

Final Report for the FY16 Surface Casing Estimator Site Project

by

Edward W. Collins, Aaron R. Averett, and Jeremy Ortuño

prepared for

Railroad Commission of Texas

under Project Reference Number UTA14-104

Bureau of Economic Geology

Scott W. Tinker, Director

Jackson School of Geosciences

The University of Texas at Austin

August 2016

Contents

ABSTRACT3
INTRODUCTION3
GEOPHYSICAL LOG SCANNING4
SURFACE CASING ESTIMATOR SITE5
FUTURE WORK5

Figures

1. Counties having Q-logs scanned6
2. Counties completed for Surface Casing Estimator Site7

ABSTRACT

The Surface Casing Estimator Site is a website that provides estimates of possible surface-casing requirements for wells and related information. Work during FY16 for the Surface Casing Estimator Site project involved (1) scanning more than 7,960 geophysical logs of the Q-log library for 12 counties and parts of 3 counties, (2) constructing digital data sets composed of geologic information that relates to estimating surface-casing requirements and groundwater depths for 5 counties in East Texas, and (3) merging/programming the new data with the website's existing data. The Estimator Site provides information on elevations and depths for the top and base of fresh water; the base of usable-quality water; the base of underground sources of drinking water; and the top and base of critical water-bearing stratigraphic units, aquifer names, geophysical logs, and well locations. The FY16 work has enabled about 375 additional geophysical logs in 5 East Texas counties to be viewed through the Surface Casing Estimator Site.

INTRODUCTION

The FY16 Surface Casing Estimator Site project continues work on (1) constructing a web-enabled estimator site with statewide coverage, and (2) scanning geophysical logs of the hard-copy Q-well log data files that are evaluated to make casing recommendations for wells drilled in Texas. Work for the Surface Casing Estimator Site, which began in 2004 with development of spatial and tabular data, has been displayed over the Internet (Arc IMS) for specific Texas counties, allowing oil and gas operators, Railroad Commission of Texas (RRC) staff, and other users to determine probable surface-casing requirements and view selected geophysical logs and other features such as land-survey boundaries, roads, and well locations. Since the initial success of the pilot project, a study of Brazos County in 2004, the project has interpreted and prepared estimator-site data sets for 70 counties and has scanned Q-well logs for 104 counties (figs. 1 and 2).

This project year's scope of work and budget were amended in March 2016 at the request of the Railroad Commission Groundwater Advisory Unit (RRC GAU). The amended work involved three primary phases: (1) scanning of geophysical logs for 12 counties and initial study of RRC data for 8 counties to prepare data sets for addition to the Surface Casing Estimator Site, (2) interpretation of geologic data for estimator-site-study counties, and (3) construction and review of Surface Casing Estimator Site digital data sets for 5 counties. Project deliverables are digital TIFF images of the scanned Q-logs and study-area additions/updates to the web-enabled Surface Casing Estimator Site. More than 7,970 log scans were delivered during this project year. Data for the 5-county East Texas study area have been added to the Surface Casing Estimator Site at <http://www.beg.utexas.edu/research/areas/groundwater-studies/surface-casing-estimator>.

Scanning of the RRC Q-log library is an ongoing task that will continue for 12 additional counties into a new contract year, FY17, with the RRC. Data for 8 counties will be studied and added to the Surface Casing Estimator Site during FY17 with the RRC.

GEOPHYSICAL LOG SCANNING

More than 7,960 scans of geophysical Q-logs were made during FY16. Required scanning for 12 counties—Andrews, Borden, Cochran, Dawson, Gaines, Hemphill, Hockley, Lynn, Pecos, Terry, Wheeler, and Yoakum—was completed. Scanning for Andrews County began at the end of the FY15 work period. Selection of these counties for scanning relates to RRC needs and drilling activity within the Midland Basin region of West Texas and Anadarko Basin in the Texas Panhandle. In addition to the required Q-log scanning for FY16 deliverables (7,518 scanned Q-logs), about 450 Q-logs of Jackson, Victoria, and Calhoun Counties were scanned to assist other project needs and help fulfill the RRC GAU goal of scanning the complete Q-log library. Scanning was conducted at the RRC Q-log library and typically occurred 5 days a week during much of the work year. A summary of FY16 scanning follows:

