

1.2 PROJECT BACKGROUND

This project will consist of the construction, instrumentation, and monitoring of a horizontal recharge structure in Gaines County. The LEUWCD and other members of the project team will monitor the structure and document results for a 36-month period. The monitoring data will then be used to determine the impact of enhanced or induced recharge on the groundwater level and underlying soil moisture beneath the structure.

1.2.1 Project Location

The vicinity map shows a layout of the major roads in Gaines County.

Multiple sites will be initially identified as potential project areas, based primarily on geographic and surface conditions. The preliminary locations will be selected as 1-acre tracts, located along or adjacent to one of the highways and within approximately 500-feet of the road for easy access. The sites selected will need to have the following characteristics:

- Located at least 1,000-feet from active or existing wells
- Isolated from current high-use areas
- Adjacent to or within grassland or land currently vegetated with CRP
- Relatively thin underlying caliche layer
- Proximity to existing rainfall recording site(s)
- Topography of site (grading considerations)
- Expandable from 1 acre to 5 acres

Once 3 to 4 potential sites have been identified the site with the most desirable geology and site characteristics will be selected for the project site.

1.2.2 Project Objectives

The LEUWCD has identified five primary objectives of this project, including:

- Stabilization or restoration of currently receding groundwater levels
- Agricultural water supply enhancement
- Long-term increase in rate of recharge into the Ogallala Aquifer
- Emergency storage, or Strategic reserve
- Seasonal storage and banking of water

Llano Estacado Underground Water Conservation District
Study of Artificial Recharge on Groundwater Levels of the Ogallala Aquifer
January 2007

These objectives agree with the overall goals of the LEUWCD and Gaines County residents. Six secondary objectives were also identified for this project, in particular:

- Determine infiltration and percolation rates at a depth of 20-24 feet below the surface
- Determine actual evaporation and infiltration rates
- Investigate behavior of water in the vadose zone
- Advance the design, use, and benefit of rain water collection for large water users
- Encourage conservation, capture, and use of rain water within the LEUWCD
- Facilitate technology transfer of this project to widespread use by assisting in the marketing, financing, refinement, and mass use of this type recharge project.

1.2.3 Methodology

There are five main modes of artificial recharge, including spreading, recharge shafts, injection wells, induced recharge, and improved land and watershed management. The induced recharge method will be used for this project.

The details of the proposed project are shown in the site layout figure. The site will consist of a one-acre area that will be graded toward a recharge pit located in the center. The site will be lined with a 40-mil smooth HDPE liner overlain by smooth cobbles. This will increase runoff to the pit by eliminating obstructions due to infiltration or root uptake. The recharge pit will have dimensions of 30-ft x 90-ft, and was sized to provide adequate volume to store a 2-inch rainfall event. The recharge pit will be excavated and backfilled with graded sand and rock and lined with geotextile fabric. The rock will be placed in layers, beginning with larger diameter rock at the bottom and continuing with various gradations of rock and sand to the top of the pit. Sand was selected as the material for the top layer for maintenance reasons. As recharge structures are prone to clogging the sand can be reworked periodically. The geotextile fabric will also be placed at the base of the sand layer, to help prevent clogging and to prevent the sand from mixing with the larger diameter, underlying rock.

Three monitor wells will be installed on the site near the recharge pit. The monitor wells will be used to provide background on the existing condition of the aquifer, until results of the project can be seen. A pressure transducer and data logger will be installed in one of the monitor wells to collect the data. Soil moisture sensors made of gypsum will also be installed surrounding the pit at varying depths. The soil moisture sensors will serve as indicators of the movement of water through the soil profile, long before results will be seen in the monitor wells.

On the surface a rain gauge will be installed by LEUWCD to measure rainfall at the site. Monitoring data from the site will then be used to compute or account for variables of the water budget. There is also a Mesonet site located in Gaines County, which will be useful for comparing measured and calculated values from the site.

DUPLICATION OF PRIOR PROJECTS

Llano Estacado Underground Water Conservation District has talked with and interviewed the following agencies and individuals to conduct "due diligence" concerning duplication of effort. This "due diligence" showed no duplication of effort.

