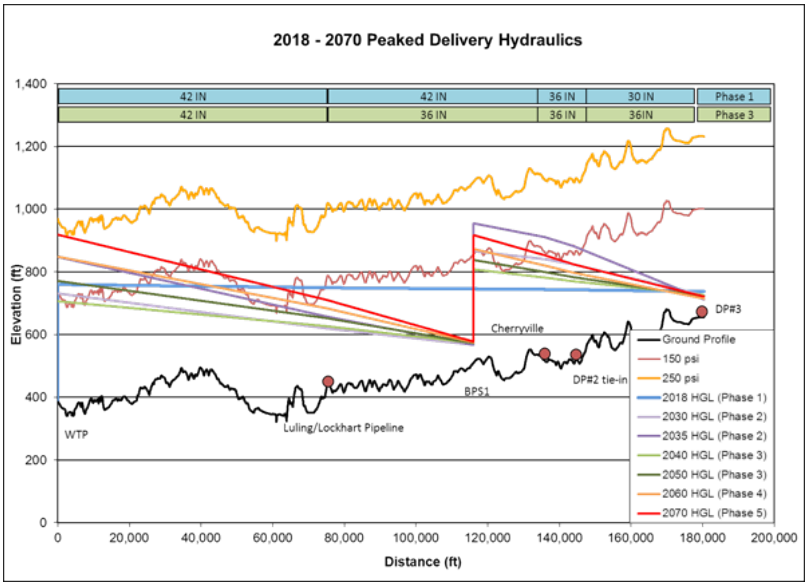
Client Name: Guadalupe-Blanco River Authority (GBRA), Seguin, TX

GBRA, with ongoing technical support from HDR, has been engaged in the planning, conceptual development, technical evaluation, and refinement of the Mid-Basin Water Supply Project (MBWSP) since 2004 taking proactive steps to meet projected needs for new regional water supplies approaching 50,000 acre-feet in the next 50 years. The MBWSP is a sustainable water management strategy intended to meet the needs of rapidly growing communities and future growth areas along the Interstate Highway 35 and State Highway 130 corridors. It is recommended for implementation in the 2016 South Central Texas Regional Water Plan and the 2017 State Water Plan. With a loan from the Water Infrastructure Fund (WIF) for planning of State Water Plan projects administered by the Texas Water Development Board (TWDB), GBRA has conducted many of the detailed studies necessary to evaluate potential project components and provide economical delivery of new water supplies to participants and customers.

Water sources and facilities associated with the MBWSP may include surface water, groundwater, well fields, river intakes, water treatment, aquifer storage and recovery (ASR), pump stations, transmission pipelines, and/or integration of existing GBRA water sources and facilities. Participants and customers, timing of needs for additional water supply, and points of delivery have been evaluated and will be finally determined when the ultimate water supply capacity of the MBWSP is established. The complexity of the MBWSP, the dynamic nature of its development, and GBRA's intentions to deliver economical and reliable new water supplies in cooperation with its customers and in compliance with regulatory requirements, have necessitated both patience and determination.

HDR has served as GBRA's lead technical consultant throughout on-going development of the MBWSP from initial conceptual formulation, through surface water and groundwater availability modeling, surface water permitting, regional water plan integration, and comprehensive feasibility studies. As each of these sources and facilities has the potential to bring significant water supplies to existing and future customers, HDR and the team worked with GBRA to identify the most feasible project and phasing of project facilities (based on cost of water, reliability, permitting considerations, environmental impacts, customer growth patterns, and other factors) to meet customer needs. **HDR's cost model (a version of the TWDB UCM) was used for preliminary hydraulic analyses and to estimate capital and project costs.**

Project Team: Sam Vaugh, Peter Newell, Zach Stein, James Dwyer, Bill Thaman, Grady Reed



Dallas Long Range Water Supply Plan

HDR and the City of Dallas have developed a feasible plan of action that will allow Dallas to meet its water supply demands and associated needs of their customers through 2070 and beyond. This objective is being met through forecasting demands, quantifying available supplies, determining needs, identifying and evaluating strategies, and developing a sustainable, yet flexible, integration plan.

The study was organized using six specific areas of focus: 1) project plan, objectives and meetings; 2) demands, supplies and needs; 3) impacts of existing and anticipated State and Federal regulations; 4) water management strategy identification, evaluation and plan development; 5) infrastructure needs; and 6) final plan report. These included many facets of water resources planning covering the entire spectrum of Dallas' system from source to tap.

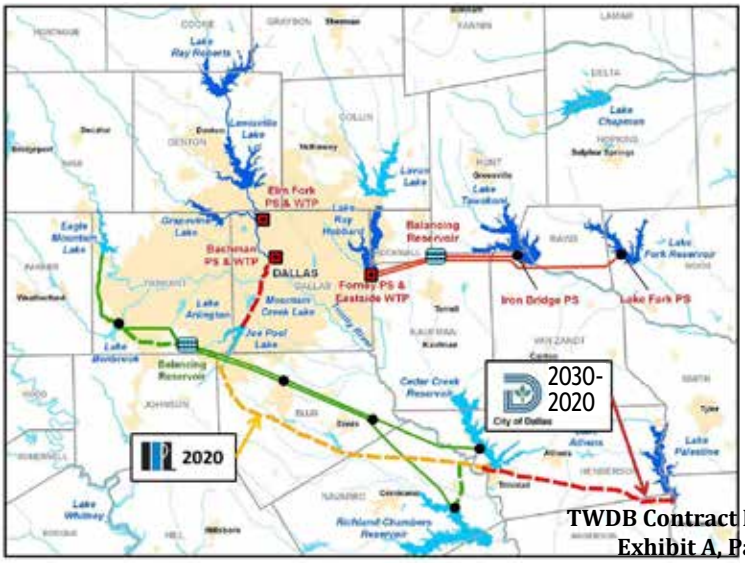
Considering future supplies requires a systematic approach to understanding the client's long-term needs and preferences. **HDR identified more than 300 strategies from previous reports, as well as some new strategies to potentially meet Dallas' needs and applied a version of the UCM to evaluate the vast majority of them.** HDR developed an evaluation matrix to identify which strategies scored well economically, politically, environmentally, and strategically for the City, resulting in a ranking of recommended strategies, which are incorporated into the integration plan.

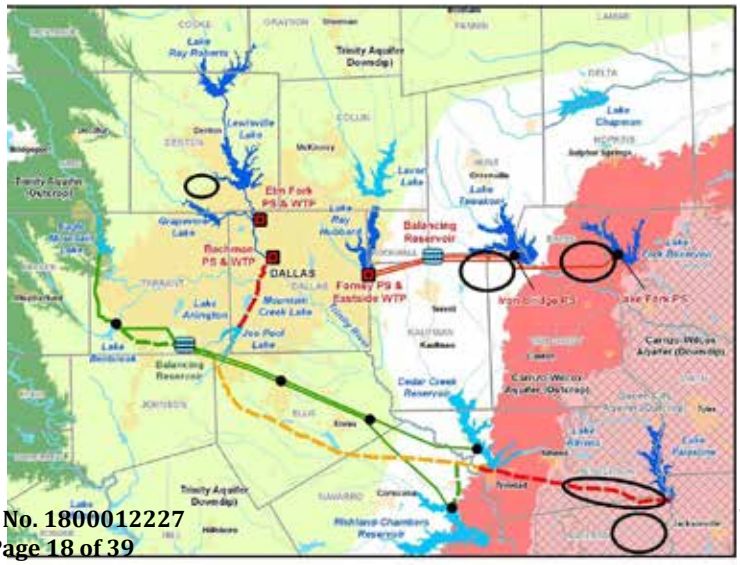
HDR modeling experts worked with the City to develop the new state-of-the-art Dallas Water Supply Model (RiverWare), which simulates all components of Dallas' raw water supply system. The RiverWare model is an essential tool in not only evaluating potential water supplies, but determining how a potential supply can be integrated into the Dallas system.

HDR was also tasked with performing a Title XVI reuse feasibility study for Dallas under the direction of the U.S. Bureau of Reclamation for the Long Range Water Supply Plan. The results of this study within a study identified four potential direct non-potable reuse options. These options were then incorporated into the strategy evaluation criteria matrix to be compared with other potential strategies. The identified alternatives focused on extending the City's reuse program to areas near downtown Dallas. Each evaluation included a 50-year economic analysis and potential for the project to "pay for itself" under different rate structures.

HDR also provided policy advice to the City concerning their current retail and wholesale rate structure and recommendations for modifications to the service area as these areas are related to the City's overall water supply planning effort. From population and water demand estimates to applying the results of climate change models to forecast future water supplies to ranking and scoring 300+ strategies to evaluating treatment plant capacity and needed updates to the treated water distribution system, HDR is providing the expertise to develop the City's path to securing a water supply for their customers for the next 50+ years.

Project Team: Cory Shockley, Peter Newell, Grady Reed, Zach Stein

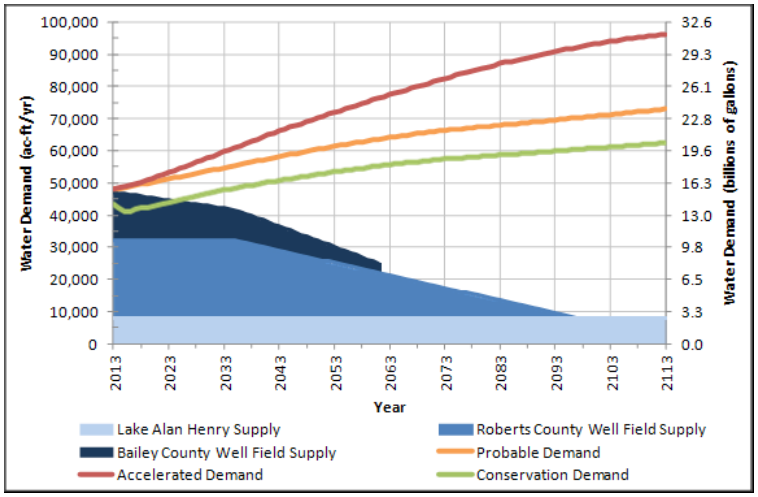




Strategic Water Supply Plan for Lubbock

Based on a long history of assisting the City with water supply issues, HDR was asked to assist the City of Lubbock in developing the City's 2013 and 2018 Strategic Water Supply Plans. For the 2013 plan, HDR provided City staff with population, water demand, and wastewater flow projections, and assisted the City in identifying and evaluating various long-range water supply alternatives. **Most of these alternatives were evaluated using a version of the UCM.** HDR assisted the City in developing a methodology for scoring and priority ranking the alternatives. Options evaluated included two aquifer storage and recovery (ASR) alternatives, several surface water alternatives, and direct and indirect reuse of reclaimed wastewater. The financial impact to customer water rates of various combinations of alternatives also was assessed.