<u>County</u>	<u>Q-Log Folders</u>	<u>Scans of Logs</u>
Andrews	Q1 to Q1745	1,731 (August–September 2015)
Borden	Q1 to Q573	549
Cochran	Q1 to Q342	329
Dawson	Q1 to Q615	590
Gaines	Q1 to Q991	985
Hemphill	Q1 to Q100	91
Hockley	Q1 to Q590	582
Lynn	Q1 to Q162	154
Pecos	Q1 to Q1333	1,328
Terry	Q1 to Q400	395
Wheeler	Q1 to Q137	126
Yoakum	Q1 to Q659	658
Jackson	selected folders	302
Victoria	selected folders	116
Calhoun	selected folders	31

SURFACE CASING ESTIMATOR SITE

Data sets for 5 counties were added to the Surface Casing Estimator Site this work year: Angelina, Nacogdoches, Sabine, San Augustine, and Shelby Counties at the southern part of the Carthage–Haynesville field. Work to construct the data sets involved (1) collection of available data and digital files for county surveys and abstracts, county boundaries, previous surface-casing recommendations, well-location maps, ground elevations, and subsurface and surface geology; (2) creation of a GIS project using standard ArcMap software; (3) creation of digital-elevation model grids for ground elevations; (4) review of study-area geology and groundwater units with Surface Casing Team staff, and designation of critical stratigraphic intervals, horizons, and aquifers; (5) study of geologic data, geophysical logs, and location of wells, and construction of digital files for well locations; (6) construction of data spreadsheets and GIS attribute tables for study intervals and horizons, including stratigraphic units, top and base of fresh water (1,000 TDS), base of usable-quality water (3,000 TDS), base of underground source of drinking water (10,000 TDS), and aquifers; (7) construction of GIS contour grids for study intervals and of horizon and shapefile layers for well locations and aquifer-recommendation areas; and (8) review of data layers through evaluation of layer-overlap techniques and visual study.

Contour-grid image files and point and polygon shapefiles have been added and programmed into the Surface Casing Estimator Site using the ArcGIS Server so that this year's data could be merged with the site's existing data. Other work involved review and initial interpretation of geologic data for Crockett, Howard, and Martin Counties within the Spraberry and Lin fields of the Midland Basin, West Texas. Data sets for these 3 counties are planned to be included with the FY17 tasks. This year's work for the estimator site also included upgrades related to the programming of data sets, routine maintenance, and updates to the website server.

The data set for the 5 East Texas counties incorporates information from about 375 geophysical logs and about 625 RRC SCRP and SWD well records. This year's project counties were in different parts of the state, requiring the study of different horizons. Study horizons included the bases of fresh water, usable-quality water, and underground source of drinking water, as well as the tops of the Sparta isolation interval and the Carrizo Formation isolation interval. The 5-county data set also enables viewing of about 375 additional geophysical logs on the Surface Casing Estimator Site.

Study of the 3 West Texas counties (Crockett, Howard, and Martin)—which included more than 360 Q-logs and about 370 RRC SCRP and SWD well records near the end of FY16—is ongoing. The study horizons for the West Texas counties are the bases of West Texas shallow aquifers, the Santa Rosa Formation, and underground sources of drinking water, as well as a local area at the top and bottom of the San Andres interval. Geologists from the RRC GAU provided technical information that helped determine the aquifers and which surface-casing recommendations were needed.

FUTURE WORK

Future work includes scanning of geophysical Q-logs for 12 counties: Armstrong, Carson, Culberson, Gray, Hansford, Hutchinson, Lipscomb, Moore, Ochiltree, Potter, Randall, and Roberts. Planned interpretive work for Surface Casing Estimator Site data sets involves 8 Texas counties coinciding with the Spraberry, Fuhrman–Mascho, Seminole, and Wasson fields: Andrews, Crockett, Dawson, Gaines, Glasscock, Howard, Martin, and Yoakum. Scheduling to determine which counties will have data interpreted and which will have logs scanned should be kept flexible to meet changes in priorities that may occur during a work year. Upgrades to the website and server are also periodic tasks.