Bureau of Economic Geology
University of Texas at Austin
Austin, Texas
Bridget Scanlon – Hydrogeologist
512-471-8241

(The Bureau of Economic Geology has previously drilled holes in dry land, native, and irrigated farm lands in Lamb, Terry, Baily, Martin, Dawson and Howard counties to document natural recharge rates. This project had no engineered structures to accelerate this percolation.)

U.S. Geological Survey
Colorado Water Science Center
Denver, Colorado
Peter McMahon – Hydrogeologist
303-236-4882 #286

(This project was contamination and evaluation, specifically herbicides / pesticides, in playas, ranch land, and irrigated farm land in Baily, Hale, and other Texas Panhandle counties. It focused on natural percolation and also had no engineered structures.)

High Plains UWCD
Lubbock, Texas

(This project was a percolation project done in a playa in the district. Bore holes were drilled, cased and perforated in the bottom of the playa for water entry. However, there was no polyethylene or gravel trenching constructed and the project silted closed.)

Ken Rainwater
Director Water Resources Center
Texas Tech University
Lubbock, Texas
806-743-3490

(no knowledge of any project similar to the Llano Estacado Underground Water Conservation District project.)

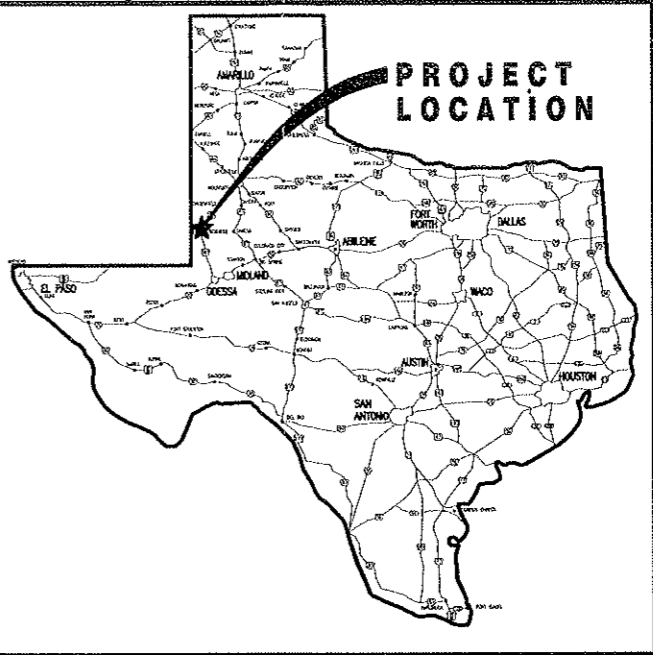
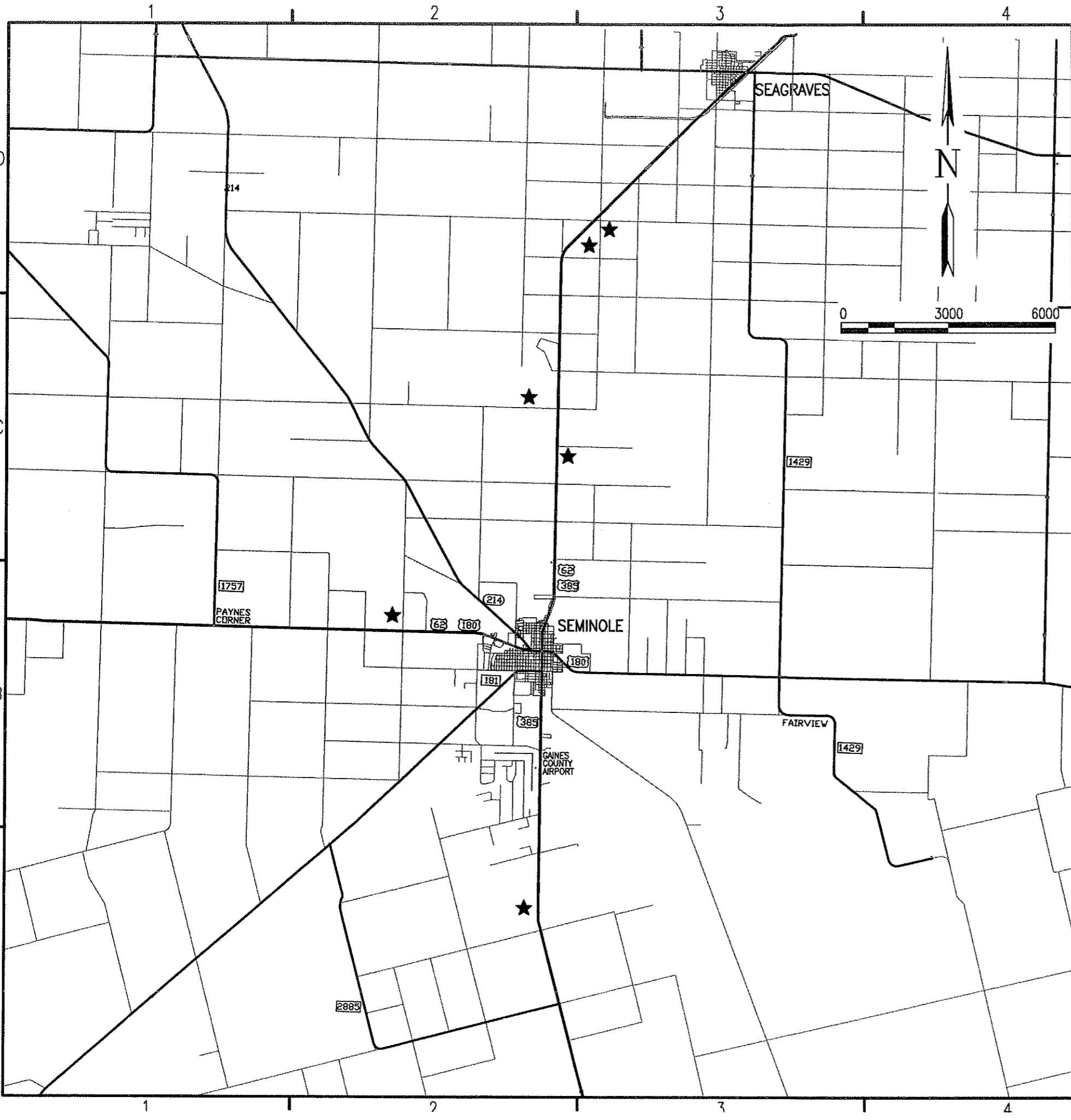
Gary Walker
District Manager
Sandy Land UWCD
Plains, Texas
806-456-2155