Project Team: David Dunn, Peter Newell, Zach Stein, Grady Reed, James Dwyer



100-Year Annual Water Demand vs. Current Water Supply

References

We have asked the following clients knowledgeable of similar projects to mail reference letters to you:

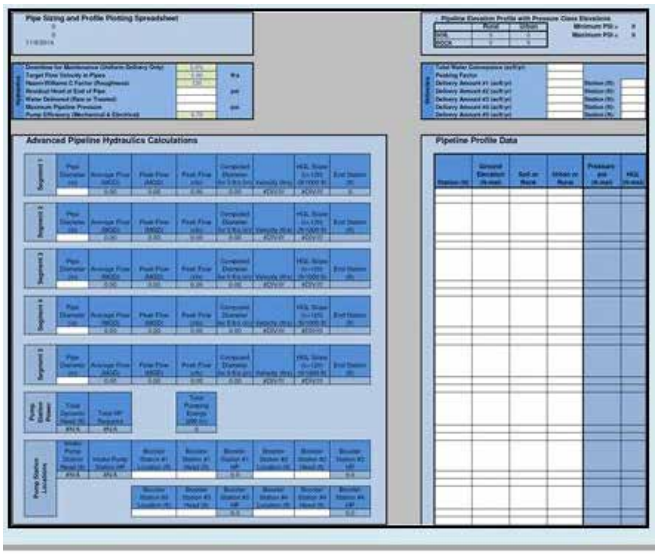
Wayne Wilson, Chair
Brazos G Regional Water Planning Group
wlwilsoncattlecompany@gmail.com
979.218.1800

Charles M. Hickman, P.E., CFM, Manager of Project Engineering
Guadalupe-Blanco River Authority
chickman@gbra.org
830.379.5822

Denis Qualls, Senior Program Manager
City of Dallas, Water Utilities Department
denis.qualls@dallascityhall.com
214.670.3843

Uniform Costing Model

The HDR Team was the primary consultant in the development of a semi-automated, planning-level, costing tool. Recently that tool was used by all regional water planning groups to estimate costs of water management strategies during the development of the 2016 Regional Water Plans for the State of Texas. Below is a screen shot of what the tool looks like.



04 Ownership of the Business Entity

CONTENT ITEM 4 – OWNERSHIP OF BUSINESS ENTITY
Name(s) of Each Person with at least
25 Percent Ownership of the Business Entity Submitting the RFQ
(if applicable)

N/A ★

Name

Name

Name

Name

★ The sole "shareholder" of HDR, Inc. is the HDR, Inc. BEST Plan and ESOP, a qualified benefit plan in which all employees are "participants." No one participant/ employee owns more than one percent of the outstanding stock of the company.

05 Technical Approach

The right team to leverage maximum experience and efficient costs for greatest impact.

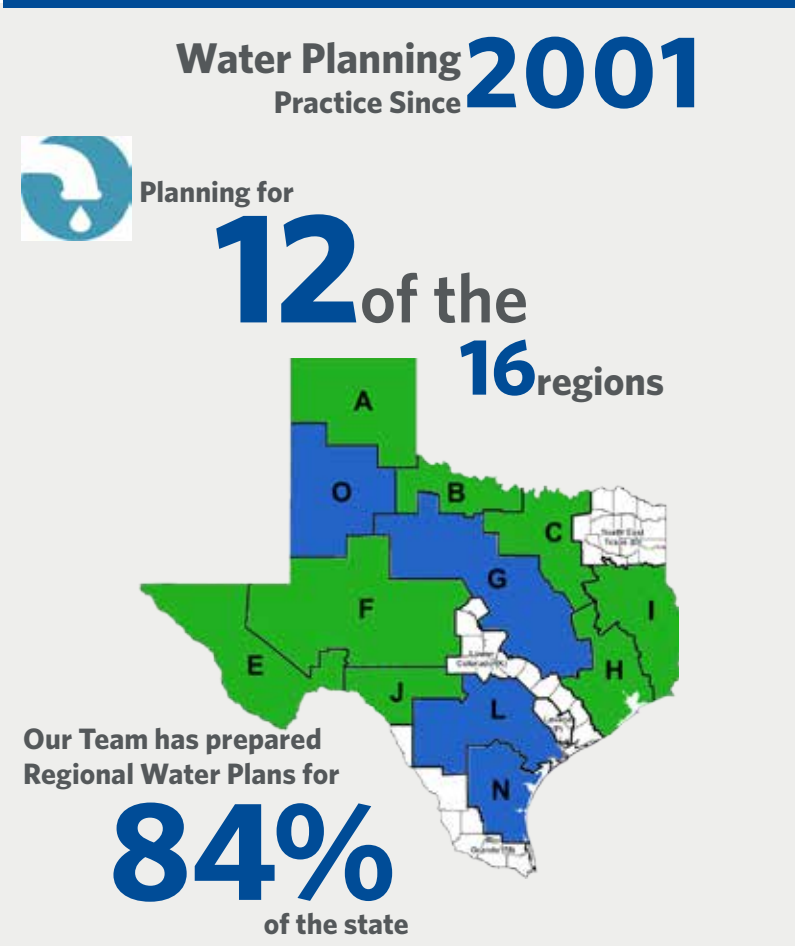
Background

HDR and FNI (HDR Team) have been developing water management strategy costs for the regional water plans since 2001. The consistency of approach and general accuracy of costs, convinced the TWDB in 2011, to ask the HDR Team to develop the first Uniform Costing Model (UCM) to be applied to all of the regions for the fourth planning cycle (2016 RWPs). Implementation of the UCM has significantly improved the regional and state water planning process by ensuring consistent cost estimates for potentially feasible projects across the state. The HDR Team is comprised of members of the original development team for the TWDB UCM augmented by those most experienced in its application as well as experts in moving projects from conception through construction to long-term operations.

As original creators of the UCM, the HDR Team has extensive experience working with the tool, enhancing its capabilities, and maintaining its utility through periodic integration of the latest bids for construction of water supply facilities. Many of the deficiencies listed in the RFQ have previously been identified and addressed. HDR applied the UCM to the 2016 Brazos G RWP, Region L, Region N, and Region O. FNI likewise applied it to their regions (A, C, F & H and subconsultant in B, E, G, I & J. Together, HDR and FNI have applied the UCM in 12 of the 16 regions.

The HDR Team frequently applies the tool outside of regional planning for a range of clients. (GBRA – MBWSP, Dallas LRWSP, Lubbock SWSP to name a few). With this experience, the HDR Team has refined approaches for cost estimation, identifying flaws in the computational processes and opportunities to enhance the model as well as updating unique facility cost curves and integrating the latest ENR CCI and PPI indices.

We are Texas committed.
We are ready to keep serving the TWDB



For the UCM update, the HDR Team's approach is to efficiently update and enhance the UCM using our combined experience with the UCM and with recent construction projects. The HDR Team will focus on: 1) updating and refining the cost tables, 2) identifying and completing necessary model enhancements, and 3) updating the user's guide. A test team will be engaged throughout the process to provide feedback on model improvements.

Project Management

Peter Newell will serve as the Project Manager. He has been involved in cost estimation for regional water planning and other studies since the 2011 cycle and was a lead engineer in the development of the 2012 UCM. He will oversee and engage in the cost model update, review the cost curves, actively coordinate with TWDB staff, and ensure that TWDB deliverable expectations are met. As previously noted, nearly every individual involved in the HDR Team has a deep background with the model, regional planning and cost estimation.

Refine Cost Data

Jeremy Rice will coordinate FNI efforts and be the task lead for updating cost tables and the test team. The team supporting Jeremy will include **Mark Graves** who developed the original water treatment plant (WTP) capital and operation and maintenance cost curves. Mark has experience with RWP cost estimating dating back to the 2001 Plan. Both **HDR** and **FNI** Constructors groups will provide input on facility construction costs. Cost data will also be refined through review of plan house bid tabs, TXDOT construction data, and other data readily available to HDR and FNI.

As creators of the 2012 UCM, HDR and FNI fully understand the original data sets and have identified ways to update existing WTP, pipeline, pump station, production well and ASR curves. **James Dwyer** is leading ASR projects across the state and will evaluate and update the associated ASR cost curves for the new UCM.

Direct Potable Reuse projects represent 1% (nearly 87,000 acft/yr) of strategy supplies by 2070 in the 2017 State Water Plan and are likely to increase in each successive plan. Costs for these strategies are difficult to assess since the TCEQ evaluates these facilities on a case by case basis and there are only two constructed projects in Texas to reference. HDR has reviewed this cost data as part of the 2015 TWDB Direct Potable Reuse Resource Document to evaluate advanced treatment cost curves that could be applied to the UCM and has experience developing direct potable reuse strategy costs for advanced treatment including the 2017 Potable Water Reuse Feasibility Study for the City of Lubbock.

Model Enhancements

Bill Thaman has significant experience with advanced Microsoft Excel customization and will lead the model enhancement effort. The HDR Team will compile lists of identified programming issues (from the TWDB RFQ and our own experience), recommended enhancements, and best practices based on extensive experience with regional water planning and various other studies for other clients.

The HDR Team will focus on improved functionality of the model to improve user experience, data integrity, maintainability, and computational accuracy. For example, one complaint regarding the current UCM is its file size, which at 12.5 MB often exceeds email size limits and affects performance. To address this, HDR optimized the file size by performing an analysis of how Excel was storing the UCM's used ranges on each worksheet, which eliminated a large volume of unnecessary stored information. This process reduced file size by almost 90% (down to 1.6 MB), which significantly improves performance efficiency and facilitates routine transmittal of the UCM via email. The optimized UCM is currently being used in actual project work. Other proposed enhancements besides those listed in the RFQ may include a customized ribbon tab for adding menu items, data output formatted for DB 22 input, creation of custom programmed functions to centralize hydraulic and energy calculations for increased accuracy and maintainability, options for creating pipeline profiles using free web tools for the advanced hydraulics tabs, and addition of infrastructure relocation costs.

Grady Reed will lead the update of the conservation cost approaches for the UCM. Conservation costs include both program and infrastructure costs. The infrastructure costs for conservation strategies will include system improvements to reduce water loss, such as meter replacements. Grady developed the technique for estimating annual unit costs of drought management used in regional water planning and may update the associated UCM capabilities. The current conservation module will be reviewed and tested for improved functionality and accuracy of costs.

The test team will work with the updated model and the revised user's guide to eliminate any errors and opportunities for misinterpretation prior to delivery to TWDB. The test team will be composed of individuals from HDR and FNI that have experience with the UCM in multiple regional water planning areas. **Zach Stein**, an engineer who participated in development of the first UCM with exhaustive experience using it for regional water planning, will participate in the test team and document the new model in a revised User's Guide highlighting new features.

Schedule

The RFQ for Updating the UCM requires that the model be ready by October 2018 and consistent with the First Amended General Guidelines for 5th cycle of RWP Development (April 2017). In order to align with planning group schedules for 2021 regional plan development, our team will have the updated UCM tested and ready for use as required by the TWDB. It is noted that ENR indices are generally posted and validated within about one month after the specified index time indicating that the September 2018 ENR CCI will not be available until October 2018 at the earliest. Furthermore, the Bureau's PPI specific for steel costs is generally validated within about two months after the specified index time and may not be available until November 2018. The HDR Team will address these schedule challenges in accordance with TWDB direction.