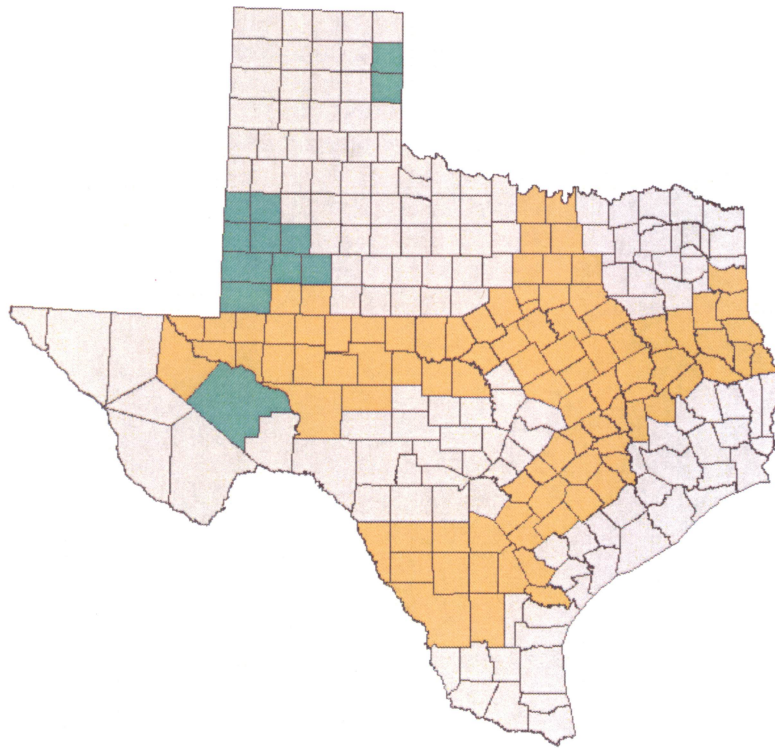


Figure 1. Counties having Q-logs scanned. Counties having Q-logs scanned during FY16 are green. Counties having Q-logs scanned during previous work years are orange.

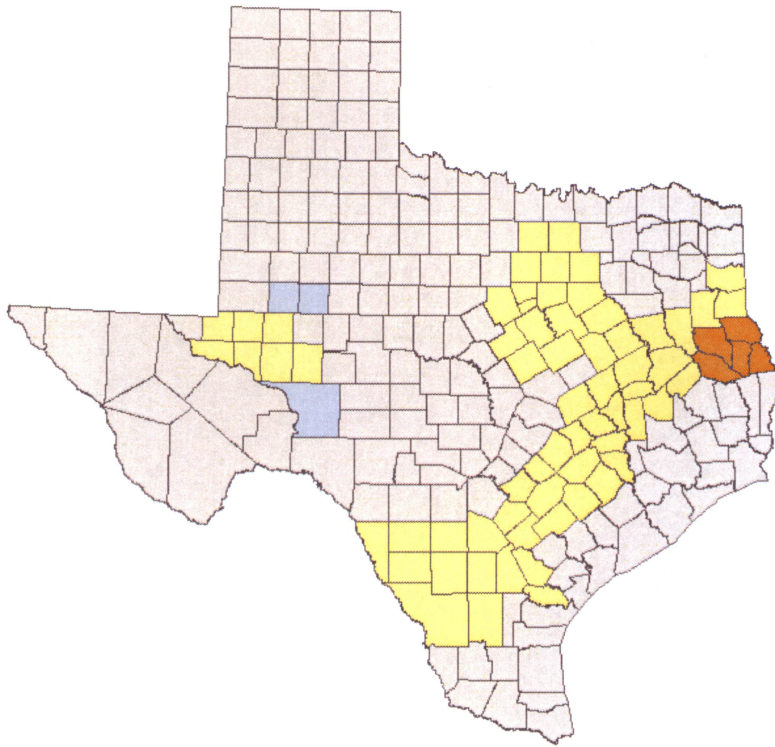


Figure 2. Counties completed for Surface Casing Estimator Site. Counties completed in FY16 study are orange. Three counties studied during FY16 that will be completed during FY17 are blue. Counties completed during previous work years are yellow.