

## EXHIBIT B

### SCOPE OF WORK

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**Task 1 -Project Management.** The INTERA Team's Project Manager, Dr. Steve Young, P.G., P.E., will serve as the single point of contact for the TWDB and will provide prompt and comprehensive information on the project's schedule, budget, and technical work. With over 25 years of Hydrogeologic consulting experience, 20 years of management experience, and proven experience on several TWDB projects, Dr. Young possesses the technical and management expertise needed for successful project completion. As his resume in Appendix A indicates, Dr. Young's experience includes managing several projects focused on literature searches, on developing regional groundwater models including several under TWDB's GAM Program, and on characterizing and modeling brackish groundwater. Currently, Dr. Young is working with several Groundwater Conservation Districts (GCDs) to help define their brackish resources and with the TWDB to define the brackish resources associated with the northern section of the Gulf Coast Aquifer. Dr. Young will meet with TWDB staff at the beginning of the project for a kickoff meeting and at least every two months thereafter until the project is completed. A formal discussion of the results will be presented to the TWDB staff at the end of the project. The INTERA Team will submit monthly progress reports to the TWDB summarizing the task activities and expenditures.

**Task 2 – Literature Search.** The objective of the literature search is to compile a comprehensive list of references for the major and minor aquifers in the state using existing bibliographies developed for the GAM Program and other relevant literature published in journals, books, conference proceedings, government agency reports, theses and dissertations, electronic journals and databases, scientific magazines, and indexes and abstracts. The bibliography will include, among other things, references to works on geology, geophysics, geochemistry, hydrology, and other pertinent topics that may be of relevance to the major and minor aquifers in Texas and the goals of BRACS.

Our initial reference list will begin with the bibliography of over 10,000 references contained in the USGS report by Mr. Ernie Baker titled, "Bibliography of Ground-Water References for All 254 Counties in Texas" (Baker, 2005). This report cites materials published between 1886 and 2001 that pertain to all of Texas's 254 counties. To develop this bibliography, Mr. Baker obtained references from more than 30 agencies, universities, water districts, geological societies, cities, consultants, and private publication outlets. After we have entered the 10,000+ references from Baker (2005) into a database and appropriately culled references deemed non-relevant to BRACS, we will update, augment, and improve the bibliography by cross-checking with bibliographies compiled from the TWDB GAM Program and then from state and federal agency reports and finally from the remaining literature sources including databases of electronic journals, publically available consulting reports, university publications, and geohydrological societies/organizations.

#### **References from Federal and State Agencies.**

In order to maximum the effectiveness of our data mining, we will tailor our search for references to each specific federal and state organization and adapt our methods as conditions merit. Our initial approach for searching the various agencies is described below.

***United States Geological Survey*** – The INTERA Team will interface with the USGS through Mr. Baker and will guide our search using references provided in the USGS report titled “Water-Resources Reports of the US Geological Survey Texas Water Science Center, 1898-2007” (USGS, 2010) which is available online at [http://tx.usgs.gov/wrr\\_tx\\_wsc.pdf](http://tx.usgs.gov/wrr_tx_wsc.pdf). This report was prepared to serve as a record of all publications prepared during that period by the USGS in (or for) the Texas Water Science Center (formerly the Texas District). The report includes 88 pages of references to a wide-range of professional papers, water-supply papers, scientific investigation reports, open-file reports, and water-data reports.

Among the cited publications are USGS reports done for the TWDB (formerly the Texas Department of Water Resources), the Edwards Underground District, the Corpus Christi Bay National Estuary Program, and the Texas Department of Transportation. Mr. Baker maintains an office in the USGS Austin office and has full use of the USGS facilities to help with locating non-USGS references that have been cited in USGS reports.

***Other Federal Agencies*** – Besides the USGS, other federal agencies that may provide references of value are the Pantex Plant, which is the primary U.S. Department of Energy (DOE) facility in Texas, and the Department of Defense (DOD) military installations located throughout the state. Our team will prioritize these facilities and, beginning with the most promising candidate, will investigate available references for relevancy to this project. We will continue with the next most promising candidate until we have reached a point of diminishing return. We anticipate that only a few DOD sites will have useful references. Among these sites is Fort Bliss, which is working with the city of El Paso to operate the largest inland desalinization plant in the country.