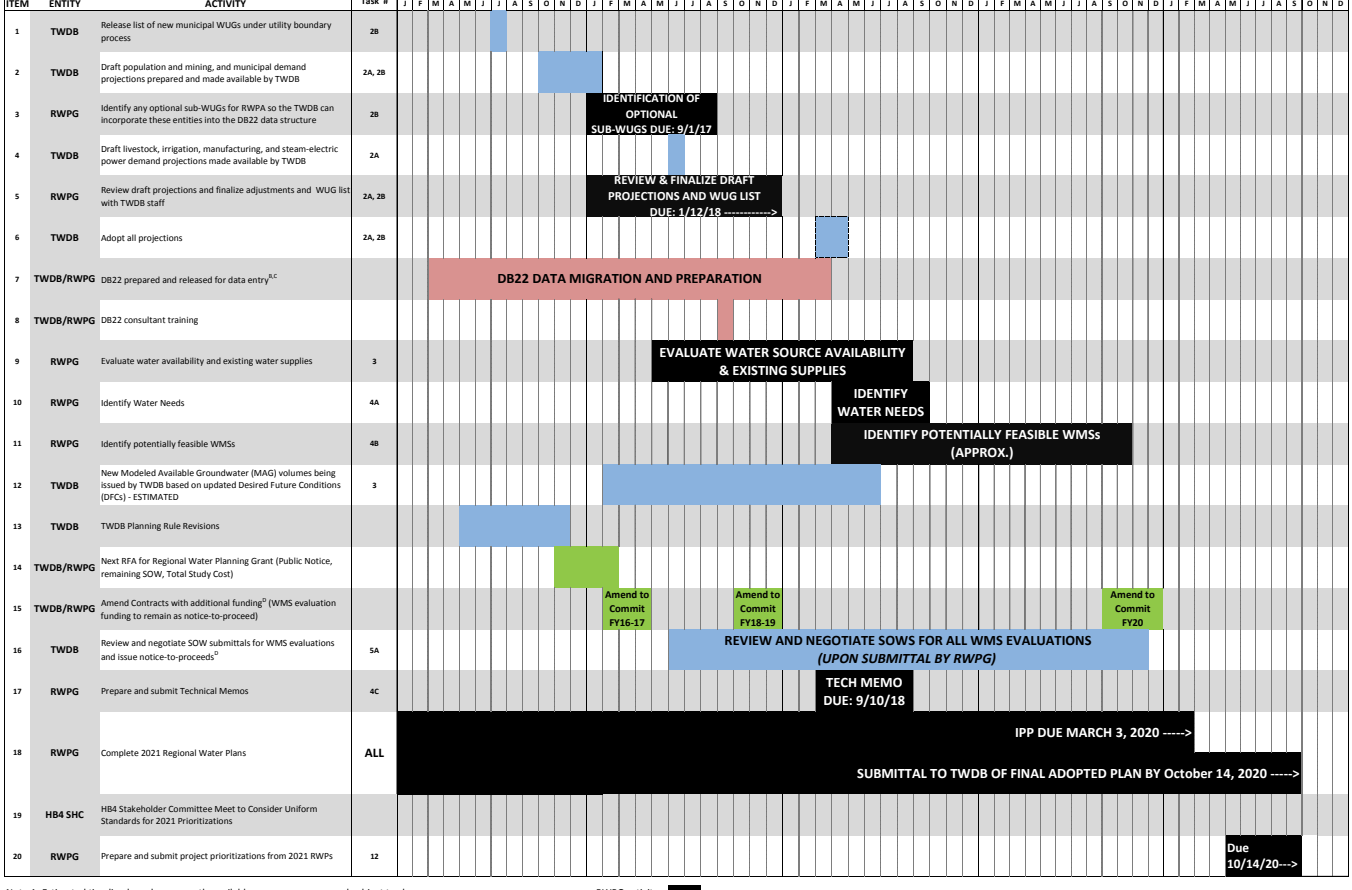
Consistent with 1st amended general guidelines for 5th cycle of RWP development (April 2017)

- Costs in Sept 2018 price indices
- Interest during construction is 3% ROI is 0.5%
- Annual interest is 3.5%
- Energy costs at $0.08 per kilowatt hour

July 2017

Working Schedule: Fifth Cycle of Regional Water Planning [A]

ITEM	ENTITY	ACTIVITY	Planning Task #
1	TWDB	Release list of new municipal WUGs under utility boundary process	2B
2	TWDB	Draft population and mining, and municipal demand projections prepared and made available by TWDB	2A, 2B
3	RWPG	Identify any optional sub-WUGs for RWPA so the TWDB can incorporate these entities into the DB22 data structure	2B
4	TWDB	Draft livestock, irrigation, manufacturing, and steam-electric power demand projections made available by TWDB	2A
5	RWPG	Review draft projections and finalize adjustments and WUG list with TWDB staff	2A, 2B
6	TWDB	Adopt all projections	2A, 2B
7	TWDB/RWPG	DB22 prepared and released for data entry[B,C]	
8	TWDB/RWPG	DB22 consultant training	
9	RWPG	Evaluate water availability and existing water supplies	3
10	RWPG	Identify Water Needs	4A
11	RWPG	Identify potentially feasible WMSs	4B
12	TWDB	New Modeled Available Groundwater (MAG) volumes being issued by TWDB based on updated Desired Future Conditions (DFCs) - ESTIMATED	3
13	TWDB	TWDB Planning Rule Revisions	
14	TWDB/RWPG	Next RFA for Regional Water Planning Grant (Public Notice, remaining SOW, Total Study Cost)	
15	TWDB/RWPG	Amend Contracts with additional funding[D] (WMS evaluation funding to remain as notice-to-proceed)	
16	TWDB	Review and negotiate SOW submittals for WMS evaluations and issue notice-to-proceeds[D]	5A
17	RWPG	Prepare and submit Technical Memos	4C
18	RWPG	Complete 2021 Regional Water Plans	ALL
19	HB4 SHC	HB4 Stakeholder Committee Meet to Consider Uniform Standards for 2021 Prioritizations	
20	RWPG	Prepare and submit project prioritizations from 2021 RWPs	12



Note A: Estimated timeline based on currently available agency resources and subject to change
Note B: DB22 is the updated, online water planning database for the 2022 State Water Plan
Note C: Anticipated database availability dates are estimates based on currently available agency resources
Note D: Subject to available funding

RWPG activity =
Contracting activity =
TWDB activity =
Database activity =

Appendix

Résumés

Peter Newell, PE

Project Manager

Peter is a water resources engineer with expertise in developing hydraulic models, water supply planning and engineering studies. His experience includes network modeling and analysis of distribution systems, sewer collection systems; pump sizing; river and reservoir modeling. Engineering studies include regional water supply planning and cost estimating, WAM analysis, wastewater salinity studies, groundwater exchange projects, conjunctive use strategies, reclaimed water studies, and water sustainability studies.

EDUCATION
M.S., Civil & Environmental Engineering, Arizona State University

B.S., Environmental Sciences/Studies, Wheaton College of Illinois

REGISTRATIONS
Professional Engineer, Texas, No. 108054, 2011

INDUSTRY TENURE
18 years

HDR TENURE
10 years

RELEVANT EXPERIENCE

Brazos G 2011, 2016 & 2021 Regional Water Plan, TX. Peter was project engineer for the development of a comprehensive water plan for 37 counties in Texas. The plan included determining existing and future surface water and ground water supplies, evaluating multiple new water management strategies, developing water plans for over 200 water user groups, and developing the 2011 and 2016 Regional Planning document that will be used by the state to develop the state water plans. He was responsible for developing water management strategies including needs analysis, WAM modeling, development of costs, and evaluation of impacts. He assisted in the development and presentation of the initially prepared and the final adopted plan.

2011 & 2016 South Central Texas Regional Water Plan, TX. Peter was a project engineer for the comprehensive water plan for 22 counties in south central Texas region. He evaluated a number of water management strategies for the Plan. Tasks included updating costs, calculating all hydraulics associated with proposed pipeline routes, determining the most cost-effective option for different variables for the proposed project, and developing project descriptions.

TWDB Unified Costing Model for Regional Water Planning, TX. Peter was involved in the development of a planning level costing tool to be used by all regional water planning groups during the development of the 2016 Regional Water Plans. The Unified Costing Model (UCM) allows users to quickly develop and compare cost estimates for water projects using costs based on empirical costing data. The UCM includes unit cost tables developed for pipelines, pump stations, water intakes, water storage tanks, treatment plants, and groundwater wells.

Hays County Water and Wastewater Facility Plan, TX. Peter was a project engineer for development of a facility plan to meet future needs for eastern Hays County. He coordinated with regional water planning efforts to develop supplies and infrastructure necessary for projected demands. He analyzed population trends and alternative development scenarios based on County ordinances, groundwater restrictions, and costs. Study participants included County commissioners, water utilities, municipalities, river authorities and the TWDB.

2013 / 2018 Strategic Water Supply Plan for City of Lubbock. Peter was project engineer to provide water supply evaluation for the City's Plan considering the next 100 years. He developed costs for infrastructure, other project costs and the annual operation for the City's reuse, groundwater and surface water strategies.

Mid Basin Water Supply Project, TX. Peter provided lead engineering to support the Guadalupe-Blanco River Authority (GBRA) for the Mid-Basin Water Supply Project (MBWSP), a sustainable water management strategy intended to meet the needs of rapidly growing communities and future growth areas in Central Texas. Water sources and facilities associated with the MBWSP include groundwater, surface water, well fields, river intakes, water treatment, aquifer storage and recovery (ASR), pump stations, transmission pipelines, and/or integration of existing GBRA water sources and facilities. As each of these sources and facilities has the potential to bring significant water supplies to existing and future customers, HDR and the team worked with GBRA to identify the most feasible project and phasing of project facilities (based on cost of water, reliability, permitting considerations, environmental impacts, customer growth patterns, and other factors) to meet customer needs.

Dallas Long Range Water Supply Plan, TX. Project engineer involved reviewing current water conditions and new water strategies to meet water demands through 2070. Study included evaluation of the population and water demand projections, water conservation impacts on demand planning, development plans and land use assumptions for the current planning area, future potential water supply sources and associated risks, comparison of alternative supply sources, identification of treatment facilities and distribution infrastructure needs, and to recommend a plan of action that will allow the DWU to provide for the needs of its customers up to the year 2070 and possibly beyond.

Direct Potable Reuse Implementation Feasibility Study, Lubbock TX. Project manager for HDR involved in the development of DPR strategies as potential water supply to offset growing demands. Study included evaluation of brine concentrate disposal, energy requirements, potential for renewable energy, and development of costs for required infrastructure.

EDUCATION
B.S., Civil Engineering, University of Texas, Austin

REGISTRATIONS
Professional Engineer, Texas, No. 93972

INDUSTRY TENURE
20 years

HDR TENURE
19 years

Troy St. Tours, PE

Project Manager | QA/QC

Troy's background is in water resources, planning, hydraulic design, and construction. He also has extensive experience in the design and construction of a variety of private and municipal water treatment and supply projects, and he is skilled at leading multidiscipline teams on complex projects for traditional and alternative delivery.

RELEVANT EXPERIENCE

Guadalupe-Blanco River Authority (GBRA) Panda Energy Project. Project Engineer. Prepared plans and specifications for facilities that would pump water from Lake Dunlap to a newly constructed PANDA Energy Power Plant. The facilities included river intake screens, a wet well, a 7.8 MGD pump station, chemical facilities, and an emergency generator facility with bulk fuel storage, and a 6-mile 24-inch transmission line.

City of Waco, 20-inch Submarine Water Supply Transmission Line Crossing Lake Waco. Project Manager. Prepared plans and specifications for installing approximately 7,400 LF of potable water transmission line across Lake Waco for supplying water west of the lake. The project was initially designed as a submerged pipeline, however during construction the installing contractor proposed installing the transmission line by horizontal direction drill (HDD) instead of the submerging the pipeline. HDR developed the HDD requirements for installing the pipeline and reviewed the contractor's plan and worked with the contractor to ensure all requirements would be met with the installation. The pipeline was successfully installed across Lake Waco using HDD technology.

City of Killeen, Lift Station No. 23 Expansion. Project Manager. Prepared plans and specifications for constructing a new lift station and approximately 5,800 LF of force and gravity mains. The new lift station will be constructed adjacent to an existing lift station, which will remain in service. Flows into the site will feed the new and old lift stations, which will then be discharged to different locations. The new and existing lift stations will operate as a common/single lift station.

City of Leander, Old 2243. Waterline Design Manager. HDR developed a plan for relocating the affected waterlines to eliminate the conflicts and provide for better accessibility for future maintenance and repairs as part of the Old 2243 roadway expansion project.. The waterline improvements included relocating lines to ovoid obstacles at numbers locations ranging in size from 6" to 24" and installing 1,560' of 8" and 4,700 of 12" waterlines. The project also included installing a 1,100' gravity sewer line extension.

City of San Marcos, Loop 82 Union Pacific Railroad Overpass Project. Waterline design manager. As a result HDR developed a plan for relating the affected waterlines to eliminate the conflicts and provide for better accessibility for future maintenance and repairs. The waterline improvements included relocating 6" and 8" waterlines with approximately 4,900 LF of 12" and 800 LF of 8", 6" and 4" waterlines. This work was coordinated to prevent impacting access and services to Texas State University's Bobcat Village and Bobcat Stadium.

Industrial Waste Collection, Conveyance and Disposal, Heckmann Water Resources. Pipeline Project Manager for a comprehensive turnkey design-build delivery project that includes over 45 miles of pipeline system, two booster pumps stations, disposal facilities, and system controls. In this fast-track project, HDR provided preliminary engineering, environmental studies, right-of-way (ROW) assistance, control strategies development, and final design, construction, and contractor services.

Johnson County Special Utility District, Cleburne, Texas, 24-in Water Transmission Line. Project Manager. Currently preparing a Technical Memorandum for use in finalizing one pipeline route and acquiring easements for approximately 13 miles of 24-inch diameter waterline. The work included performing a field route analysis to determine the most cost effective alignment based on right-of-way conflicts, environmental protection, and overall constructability, including coordination with natural gas drilling and delivery companies expanding locally.

City of Round Rock 48" East Transmission Line Phase 1. Project Manager for Construction Administration. The project included designing and constructing 8,000 LF of 48" water transmission line to provide water to the growing east side of Round Rock. Unique aspects of the project include major pipeline bores across the Georgetown Rail Road, Texas Crushed Stone plant entrance, and IH-35 main lanes and frontage roads (total bore length of about 1,150 LF), and a live-tap connection to the main 42" waterline leaving the City's water treatment plant. The project included coordination and approval with TxDOT, adjacent businesses, and Williamson County.

EDUCATION
M.S., Civil Engineering, Texas A&M University

B.S., Civil Engineering, University of Nevada - Reno

REGISTRATIONS
Professional Engineer, Texas, No. 82630

INDUSTRY TENURE
26 years

HDR TENURE
18 years

David Dunn, PE

Integrated Water Planning Senior Project Manager | QA/QC

David has focused his professional career on water supply issues in Texas. He works closely with clients supporting their efforts to increase the reliability of their water supplies, leading HDR's staff in providing hydrologic and engineering analyses of alternative supplies, strategic planning, and technical support for water supply planning and water rights permitting. His project experience has focused on planning and permitting of water supply systems, and he has completed numerous hydraulic and hydrologic evaluations of water supply systems, ranging from riverine sediment transport to river basin-scale reservoir systems analysis. David assists clients with obtaining water rights and the federal permits required to develop water supplies, and he has successfully led the multi-disciplinary teams those efforts require. He has served as a hydraulics instructor at the National Training Center of the U.S. Geological Survey.

RELEVANT EXPERIENCE

Brazos G Regional Water Plans – 2006, 2011, 2016 & 2021, Texas Water Development Board/Brazos River Authority, TX. As Project Manager, David supervised the development of the 2006, 2011 and 2016 Brazos G Regional Water Plans, and is supervising the development of the 2021 Plan. He has been responsible for directing staff in analyses of surface and ground water availability using the Brazos River Basin WAM, and the numerous Groundwater Availability Models (GAMs). David supervised and personally performed evaluations of various water management strategies involving both surface and ground water, and conjunctive use of both sources, as well as wastewater reuse. He has been responsible for presenting technical information to the Regional Water Planning Group at public meetings and in final reports presenting the 2006, 2011 and 2016 Plans.

City of Lubbock, TX. As Project Manager, David has performed and supervised the analysis of various water supply alternatives for the City, and provided consulting services regarding water rights permitting and negotiations with other entities regarding the City's plans. Recently, David supported the City in developing the City's 2013 Strategic Water Supply Plan. David has assisted the City during coordination with the Region O Water Planning Group during the development of the 2006, 2011 and 2016 regional water plans, including providing technical assistance to the Region O technical consultant during the development of the 2016 Plan.

City of Lubbock, TX. As Project Manager, David supervised the evaluation of Aquifer Storage and Recovery (ASR) as a future water supply strategy for the City. David led a project team of HDR staff and three consultants in evaluating the hydrogeologic suitability of three available aquifer systems, quantifying sources of supply available for ASR, and identifying, evaluating and ranking various alternative ASR projects.

City of Lubbock, TX. As project manager, completed a feasibility analysis of the proposed Lake 7. Project scope included initial geotechnical and geologic investigation, environmental sampling and characterization of habitat, waters of the U.S., and threatened and endangered species, and alternative project sizing. He has assisted the City with water rights permitting for the project, which included determining channel losses downstream of project locations.

City of Lubbock, TX. As Project Principal, David is part of a consulting team evaluating the feasibility of Direct Potable Reuse as a future water supply for the City.

City of Lubbock, TX. As Project Principal, David is part of a team evaluating brackish groundwater and development of a test well in the Dockum Aquifer south of Lubbock.

Confidential Client, TX. As Project Manager, David summarized groundwater, surface water and reclaimed water sources in a 51-county area in west Texas and southeastern New Mexico for a client evaluating the development of a water system to serve oil and gas development activities in west Texas and eastern New Mexico.

Confidential Client, TX. As Project Manager, supervised the analysis of multiple water supply options to meet the future water demands of a multi-city consortium. Sources evaluated included surface water, groundwater and reuse alternatives. Strategies involved pipelines to transmit water from potential supply sources to the cities, including alternative potential pipeline routes and alignments.

Texas Commission on Environmental Quality, TX. As Project Manager, David developed the water availability models (WAMs) for the Brazos River Basin and the San Jacinto-Brazos Coastal Basin, Nueces River Basin and Guadalupe-San Antonio River Basin for the TCEQ Senate Bill 1 Water Availability Modeling Project. He developed a yield version of the WRAP model to facilitate yield analyses at 46 major reservoirs in the basin. David directed the day-to-day activities of project staff and was responsible for all aspects of the project, including data set development, model simulations and summaries, and report preparation.

EXPERIENCE
13 years

EDUCATION
M.S., Biological and Agricultural Engineering, Texas A&M University

B.S., Agricultural Engineering, Texas A&M University

REGISTRATIONS/CERTIFICATIONS
Professional Engineer,
GA #041712

Professional Engineer,
TX #100102

JASON AFINOWICZ, P.E.

WATER RESOURCES PLANNING/ ASSOCIATE

Jason Afinowicz is a Project Manager in FNI's Water Resources Group. He has a wide variety of water resource planning experience, including management of the 2006, 2011, and 2016 Region H Water Plans, and the 2006 and 2011 Region P Water Plans. His technical experience includes the development of long-term demand projections for municipal, industrial, and agricultural use, development and evaluation of water management strategies including impacts on environmental flows and development of reclaimed water strategies. Jason has also performed infrastructure supply planning for the North Fort Bend Water Authority and the North Harris County Regional Water Authority surface water conversion programs. He has also assisted in the development of water conservation and drought contingency plans for various wholesale water providers and provided long-range evaluation of potential water supply alternatives. His additional experience includes cost analysis, hydraulic modeling, and TWDB planning and infrastructure funding programs.

RELEVANT EXPERIENCE:

2016 Region H Water Plan | Region H Regional Water Planning Gr | Project Manager, Project Team
Water resources planning engineering for the Region H Water Planning Group, including water demands projections, supply analysis, water management strategy analysis and evaluation, and conceptual level cost estimation.

Raw Water Supply Master Plan | San Jacinto River Authority | Project Manager
This Master Plan will provide guidance for making long-term raw water supply decisions through the analysis of future demands, existing supplies, and identified future supply projects required to meet identified needs. Demand analysis consisted of a review of various demand scenarios based on projections and potential changes to groundwater regulation and future conservation measures. Supply analyses included not only a baseline estimate of existing supplies identified as currently available from accepted state water models but also included the potential variability of such available supplies which may be predicted as a result of climate change models. The study also investigated potential water supply options for mitigating or eliminating any identified supply shortfalls through a study of alternative supply strategies including alternative benefits, financial costs, and potential risks.

Future Water Supply Studies | Gulf Coast Water Authority | Project Manager
Identification of water supply strategies with alternatives and constraints to allow the Gulf Coast Water Authority to establish an understanding of the available alternatives and form a consensus to focus future comprehensive studies. This project includes a high-level analysis of over 30 different strategies by FNI along with GCWA staff and leadership in order to prioritize the most viable alternatives for detailed analysis. This detailed analysis includes the evaluation of reservoir storage, reclaimed water use, and interbasin transfers as potential means to provide a long-term water supply solution for the authority.

Long-Range Water Supply Plan | City of Liberty | Project Team
Water supply study for the City of Liberty that includes the following services: population and water demand projections, wastewater reuse development feasibility, groundwater and surface water supply assessment, water distribution improvements to incorporate long-term water supplies, and development of a phased long-term Capital Improvements Plan.

EXPERIENCE
11 years

EDUCATION
M.S., Water Management and Hydrological Science, Texas A&M University

B.S., Renewable Natural Resources, Texas A&M University

JEREMY RICE

HYDROLOGIST

Jeremy Rice is a Hydrologist with extensive water resources experience. His background includes hydrologic modeling using applications, such as the Water Rights Analysis Package (WRAP) and RiverWare. Jeremy has worked on population estimates, demand estimates, water supply analyses and strategy evaluations for Regions A and F as part of the regional water planning process for the Texas State Water Plan. He has also participated in water supply analyses for Regions B, C, E, Brazos G and I. He has experience in municipal water conservation, including water conservation and drought contingency plans, program development and cost-benefit analysis.

RELEVANT EXPERIENCE:

Unified Costing Tool | Texas Water Development Board | Project Team
Developed unit cost tables used in estimating water management strategy cost for developing Texas regional water plans. Testing and debugging of costing tool to verify operating functionality.

Water Use Data Work Plan | Texas Water Development Board | Project Team
The purpose of this project is to research and develop the TWDB FY 15 Water Use Data Work Plan. The Plan will recommend the processes and tools to enable TWDB to collect more accurate and comprehensive water use data, and will be used to apply for Federal funds, through USGS, to implement the recommendations. A project of this type has never been performed by FNI or anyone else in Texas; it will enable the State to better assess its consumptive water use as it plans for future supplies, and will also allow more accurate reporting to the USGS as they compile national water use statistics.

Regions A, B, C, E, F, G, H, and I 2011, 2016 Water Plans| Project Team
Primary author of water supply strategies for regional water planning study. Project included development of strategies for conservation, surface water reservoirs, reuse, groundwater development, brackish groundwater desalination, and conjunctive use.

Water Conservation Plan Update | City of Fort Worth | Project Manager
Update of the City's five-year water conservation plan to meet TAC Chapter 288 Requirements. This update included standard operating procedure for reporting to the state, landscape water management and coordination with regional providers and wholesale customers.

Water Supply Plan | City of Wichita Falls | Project Team
FNI helped Wichita Falls navigate through the worst drought in recent times by developing a Long-Range Water Supply Plan. This plan outlined the path forward for the City to secure reliable water supplies for the future. The plan included a decision matrix to help guide the City in implementing the most cost effective projects in a timely manner.

Impaired Groundwater Study | Intera, Inc | Project Team
Feasibility study for adding impaired groundwater to the Tarrant Regional Water District's and the City of Wichita Falls' water supply systems to increase supplies during droughts. Included evaluations of potential groundwater sites, chemical modeling of groundwater/surface water blending and cost evaluations.

MARK GRAVES, P.E.

PROJECT MANAGER

Mark Graves, P.E. is a Project Manager with 20+ years of experience in the planning, design, construction administration, start-up, process optimization, and operations assistance of water and wastewater infrastructure for new and rehabilitated facilities.

EXPERIENCE
21 years

EDUCATION
M.S., Civil Engineering, University of Texas at Austin

B.S., Civil Engineering, Auburn University

REGISTRATIONS/CERTIFICATIONS
Professional Engineer,
OK #23820

Professional Engineer,
TX #90151

AFFILIATIONS
AWWA, State Mentoring Committee

AWWA, Capital Area Chapter Chair of Seminar Committee

AWWA Membrane Standards Committee

AWWA Disinfectants Standards Committee

Water Environment Federation

Water Environment Association of Texas

South Central Membrane Association

RELEVANT EXPERIENCE:

Water Treatment Engineering| New Braunfels Utilities | Project Manager
Manage water quality sampling/testing, bench testing, pilot study and treatment facilities selection/design/construction for new 4 MGD membrane filtration plant treating to surface water requirements.