***Texas Water Development Board*** – Our team will work directly with TWDB personnel to determine the most effective techniques for data mining the agency’s publications for appropriate references. We anticipate that our efforts will concentrate on publications by the Groundwater Resource Division and its predecessor(s), focusing particularly on publications pertaining to the GAM Program and characterization studies for the major and minor aquifers. For instance, TWDB Brackish Groundwater Manual (Guyton and NRS, 2003) lists 81 and 99 references for the major and minor aquifers, respectively. Also, the report for the groundwater availability model of the Queen City and Sparta Aquifers (Kelley and others, 2004) lists 134 references.

***Bureau of Economic Geology*** - Our Team will interface with the BEG through Dr. Bridget Scanlon and Mr. Bob Reedy and will guide our search using references provided in the BEG report (BEG, 2010) titled “List of Publications: Updated February 2010.” This comprises all BEG publications issued from 1915 through 2010, both those in print and those out of print. The report is 87 pages long and cites a wide-range of references including open-file reports, geological circulars, symposia, reports of investigations, and geological society publications.

***Texas Commission on Environmental Quality (TCEQ)*** – The INTERA Team will meet with TCEQ personnel to investigate what reports and databases are relevant to BRACS. As part of this proposal, we are committed to identifying useful references associated with the TCEQ Surface Casing Program and TCEQ Source Water Assessment and Protection Program. INTERA personnel are knowledgeable about information from both groups and have used this information to develop groundwater models. The TCEQ surface-casing program provides oil and gas

operators with estimated protection depths of fresh groundwater, usable-quality groundwater, and underground sources of drinking water. The Source Water Assessment and Protection Program fulfills 1996 Safe Drinking Water Act Amendment requirements for TCEQ to assess every public drinking water source for susceptibility to certain chemical constituents and therefore provides water supply wells and aquifer.

***Texas Railroad Commission (RRC)*** – Our Team will meet with RRC personnel to investigate what reports and databases are relevant to BRACS. During the last several years, INTERA has discovered numerous RRC documents that contain valuable pumping, water level, and aquifer-characterization data that were largely missed during construction of the original models under the GAM Program. As part of this proposal, the INTERA Team expects to identify RRC documents associated with mining and the oil and gas programs. Within Texas, the RRC has information on approximately 280 underground coal related mining sites (with pre-1977 activity) located within 40 counties. In addition, the RRC has documents related to the oil and gas programs involving the fracturing of the Barnett Shale and the Eagleford Shale and the operation of disposal and injection wells that will have references of interest to the BRACS program.

***Other State Agencies*** – Among the other state agencies that we will search for references are the Edwards Authority and river authorities, such as GCDs. As part of the kickoff meeting, we will work with TWDB to jointly determine an appropriate list of other state agencies that we will contact to obtain access to some type of bibliography for our review. We anticipate that the majority of river authorities and GCDs will have no references of interest but we nonetheless plan to contact them and review their web sites. An example of a river authority that will have relevant references is the Lower Colorado River Authority (LCRA), which conducted the San Antonio Water System (SAWS) Water Project, from 2004 through 2009. An example of a GCD that will have relevant references is the Barton Springs/Edwards Aquifer Conservation District, which has its own funded research program.

***Cities, Municipalities and Water Utilities*** – Based on INTERA's experience with obtaining information from cities, municipalities, and water utilities, we recognize that there can be problems with obtaining documents related to groundwater assessments and characterization. For instance, even though SAWS has spent tens of millions of dollars on characterizing brackish waters and constructing numerical groundwater models, SAWS does not make its reports easily accessible to the general public. In many cases, a public information request is required to obtain reports from SAWS and similar organizations operating for cities, municipalities, and water utilities. For this bibliography, we are not committing to identify references only available through a public information request. However, our team will investigate what references may be acquired from projects performed by cities, municipalities, and water utilities that are easily accessible to the general public. Of particular interest to this project are cities that have, or plan to use, a brackish groundwater supply. For these cities, the INTERA Team will work with TWDB to develop an approach to contacting these cities to identify possible useful references.

***Universities and Scientific Journals*** – The INTERA Team will have access to the University of Texas Library System and will use it to search for references associated with conference proceedings, dissertations and theses, and scientific journals. Searches of the scientific journals will be performed using journal databases such as the American Association of Petroleum Geologists (AAPG) and the American Geophysical Union (AGU), as well as specific journals

such as Ground Water and Water Resources Research. In addition to the electronic searches for university publications, our Team will contact the major universities in the state with graduate degree programs that support hydrogeological research and specialized collaboration and partnerships that could provide useful references. An example of a specialized collaboration of interest is the Texas Water Resource Institute (TWRI) at Texas State University in San Marcos. TWRI currently manages approximately 90 active projects with more than \$24 million in funding. Over the last 11 years, the Institute has brought in more than \$70 million for water resources research and extension projects.