Temporary Membrane Treatment System | New Braunfels Utilities | Project Manager
Manage design, construction, and startup of 1.3 MGD temporary membrane filtration facility treating Trinity Aquifer groundwater to surface water requirements.

ON Stevens WTP Improvements and CT Study| City of Corpus Christi | Senior Engineer
Improvements to existing WTP including preliminary design, final design and construction phase services addressing modified raw water influent infrastructure to increase the plant flow rate from 167 MGD to 194 MGD.

Reuse Facility| City of Kerrville | Senior Engineer, QA/QC
Design of treatment plant modifications for 5 MGD reuse water supply including new distribution pumping and chlorine facilities.

Unified Costing Tool | Texas Water Development Board | Senior Engineer*
Developed cost estimating methodology and automated spreadsheet for use by regions in developing Texas regional water plans. Compiled information on water treatment plant capital and operations costs and prepared cost tables for treating groundwater, surface water, wastewater reuse, and brackish and seawater desalination.

Region L 2001, 2006, 2011, 2016 Water Plans| San Antonio River Authority | Task Leader*
Primary author of water supply strategies for regional water planning study. Project included development of strategies for seawater desalination, brackish groundwater desalination from coastal aquifer, and brackish groundwater desalination from Bexar County aquifer.

Region N 2001, 2006, 2011, 2016 Water Plans| Coastal Bend Region N | Task Leader*
Led the evaluation of several water management strategies in the Regional Water Plan including brackish groundwater blending and desalination, seawater desalination and direct raw water supplies to industrial users.

EDUCATION
M.S., Civil Engineering, Texas A&M University

B.S., Mechanical Engineering, Texas A&M University

REGISTRATIONS
Professional Engineer, Texas #84024

Oracle Certified Java Programmer, 2001

INDUSTRY TENURE
22 years

HDR TENURE
1 year

Bill Thaman, PE

Business Systems Analyst | Model Enhancements

Bill has more than 22 years of experience in data management, software design and development, and water resources engineering. His civil engineering experience includes performing water supply feasibility studies, regulatory studies, and stormwater analysis and design. In addition, Bill has designed and developed web and GIS applications for state and local government agencies, and has significant experience in GIS workflow automation, database management systems, Microsoft Excel customization, and programming.

RELEVANT EXPERIENCE

Rinconada Reliability Improvement Project – Data Management Application, Santa Clara Valley Water District, San Jose, CA. Design and development of software application to manage construction phase electronic Operations and Maintenance submittals and automate the loading of equipment data into the District's Enterprise Asset Management System (Maximo). Authored requirements specifications document, and developed highly customized Microsoft Excel Equipment Summary Sheet (ESS) application used by the construction contractor to record data for all installed equipment at the Rinconada Water Treatment Plant. Excel Visual Basic for Applications (VBA) was used extensively to dynamically modify workbook content based on user selections, perform dynamic data validation with dropdown lists, and create data consistency checks. Menus were created in the Excel ribbon to execute custom functionality.

Dam Safety Monitoring Program Data Management System, San Jacinto River Authority, Conroe, TX. Designed and developed a Microsoft Excel application to serve as the system's primary data repository and to provide data analysis and visualization. Specialized Excel macros and user forms were developed to ensure data integrity, improve efficiency, analyze collected data for immediate feedback, and dynamically create and export up-to-date geographic annotation and visualization files structured for display in Google Earth. Everything is automated within the workbook, including transformation of piezometer time series data into Keyhole Markup Language (kml) format, formatting of data to alert the end user of potentially unsafe water levels, charting of time series data, and launching of Google Earth -- the end user is responsible for data entry only, and does not need any special skills to use the system.

Mid-Basin Water Supply Project Study, Guadalupe-Blanco River Authority (GBRA) – Development of an Engineering Feasibility Report for the Mid-Basin Water Supply Project (MBWSP) with financial assistance through the Texas Water Development Board. The MBWSP will bring new potable water supplies to rapidly growing communities and future growth areas along the IH35 and Tx130 corridors. Sources of water include surface water, groundwater, and Aquifer Storage and Recovery (ASR). The TWDB Unified Costing Model used extensively to develop project costs.

Region K Regional Water Plan, Lower Colorado Regional Water Planning Group, Austin, TX. Project Manager for the Lower Colorado Region 2011 Regional Water Plan (RWP) being prepared for the Texas Water Development Board in two phases. The RWP identifies water supply needs for Water User Groups throughout the Region and identifies water management strategies to address those needs. Components of the first phase of the study include evaluation and adoption of the Water Availability Model (WAM) to be used for the plan, evaluating the impact of water management strategies on environmental flows, and an analysis of high-growth areas in the planning region. The second phase involves adjustments to population, water demands, availability, and supplies to determine changes in needs.

Pricing Optimization Visualization Application, Zilliant, Austin, TX. Developed Microsoft Excel application which received pricing test case data as input, and automatically created summary tables, standard bar charts, embedded pie charts, trendline charts with regression equations, bar charts with error bars and data tables, and stand-alone pie charts for use by pricing managers. Programmed sophisticated macros that made extensive use of class modules, and which was able to handle a broad range of pricing data scenarios with no user intervention required.

GIS-Based Decision Support Tool, Tarrant Regional Water District, Fort Worth, TX. Developed a GIS-based decision support tool for use by TRWD staff and consultants to evaluate potential ASR sites based on proximity to existing customer water treatment plants, parcel type, well spacing, groundwater quality, potential ASR injection/recovery rates, and project cost. The tool was developed as an ArcMap command button in VB.NET, with a Windows form GUI. Geoprocessing and map manipulation is performed through ArcObjects, and classes were created to handle integration with an MS Excel-based costing tool, and with a SQLite database. Output for each customized model execution was a pdf report with maps and cost sheets for each potential project location.

Grady Reed

Hydrologist | Model Enhancements

Grady's background is in hydrology and water resources planning and management. He has been involved in the development of the 2001, 2006, 2011 and 2016 Regional Water Plans for the Brazos G, South Central, Coastal Bend, and Llano Estacado Regional Water Planning areas. For these plans, his involvement has included developing population and water demand projections, water supply projections, and developing water supply plans for entities facing a water need. Grady also has experience in water loss control and water conservation studies.

EDUCATION
M.A.G., Environmental & Natural Resources Management, Texas State University - San Marcos

B.S., Hydrology/Water Resources, Tarleton State University

INDUSTRY TENURE
16 years

HDR TENURE
16 years

RELEVANT EXPERIENCE

Brazos G Regional Water Plan (2001, 2006, 2011 & 2016), Brazos River Authority, TX. Grady assisted in the development of water supply elements for the Regional Water Plan for the 37-county Brazos G Region. His responsibilities included analyzing population and water demand projections, analyzing the current water supplies available in the region, and evaluating water needs in the region.

South Central Texas Regional Water Plan (2001, 2006, 2011& 2016), San Antonio River Authority, TX. Grady assisted in the development of the 21-county South Central Texas Regional Water Plan. His responsibilities included drafting an area description, analyzing population and water demand projections, analyzing the current water supplies available in the region, and evaluating water needs in the region. He also participated in developing a water supply plan for each entity with an identified need. Furthermore, Grady participated in development of the methodology for evaluation of annual unit costs for drought management and its integration into the Unified Cost Model.

Llano Estacado Regional Water Plan (2001, 2006 & 2011), High Plains Underground Water Conservation District, TX. Grady assisted in the development of the 21-county Llano Estacado Regional Water Plan. His responsibilities included drafting an area description, analyzing population and water demand projections, analyzing the current water supplies available in the region, and evaluating water needs in the region. He also participated in developing a water supply plan for each entity with an identified need.

Coastal Bend Regional Water Plan (2001, 2006, 2011 & 2016), Nueces River Authority, TX. Grady assisted in the development of the 11-county Coastal Bend Regional Water Plan. His responsibilities included analyzing population and water demand projections, analyzing the current water supplies available in the region, and evaluating water needs in the region. He also participated in developing a water supply plan for each entity with an identified need.

San Antonio River Authority, TX. Grady was responsible for completing a review of population and water demand projections for approximately 30 entities as part of the regional water planning process. As part of this study, historical trends in population and per capita water use were analyzed to determine if any of the entities needed to request a population and/or water demand revision from TWDB.

Lower Colorado River Authority, TX. Grady evaluated potential farm-level and regional economic effects of a change in the price of irrigation water to the rice farming area.

San Jacinto River Authority Conservation Plan, San Jacinto River Authority, TX. Grady updated and revised the Authority's Drought Contingency Plan to be included in the Water Conservation Plan. This included defining triggering criteria for initiation and termination of response stages, describing drought indicators, and identifying supply and demand management measures.

Water Conservation Plan, City of Stephenville, TX. Grady updated the City's Water Conservation Plan as part of a TWDB grant application. This included setting a per capita water use reduction goal and determining water conservation strategies to meet this goal.

Water Conservation Plan, City of Lubbock, TX. Grady developed revised Water Conservation and Drought Contingency Plans for retail, wholesale, and irrigation use. The plans were in response to new TCEQ rules.

Trinity River Authority, Arlington, TX. Grady developed revised Water Conservation and Drought Contingency Plans for the Tarrant County Water Supply Project, Joe Pool Reservoir, Navarro Mills Reservoir, and Bardwell Reservoir service areas. The plans were in response to new rules enacted by TCEQ.

Upper Neches Municipal Water Authority, Palestine, TX. Grady was responsible for working with the Authority to develop 5- and 10-year per capita water use goals. He was also responsible for revising the Authority's water conservation and drought management plan to conform to new rules enacted by TCEQ.

Brazos River Basin Water Availability Model, TCEQ, TX. Grady was responsible for tasks related to the development of demand distributions, return flow values, and modeled water rights. He executed the Water Rights Availability Package Model for the different run assumptions and summarized output data from the model runs. He also performed yield calculations for over 40 reservoirs located within the basin.

James Dwyer, PE

Water Resources Engineer | Model Enhancements

In the course of his 32 year career, James has played a key role in a wide variety of both groundwater related projects. His experience includes the full range of water supply and wellfield development projects, from analysis, design, and permitting through construction and rehabilitation. He has also performed and managed numerous groundwater flow modeling efforts for water supply, groundwater contamination and wellhead protection projects. His expertise in well design was recognized by his service on the Standard Development Task Groups for Well Plumbness and Alignment and Testing for Performance for the National Water Well Association.

EDUCATION

M.E. Civil Engineering, Texas A&M University

B.S. Civil Engineering, Texas A&M University

REGISTRATIONS

Professional Engineer, Florida, No.43274

Professional Engineer, Texas, No.81814

Diplomat, Water Resources Engineer, No. 181

LEED Green Associate®, No. 10649500

INDUSTRY TENURE

32 years

HDR TENURE

1 year

RELEVANT EXPERIENCE

Regional Water Development, Groundwater Wellfield Feasibility Assessment, Senior Consultant. James served as the Senior Technical Advisor for the groundwater component of the Plan of Study for the LCRA-SAWS Water Project. The purpose of the precedent-setting interbasin transfer project was to help satisfy long-term water needs in both the Colorado River basin and the San Antonio area while fostering good stewardship of the environment. Water sources included surface water development in off-channel reservoirs (150,000 acre-feet), conjunctive use of groundwater (62,000 acre-feet), and agricultural conservation (118,000 acre-feet). James was responsible for the groundwater study scope development, review of consulting team deliverables, and coordination with the other study teams, the Technical Advisory Group, a Science Review Panel of national technical experts, and the general public. The studies defined in this process supported answering seven legislative required findings and future project permitting over a 6 year study period.

City of Bastrop, Texas, Water Supply Evaluation, Senior Water Resources Engineer. CH2M assisted the City of Bastrop, Texas, with evaluating the quality and reliability of Simsboro aquifer rights offered for purchase to the City. James supervised the initial groundwater modeling to predict 50-year water levels at proposed production wells. He also supervised construction oversight and testing of a new monitor well to bracket produced water quality and aquifer transmissivity, which were critical to establishing a value for the supply.

Confidential Power Generator, Brackish Groundwater Desalination Market Assessment, Senior Water Resources Engineer. James worked with a diverse team to develop potential projects to serve growing demands for municipal supply in El Paso, Midland/Odessa, the lower Rio Grande Valley, Corpus Christi, Fort Bend County, and the lower Rio Grande Valley. For each potential market, he identified and quantified the most suitable brackish water sources to address the need for additional supply identified in the 2012 Texas Water Plan and worked with the treatment experts to determine expected finished water volumes. James then prepared Class V cost estimates for the raw water and concentrate disposal infrastructure as part of an estimate of fished water cost. Capital, operation and maintenance costs were itemized separately in the study.

Confidential Multinational Energy Company, Groundwater Availability Study, Senior Water Resources Engineer. A multination energy company was developing land for growing energy cane as a feedstock for a future ethanol plant in east Texas. The energy cane requires periodic irrigation to maximize the yield. Surface water, the primary source of irrigation water, was forecasted to be severely curtailed during an ongoing drought. James managed an expedited feasibility study to look at on-farm groundwater resources that could be quickly developed to augment diminished surface water supplies for irrigation. The study provided a brief assessment of the quality, quantity, and cost to develop groundwater beneath selected properties in Liberty and Jefferson Counties, Texas. Life cycle costs for the wells and surface facilities included O&M and accurately reflected escalated drilling prices associated with coincident shale energy development in the Eagle Ford in southwest Texas.

City of Fredericksburg, Texas, ASR and Bank Filtration Feasibility Study, Senior Water Resources Engineer. Mr Dwyer managed the drilling and testing, and subsequent feasibility analysis for a back filtration project for Fredericksburg, Texas. The concept developed by CH2M was to use the natural filtration capacity of the shallow alluvial aquifer to treat surface water from the adjacent Pedernales River, thereby reducing treatment costs and improving the baseline quality and reliability of the source water. The exploration program included five shallow geotechnical borings, the results of which were used to select a representative prototype site. Results of aquifer testing indicated significant reductions in suspended solids, nutrients, and biological constituents.

Zachary “Zach” Stein, PE

Water Resources Engineer | User’s Guide & Test Team

Zach's experience is focused primarily in water resources engineering and he specializes in hydrology and hydraulics, surface water permitting, and long range planning. Zach provided support in the development of the original TWDB unified costing model has extensive experience using the tool to develop planning level cost estimates. In addition, Zach has experience using analysis and modeling tools such as WRAP, RiverWare, FRAT and original spreadsheet models.

EDUCATION
M.E., Civil Engineering, Texas A&M University

B.S., Civil Engineering, Texas A&M University

REGISTRATIONS
Professional Engineer, Texas, No. 106331

INDUSTRY TENURE
11 years

HDR TENURE
11 years

RELEVANT EXPERIENCE

2014 Texas Water Development Board – *Unified Costing Model.* Zach researched and assembled construction bid tabulations for pump stations and transmission pipelines to derive cost curves utilized by the model. He assisted in the development of the programming code embedded within the model for hydraulic and costing calculations of pump stations and large diameter transmission pipelines. In addition, Zach conducted model tests to ensure calculations were being performed correctly.

2011 & 2016 Region N, L, and G Regional Water Plans. Zach assisted in the development of the 2011 & 2016 Coastal Bend (Region N), South Central Texas (Region L) and Brazos G (Region G) Regional Water Plans. Tasks during the plan formulation process included projecting water demands for water user groups, determining existing surface water and groundwater supplies, assessing water needs, evaluating water management strategies, and formulating a comprehensive water plan to meet those needs. In addition, Zach calculated existing surface water supplies on a monthly reliability basis for surface water rights and completed preliminary cost estimates for individual water management strategies using the TWDB unified costing model. The completion of the preliminary cost estimates included mapping of pipeline routes using GIS software, performing pipeline hydraulic calculations, and determining the most cost-efficient configuration of the individual water management strategies. He assisted in selecting possible off-channel reservoir sites for storage of additional water supplies. This task included developing elevation-area-capacity relationships using GIS applications and determined impacts to developed areas resulting from possible impoundment.

2014 Long Range Water Supply Plan –City of Dallas Zach updated Dallas’ existing reservoir yields utilizing Dallas’ RiverWare model developed by HDR while considering the 1950’s and 1908 droughts, reservoir sedimentation and existing and future wastewater flows from upstream treatment facilities. Additionally, Zach determined how various climate change scenarios will affect reservoir yields as a result of potential increases in evaporation and potential reductions in reservoir inflows. Zach identified and evaluated potential new reservoirs and off-channel reservoir sites, run-of-river diversions and the potential purchase of water from existing reservoirs owned or planned by others entities. Zach developed estimates of capital and life-cycle costs for these strategies using the TWDB unified costing model. Zach updated estimates of water availability for various watersheds considering urban development that has occurred within the watersheds since 1950. Zach refined Dallas’ RiverWare model to incorporate final decadal water demands, selected reservoirs, pump stations, transmission pipelines, new interconnections and other facilities that move water through the Dallas system on a monthly timestep in response to hydrologic inputs and user demands. The model was updated to help Dallas staff evaluate alternative operating plans to help evaluate energy use while increasing system reliability.

2018 Strategic Water Supply Plan –City of Lubbock As part of the long range plan, Zach updated and refined various surface water supply strategies. The update included the development of new planning level cost estimates and Zach utilized the TWDB unified costing model to complete this task. Cost estimates were developed for various infrastructure components including pipelines, pump stations, reservoirs and well fields.

EXPERIENCE
36 years

EDUCATION
B.S., Hydrology and Water Resources, Tarleton State University

JON ALBRIGHT

WATER RESOURCES PLANNING HYDROLOGIST/ ASSOCIATE

Jon Albright is Senior Hydrologist and Water Resources Project Manager whose experience and focus provides clients with an in-depth, accurate look at water supply opportunities and issues. An FNI Associate, he has wide-ranging experience in water supply planning and hydrologic modeling. He has participated in developing water supply strategies for Regions B, C, E, F, G and J. Jon has provided water supply analysis support to Regions A, B, C, E, F, G, H, I and J using the TCEQ WAMs. He participated in the development of water availability models (WAMs) of the Brazos, Trinity, Neches and San Jacinto-Brazos River Basins. He has used the Canadian, Red, Sulphur, Cypress, Sabine, Neches, Trinity, San Jacinto, Brazos, Colorado, Lavaca, Guadalupe-San Antonito and Rio Grande WAMs for a variety of projects.

RELEVANT EXPERIENCE:

Unified Costing Tool for Regional Water Planning | HDR, Inc. | Project Manager
As a subcontractor for HDR, oversaw FNI's portion for development of a standard tool for development of costs for regional water plan. FNI's primary responsibility was development of unit costs for incorporation in the tool.

2016 Far West Texas Regional Water Plan | LBG Guyton Associates | Project Manager
Responsible for updating existing and new strategies as part of the El Paso Integrated Water Management Plan using the UCM. Included costs for complex water import projects with multiple sources and phases, off-channel storage, reuse, water treatment plant expansions, and ASR.

2016 Region Water Plan, Regions B, C, F, G, H and I | Multiple Clients | Project Team
Continuing development of SB 1 regional water plans. Primarily responsible for water supply evaluations using water availability models and updating/review of costs for water management strategies. For the 2016 plan, this involved extensive use of the UCM.

Update Water Project Estimated Costs | Texas Water Development Board.
Update of costs for 18 water supply projects and 16 water conveyance projects for inclusion in Water for Texas, the state water plan.

Lavaca River Water Supply Project Feasibility Study | Lavaca-Navidad River Authority | Project Team
Engineering feasibility study to evaluate water supply options to develop an additional 10,000 acre-feet/year of water in Edna, Texas. The options were the Palmetto Bend Stage II dam and reservoir and two off-channel reservoir alternatives. The project involved WAM modeling, off-channel reservoir site selection, pipeline routing, alternative pump station capacity alternatives, and engineering cost analysis.

Water Supply Evaluation | City of Wichita Falls | Project Team
Development of a Long-Range Water Supply Plan for Wichita Falls to evaluate its water needs and provide recommendations for Wichita Falls to secure water supplies for the City's future. Assessed the potential strategies based on 10 criteria, including water quantity, water quality, reliability, potential cost, etc.; then performed a detailed analysis to recommend four supply scenarios to meet the City's water needs.

Long-Range Water Supply Plan | City of Irving | Project Team
Development of a Long-Range Water Supply Plan to identify water management strategies for incorporation into the 2016 Region C Water Plan. Evaluated 22 strategies as viable alternatives to meet Irving's water needs, using a decision-support tool with seven key criteria: cost, year online, reliability, autonomy, implementation difficulty, environmental considerations and new water.

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EXHIBIT B

SCOPE OF WORK

The CONTRACTOR shall update the current Uniform Costing Model (UCM) to correct bugs that were discovered during the fourth cycle of regional water planning, reflect more recent construction costs, reflect relevant updates to the regional water planning guidelines, and improve the functionality of specific modules. The Scope of Work includes the following tasks, listed in priority order:

A. Update UCM documentation consistent with planning guidance:
   1. Provide an update to the accompanying "Uniform Costing Model User's Guide" document (User's Guide) reflecting all relevant changes to each module of the Costing Model. The updated User's Guide will include an appendix documenting all changes and explaining how modules were evaluated and updated based on SOW tasks. After evaluation, if an update is not determined to be necessary, provide an explanation.
   2. Ensure the updated UCM is consistent with Section 5.5 of the *First Amended General Guidelines for Fifth Cycle of Regional Water Plan Development*, or if amended, the most recent version of that document.

B. Correct bugs and errors identified during the fourth cycle of regional water planning, including:
   1. Multiple issues were identified with the drop-down menus for pipe diameters in the hydraulics and well field modules. Repair any non-functioning drop-down options and update to include appropriate ranges for all drop-downs, e.g., pipe diameter and pressure classes.
   2. For pipelines built along declining elevations, the model erroneously yields power being generated and money earned.
   3. In the well field module, the tool does not include the electricity cost to pump water to ground level at the individual well level but does include this cost for the whole well field. Evaluate the need for adding electricity cost at the individual well level and update if appropriate. In either case, clarify the intended functionality of the module in the User's Guide.
   4. Errors were identified in the summing of costs on the 'Costing Summary' tab, wherein some values are not being captured.
   5. The date does not display properly on the 'Costing Summary' tab.

C. Update pertinent cost data where necessary, including:
   1. Update construction costs to reflect recent costs of actual projects (e.g., trenching costs in rock/soil and urban/rural settings).
   2. Tables in the 'Reference – Cost Indices' tab, the Construction Cost Index (CCI) and Producer Price Index (PPI), must be updated.
   3. Revise assumptions regarding interest rates in accordance with agency guidance.
   4. Cost estimates for wells shallower than 100 feet deep will be evaluated and included if sufficient data is available.
   5. Cost estimates for aquifer storage & recovery (ASR) wells will be reevaluated and revised accordingly.

6. Capital cost and operations and maintenance (O&M) cost formulas for advanced water treatment plants will be added for direct potable reuse projects based on TWDB Direct Potable Reuse Resource Document.
7. Reservoir land acquisition costs will be reevaluated and revised accordingly.
8. The O&M costs associated with water treatment plants will be evaluated and revised as appropriate. Update the User's Guide to clarify how peaking factor and plant size impact cost estimates in the UCM.
9. Evaluate and, if appropriate, update costing capabilities for drought management water management strategies.
10. For all project types, a unit cost of annual water supply must be added after amortization (in addition to O&M costs).