***Miscellaneous Sources*** – Among the miscellaneous sources that our Team will search is the information databases and card catalog services provided through the University of Texas Library system, the USGS libraries, and the BEG library. We will use these resources to identify books of interest and then to review their respective bibliographies to identify other references.

**Task 3 – Bibliography Database.** The primary objective of Task 3 is to enter the references assembled in Task 2 into a digital database such as a bibliographic management software system (BMSS). Examples of this software include EndNote, ProCite, and Reference Manager. Prior to our final selection of the management software, we will meet with TWDB to discuss the criteria and justifications for selecting the software system. Listed below are some of the criteria that we anticipate using in the selection process:

- search and retrieval capabilities,
- export capabilities,
- friendly, consistent graphical user interface,
- ability to handle different reference formats,
- import capabilities,
- web capabilities, and
- ability to handle large text fields,
- sorting, formatting, and spell-checking
- ability to handle a large number of references, capabilities.
- cost,

Based on our preliminary evaluation, EndNote is the most likely candidate for our BMSS. BEG personnel have experience using this software, and the BEG has a database of references that can be culled and imported into EndNote relatively seamlessly.

Two major subtasks in Task 3 are the construction and the documentation of the database.

**Subtask 3a – Construction of the BMSS.** Because of the anticipated large number of references that will be imported into the BMSS, we will develop a protocol for reformatting and importing the references into the software. Our protocol will include procedures to check for duplicate references, typos, incorrect capitalizations, and misspellings. Our protocol will be designed by INTERA's Ms. Bridget Ronayne, who has over 10 years of experience working with a wide range of database-type programs. Ms. Ronayne's task of populating the BMSS involves several activities in addition to uploading a series of files into the software program. In addition, she will be responsible for the conversion of a considerable number of scanned images of bibliographies into machine-encoded text using optical character recognition (OCR) software, as well as the quality assurance and quality control checking that must follow such procedures. We also

anticipate that some references will need to be manually entered into the database because of problems with applying the OCR software or because lone references will be discovered on the web, within a library, or in an agency's files.

The RSQ does not explicitly state that the references be accompanied with keywords to assist in searching the populated BMSS. Indeed, reviewing and assigning keywords to over 10,000 references is a mammoth task that is beyond the level of commitment that we can propose. Nonetheless, keywords can be a valuable aspect of the databases from a user's perspective. Therefore, we propose to put a sizeable effort into adding several keywords to most of the references. Among the keywords we propose to use are the names of the counties, major aquifers, and minor aquifers referenced in a particular citation. Prior to selecting and adding our keywords, we will discuss this option with the TWDB.

**Subtask 3b – Documentation of the BMSS.** The INTERA Team will deliver to TWDB a digital copy of the populated database on a compact disc (CD) or digital disc (DVD). Although the RSQ does not require a database report to be delivered along with the BMSS, we plan to submit such a report pending approval by TWDB of an acceptable outline. We propose preparing a report to document the following:

- purpose of the database,
- overview of the capabilities of the BMSS,
- approach/methods used for assembling
- links for tutorials for the BMSS, and references from the different sources,
- contact information for agencies helpful in our
- statistical summary of the references, search.

**Reports and Deliverables.** INTERA has worked on 10 models under the GAM Program over the last ten years supporting the TWDB. This experience provides us with an in-depth understanding and familiarity with developing reports and geodatabases under GAM Program guidance. We have been communicating complex technical information in groundwater reports for over 30 years. All documentation for this study will be prepared in a manner consistent with the format and content defined by the TWDB in the RSQ and consistent with standards currently employed at the TWDB.

Documentation will include two major products: (1) the electronic copy of the populated database to TWDB on CD or DVD and the six hard copies, as requested in the RSQ, and (2) a technical report in both Microsoft Word and Portable Document Format (PDF) providing documentation of the database as described in Subtask 3b, above.

## Estimated Schedule for BRACS Bibliography Project

| Task Number/Name         | 2011 |   |   |   |   |   |   |   |
|--------------------------|------|---|---|---|---|---|---|---|
|                          | J    | F | M | A | J | J | A | S |
| 1. Project Management    |      |   |   |   |   |   |   |   |
| 2. Literature Search     |      |   |   |   |   |   |   |   |
| 3. Bibliography Database |      |   |   |   |   |   |   |   |
| 3a. Population           |      |   |   |   |   |   |   |   |
| 3b. Documentation        |      |   |   |   |   |   |   |   |