D. Improve the functionality of the UCM and specific costing modules, including:

1. Evaluate the methodology and assumptions in the Conservation module, and revise as appropriate. If timing and budget allow, this task should be coordinated with TWDB's efforts to develop a conservation-specific tool.
2. The Reservoir Embankment Cost Calculator module is primarily useful for developing cost estimates for off-channel or ring dike reservoirs. Evaluate the need for costing capabilities for additional types of reservoirs (e.g., on-channel) and update the UCM as appropriate. In any case, clarify the intended functionality of the module in the User's Guide.
3. Add instructions and an example diagram directly within the worksheet for the well field module.
4. In the pipeline hydraulics modules, provide for multiple pipe pressure classes along a single pipeline segment and describe the method for hydraulic and cost calculations for branching transmission systems in the User's Guide.
5. In the formulas for pump station costs (a component of the pipeline hydraulics modules), allow user to specify whether the first pump station should include an intake structure.
6. Evaluate opportunities to add capabilities to accommodate project phasing and expansion of existing infrastructure as additional considerations of the model and add them as appropriate. If adding project phasing or expansion capabilities is infeasible, update the User's Guide to describe how the UCM can be best used to effectively evaluate phased projects or project expansion.
7. Evaluate the Costing Form tab and identify opportunities to allow users to see additional detail and to verify work. Implement appropriate modifications, including adding a text field for user's notes. Update the User's Guide to reflect any changes and to clarify how users can check details and verify work.
8. Create custom program functions to centralize hydraulic and energy calculations.
9. Optimize the UCM file size.

EXHIBIT C

TASK AND EXPENSE BUDGETS

TASK BUDGET

TASK	DESCRIPTION	AMOUNT
A	Update UCM documentation consistent with planning guidance	$13,500
B	Correct bugs and errors identified during the fourth cycle of regional water planning	4,300
C	Update pertinent cost data where necessary	14,300
D	Improve the functionality of the UCM and specific costing modules	7,900
TOTAL		**$40,000**

EXPENSE BUDGET

CATEGORY	AMOUNT
Salaries & Wages[1]	$8,706
Fringe[2]	4,251
Travel[3]	50
Other Expenses[4]	150
Subcontract Services	10,000
Overhead[5]	13,863
Profit	2,980
TOTAL	**$40,000**

[1] Salaries and Wages is defined as the cost of salaries of engineers, draftsmen, stenographers, surveymen, clerks, laborers, etc., for time directly chargeable to this contract.
[2] Fringe is defined as the cost of social security contributions, unemployment, excise, and payroll taxes, workers' compensation insurance, retirement benefits, medical and insurance benefits, sick leave, vacation, and holiday pay applicable thereto.
[3] Travel is limited to the maximum amounts authorized for state employees by the General Appropriations Act, Tex. Leg. Regular Session, 2017, Article IX, Part 5, as amended or superseded
[4] Other Expenses is defined to include expendable supplies, communications, reproduction, postage, and costs of public meetings directly chargeable to this CONTRACT.
[5] Overhead is defined as the costs incurred in maintaining a place of business and performing professional services similar to those specified in this contract.

EXHIBIT D

GUIDELINES FOR AUTHORS SUBMITTING CONTRACT REPORTS TO THE TEXAS WATER DEVELOPMENT BOARD

1.0 Introduction

The purpose of this document is to describe the required format of contract reports submitted to the Texas Water Development Board (TWDB). Our reason for standardizing the format of contract reports is to provide our customers a consistent, and therefore familiar, format for contract reports (which we post online for public access). Another reason for standardizing the format is so that we can more easily turn a contract report into a TWDB numbered report if we so choose. Remember that your report will not only be seen by TWDB staff, but also by any person interested in the results of your study. A professional and high quality report will reflect well on you, your employer, and the TWDB.

Available upon request, we will provide a Microsoft Word template (used to write these instructions) that gives the fonts, spacing, and other specifications for the headings and text of the report. Please follow this template as closely as possible.

2.0 Formatting your report

The TWDB format is designed for simplicity. For example, we use Times New Roman for all text. We use 12 point, single-spaced text, left justification for paragraph text, 18 point bold for first-level headings, and 14 point bold for second-level headings. Page numbers are centered at the bottom of the page. Other than page numbers, please refrain from adding content to the document header or footer. Page setup should use one-inch margins on all four sides.

2.1 Text

The best way to format your document is to use the styles described and embedded in the template document (Authors_Template.dot) that is available on request from the TWDB. To use the Authors_Template.dot file, open it in Word (make sure *.dot is listed under Files of type) and save it as a .doc file. Advanced users can add the .dot file to their computers as a template. Make sure the formatting bar is on the desktop (to open, go to View→Toolbars→Formatting) or, to view all of the formatting at once, go to Format→Styles and Formatting and select Available Styles from the dropdown box at the bottom of the window. The formatting in the template document provides styles (such as font type, spacing, and indents) for each piece of your report. Each style is named to describe what it should be used for (for example, style names include Chapter Title, Body Text, Heading 1, References, and Figure or Table Caption). As you add to your report, use the dropdown list on the Formatting Toolbar or the list in the Styles and Formatting window to adjust the text to the correct style. The Authors_Template.dot file shows and lists the specifications for each style.

2.1.1 Title

Give your report a title that gives the reader an idea of the topic of your report but is not terribly long. In addition to the general subject (for example, “Droughts”), you may include a few additional

words to describe a place, methodology, or other detail focused on throughout the paper (for example, “Droughts in the High Plains of Texas” or “Evaluating the effects of drought using groundwater flow modeling”). Please capitalize only the first letter of each word except ‘minor’ words such as ‘and’ and ‘of’. Never use all caps.

Use headings to help the reader follow you through the main sections of your report and to make it easier for readers to skim through your report to find sections that might be the most interesting or useful to them. The text of the report should include an executive summary and sections outlined in 4.4 of Attachment 1. Headings for up to five levels of subdivision are provided in the template; however, we suggest not using more than three or four levels of subdivision except where absolutely necessary. Please avoid stacked headings (for example, a Heading 1 followed immediately by a Heading 2), and capitalize only the first letter of headings or words where appropriate—never use all caps.

2.2 Figures and photographs

To publish professional-looking graphics, **we need all originals to be saved at 300 dots-per-inch** (dpi) and in grayscale, if possible, or in the CMYK color format if color is necessary. Excessive use of color, especially color graphics that do not also work in grayscale, will prevent us from publishing your report as a TWDB numbered report (color reproduction costs can be prohibitive). Preferred file formats for your original graphics are Adobe Illustrator (.ai), Photoshop (.psd), EPS with .tiff preview, .jpg, .png, or .tiff files. Refrain from using low resolution .jpg or .gif files. Internet images at 72 dpi are unacceptable for use in reports.
All graphics shall be submitted in two forms:

1. Inserted into the Microsoft Word document before you submit your report. Ideally, inserted graphics should be centered on the page. Format the picture to downsize to 6 inches wide if necessary. Please do not upsize a graphic in Word.
2. Saved in one of the formats listed above.

2.2.1 Other graphics specifications

It is easiest to design your figures separately and add them in after the text of your report is more or less complete. Graphics should remain within the 1-inch page margins of the template (6.5 inches maximum graphic width). Be sure that the graphics (as well as tables) are numbered in the same order that they are mentioned in the text. Figures should appear embedded in the report after being called out in the text. Also, remember to include a caption for each graphic in Word, not as part of the graphic. We are not able to edit or format figure captions that are part of the figure. For figures and photographs, the caption should appear below the graphic. For tables, the caption should appear above.

2.2.2 Creating publication-quality graphics

When designing a graphic, make sure that the graphic (1) emphasizes the important information and does not show unnecessary data, lines, or labels; (2) includes the needed support material for the reader to understand what you are showing; and (3) is readable (see Figures 1 and 2 for examples). Edward R. Tufte’s books on presenting information (Tufte, 1983; 1990; 1997) are great references on good graphic design. Figures 1 through 3 are examples of properly formatted, easy to understand graphics. Do not include fonts that are less than 6 points.

For good-looking graphics, the resolution needs to be high enough to provide a clear image at the size you make them within the report. In general, 300 dpi will make a clear image—200 dpi is a minimum. Try to create your figures at the same size they will be in the report, as resizing them in Word greatly reduces image quality. Photographs taken with at least a two-megapixel camera (if using digital) and with good contrast will make the best images. Save the original, and then adjust color levels and size in a renamed image copy. Print a draft copy of your report to double-check that your figures and photographs have clear lines and show all the features that you want them to have.

Figures and photographs should be in grayscale. Color greatly adds to the cost of printing, so we are trying to keep it to a minimum. Also remember that your report may be photocopied, scanned, or downloaded and printed in black and white. For this reason, you should use symbols or patterns, or make sure that colors print as different shades in black and white. All interval or ratio data (data measuring continuous phenomena, with each color representing an equal interval) need to be displayed in a graded scale of a single color (Figure 3). This way your figures will be useful even as a photocopy.

If you need help with your graphics or have questions, please contact the TWDB graphics department at (512) 936-0129.

2.2.3 Using other people's graphics

Figures and photographs (and tables) need to be your own unless you have written permission from the publisher that allows us to reprint them (we will need a copy of this permission for our records). Avoid using any figures or photographs taken off the Internet or from newspapers or magazines—these sources are difficult to cite, and it is often time-consuming and expensive to gain permission to reproduce them.

2.3 Tables

Tables should be created in Microsoft Word (see Table 1). Tables should include a minimal amount of outlining or bold font to emphasize headings, totals, or other important points. Tables should be numbered separately from figures, and captions should appear above the text of the table.

Table 1: A sample table. Note caption above table.

Table text heading*

Table text	1940	1950	1960	1970	1980	1990	2000	%GW
Table text	15	441	340	926	196	522	83	97.4
Table text	64	944	626	173	356	171	516	99.9
Total	79	1385	966	1099	552	693	599	

* A footnote should look like this using 10 point Times New Roman.
%GW = percent groundwater
Be sure to describe any abbreviations or symbols, and, unlike in this table, be sure to note the units!

3.0 Units

Measurements should be in English units. Metric units may be included in parentheses after the English units.

All units of geologic time should conform to the most recent geologic timescale (Gradstein and others, 2004). A summary of this timescale is available from the International Commission on Stratigraphy's website at http://stratigraphy.org/chus.pdf.

4.0 Citations and references

It is important to give credit where credit is due. Therefore, be sure to use the appropriate citations and include references in your paper.

4.1 In-text citations

Each piece of information you use in your report that comes from an outside source must be cited within the text using the author's last name and the year of publication. If there are two authors, list the last name of each followed by the year, and if there are more than two authors, list the last name of the first author followed by "and others" and the year. For example: the end of the Jurassic Period occurred approximately 145.5 million years ago (Gradstein and others, 2004).

4.2 References

All sources that are cited within the report should be listed at the end of the paper under the heading References. The references should follow the guidelines in "Suggestions to Authors of the Reports of the United States Geological Survey" (Hansen, 1991). These are available online at http://www.nwrc.usgs.gov/lib/lib_sta.html (a link to the chapter "Preparing references for Survey reports," p. 234-241, is found here). Several examples of complete reference citations are listed at the end of these guidelines. Be sure that any citations that appear in tables or figures are included in the reference list. Also, before submitting the report, please check that all the citations in the report are included in the reference list and all references in the reference list are cited in the report. If at all possible, avoid web-based citations. These materials are often transient and therefore useless to future readers.

5.0 Submitting your report

Before you submit your report, proofread it. Look for spelling and grammatical errors. Also, check to see that you have structured the headings, paragraphs, and sentences in your paper so that it is easy to follow and understand (imagine you are a reader who does not already know the information you are presenting!).

6.0 Conclusions

Following the instructions above and providing accurate and readable text, tables, figures, and citations will help to make your report useful to readers. Scientists may read your report, as well as water planners, utility providers, and interested citizens. If your report successfully conveys accurate scientific information and explanations to these readers, we can help to create more informed decisions about the use, development, and management of water in the state.

7.0 Acknowledgments

Be sure to acknowledge the people and entities that assisted you in your study and report. For example:
We would like to thank the Keck Geology Consortium, the American Society of Civil Engineers, and the Texas Bar CLE for providing examples to use in developing these guidelines. In addition, we appreciate Mike Parcher for providing information on how to create publication-quality graphics, Shirley Wade for creating the data used in sample Figure 1, and Ian Jones for providing sample Figure 3.

8.0 References

Gradstein, F.M., J.G. Ogg, and A.G. Smith, eds., 2005, A geologic time scale 2004: Cambridge, Cambridge University Press, 610 p.

Hansen, W.R., ed., 1991, Suggestions to authors of the reports of the United States Geological Survey (7th ed.): Washington, D.C., U.S. Government Printing Office, 289 p.

Tufte, E. R., 1983, The visual display of quantitative information: Cheshire, C.T., Graphics Press, 197 p.

Tufte, E. R., 1990, Envisioning information: Cheshire, C.T., Graphics Press, 126 p.

Tufte, E. R., 1997, Visual explanations: Cheshire, C.T., Graphics Press, 156 p.

9.0 Examples of references

Arroyo, J. A., and Mullican, III, W. F., 2004, Desalination: *in* Mace, R. E., Angle, E. S., and Mullican, W. F., III, editors, Aquifers of the Edwards Plateau: Texas Water Development Board Report 360, p. 293-302.

Bates, R. L., and Jackson, J. A., 1984, Dictionary of geological terms: Anchor Press/Doubleday, Garden City, New York, 571 p.

Blandford, T. N., Blazer, D. J., Calhoun, K. C., Dutton, A. R., Naing, T., Reedy, R. C., and Scanlon, B. R., 2003, Groundwater availability of the southern Ogallala aquifer in Texas and New Mexico–Numerical simulations through 2050: contract report by Daniel B. Stephens and Associates, Inc., and the Bureau of Economic Geology, The University of Texas at Austin to the Texas Water Development Board, variably paginated.

Fenneman, N. M., 1931, Physiography of Western United States (1st edition): New York, McGraw-Hill, 534 p.

Hubert, M., 1999, Senate Bill 1–The first big bold step toward meeting Texas's future water needs: Texas Tech Law Review, v. 30, no. 1, p. 53-70.

Kunianski, E. L., 1989, Precipitation, streamflow, and baseflow in West-Central Texas, December 1974 through March 1977: U. S. Geological Survey Water-Resources Investigations Report 89-4208, 2 sheets.

Mace, R. E., Chowdhury, A. H., Anaya, R., and Way, S.-C., 2000, A numerical groundwater flow model of the Upper and Middle Trinity aquifer, Hill Country area: Texas Water Development Board Open File Report 00-02, 62 p.

Maclay, R. W., and Land, L. F., 1988, Simulation of flow in the Edwards aquifer, San Antonio Region, Texas, and refinements of storage and flow concepts: U. S. Geological Survey Water-Supply Paper 2336, 48 p.

For more examples of references, see p. 239-241 of "Suggestions to Authors of the Reports of the United States Geological Survey" at http://www.nwrc.usgs.gov/lib/lib_sta.html.

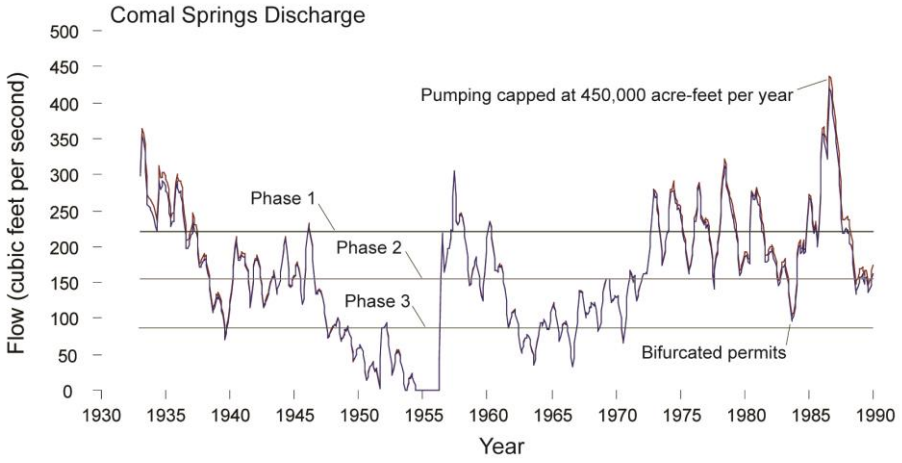

Figure 1. A sample figure showing only the information needed to help the reader understand the data. Font size for figure callouts or labels should never be less than 6 point.

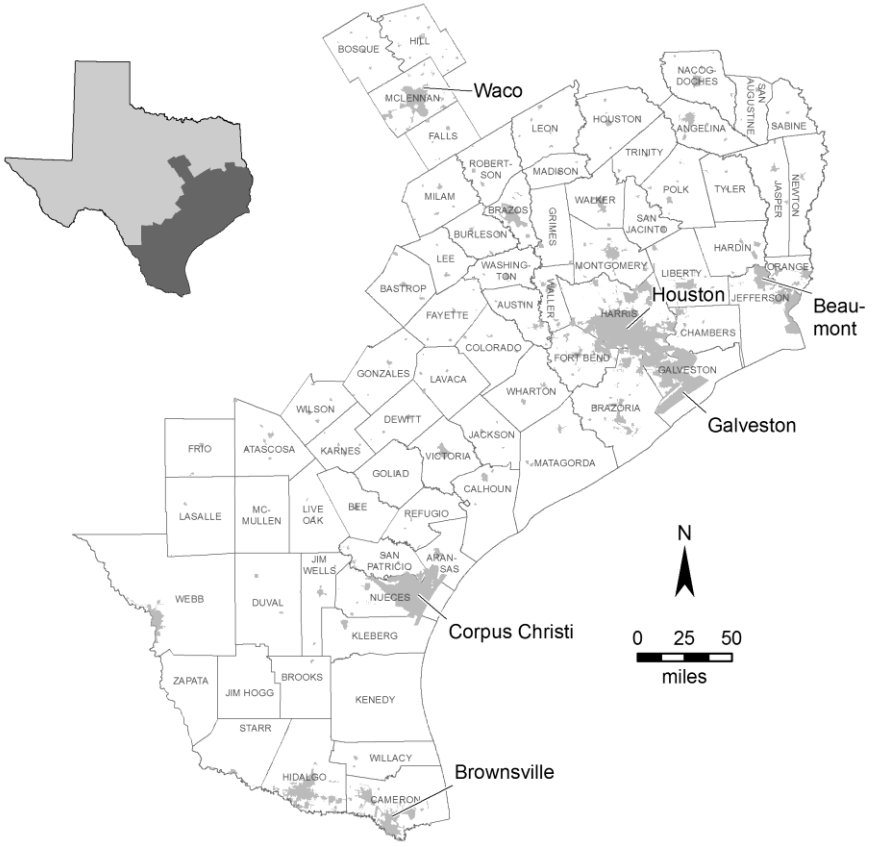

Figure 2. A sample subject area map, giving the reader enough information to understand the location being discussed in this conference. For map figures, be sure to include a north arrow to orient the reader, a scale, and, if needed, a submap that places the figure in greater geographic context. Be sure that text is readable and that any citations listed on the figure or in the figure caption are included in the reference list. Font size should never be less than 6 pt.

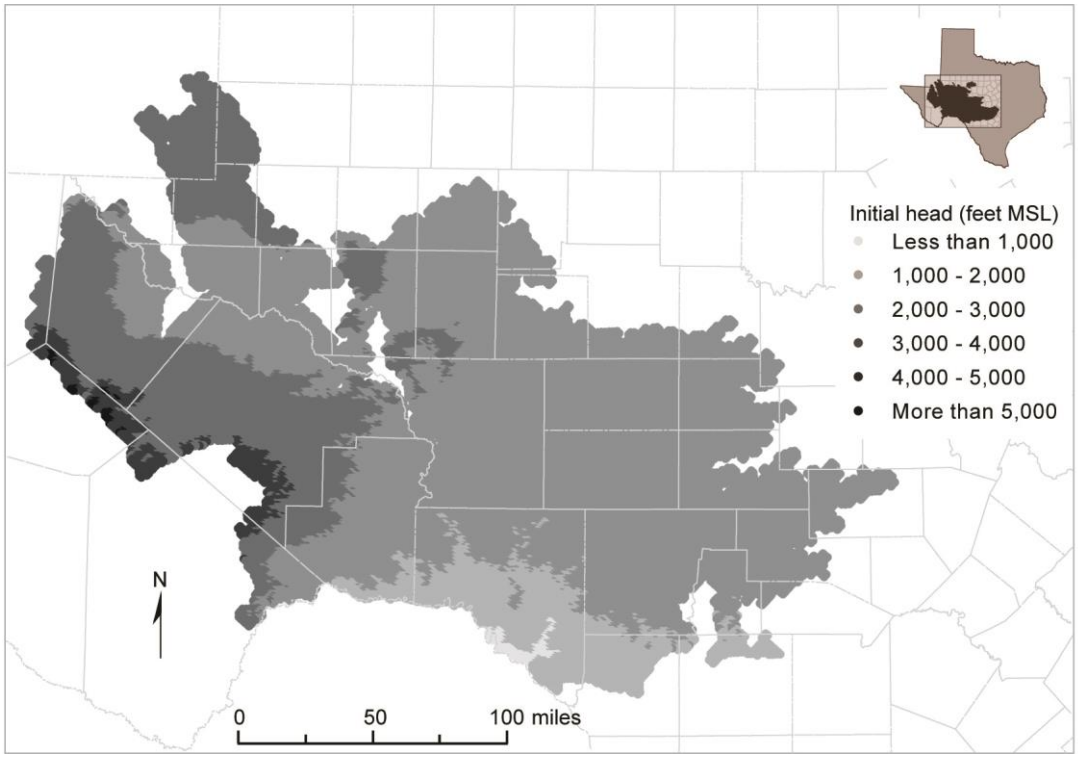

Figure 3. Initial hydraulic heads used in model simulations for layer 1. Note the use of grayscale shading to show differences.

EXHIBIT E

TWDB Guidelines for a Progress Report

Texas Water Development Board Contractors are required by their contracts to provide Progress Reports usually with the submission of an invoice/payment request.

The progress report should contain the following standard elements:

- Date: Date the memo is sent
- To: Name and position of the reader
- From: Name and position of the writer
- Subject: TWDB Contract Number and a clear phrase that focuses the reader's attention on the subject of the memo

Work Completed: *(The next section of a progress report explains what work has been done during the reporting period. Specify the dates of the reporting period and use active voice verbs to give the impression that you or you and your team have been busy) For Example:*

Task 1: Completed 3 draft chapters and all appendices. Met with sub consultants on their chapters.
Task 2: Completed sample collection throughout river reach.
Task 3: No work completed in reporting period.

Problems:
If the reader is likely to be interested in the glitches you have encountered along the way, mention the problems you have encountered and explain how you have solved them. If there are problems you have not yet been able to solve, explain your strategy for solving them and give tell the reader when you think you will have them solved.

EXHIBIT F

HUB SUBCONTRACTING PLAN PROGRESS ASSESSMENT REPORT

(Use current form located at:
http://www.window.state.tx.us/procurement/prog/hub/hub-forms/)