(Mr. Walker is also former chairman of Texas House of Rep. Natural Resources Committee.
No knowledge of any project similar to the Llano Estacado Underground Water Conservation District project.)

Mike McGregor
District Manager
Llano Estacado UWCD
January, 2007

Shelby Elam
Chairman
Llano Estacado UWCD
January, 2007

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VICINITY MAP

GENERAL NOTES

- ★ POTENTIAL PROJECT LOCATIONS

KEY PLAN

NO.	DATE	DESCRIPTION

ISSUING OFFICE: Lubbock PROJECT NO: 01-2306-06

VICINITY MAP

G-001

Parkhill, Smith & Cooper, Inc.
 Engineers • Architects • Planners
 Lubbock El Paso Midland Amarillo Odessa

**LEUWCD
 GROUNDWATER
 RECHARGE
 STUDY**

GAINES COUNTY COURTHOUSE
 101 S. MAIN, #B-2
 SEMINOLE, TX 79360

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Parkhill, Smith & Cooper, Inc.
Engineers • Architects • Planners
Lubbock • Pico • Midland • Amarillo • Odessa

LEUWCD GROUNDWATER RECHARGE STUDY

GAINES COUNTY COURTHOUSE
101 S. MAIN, #B-2
SEMINOLE, TX 79360

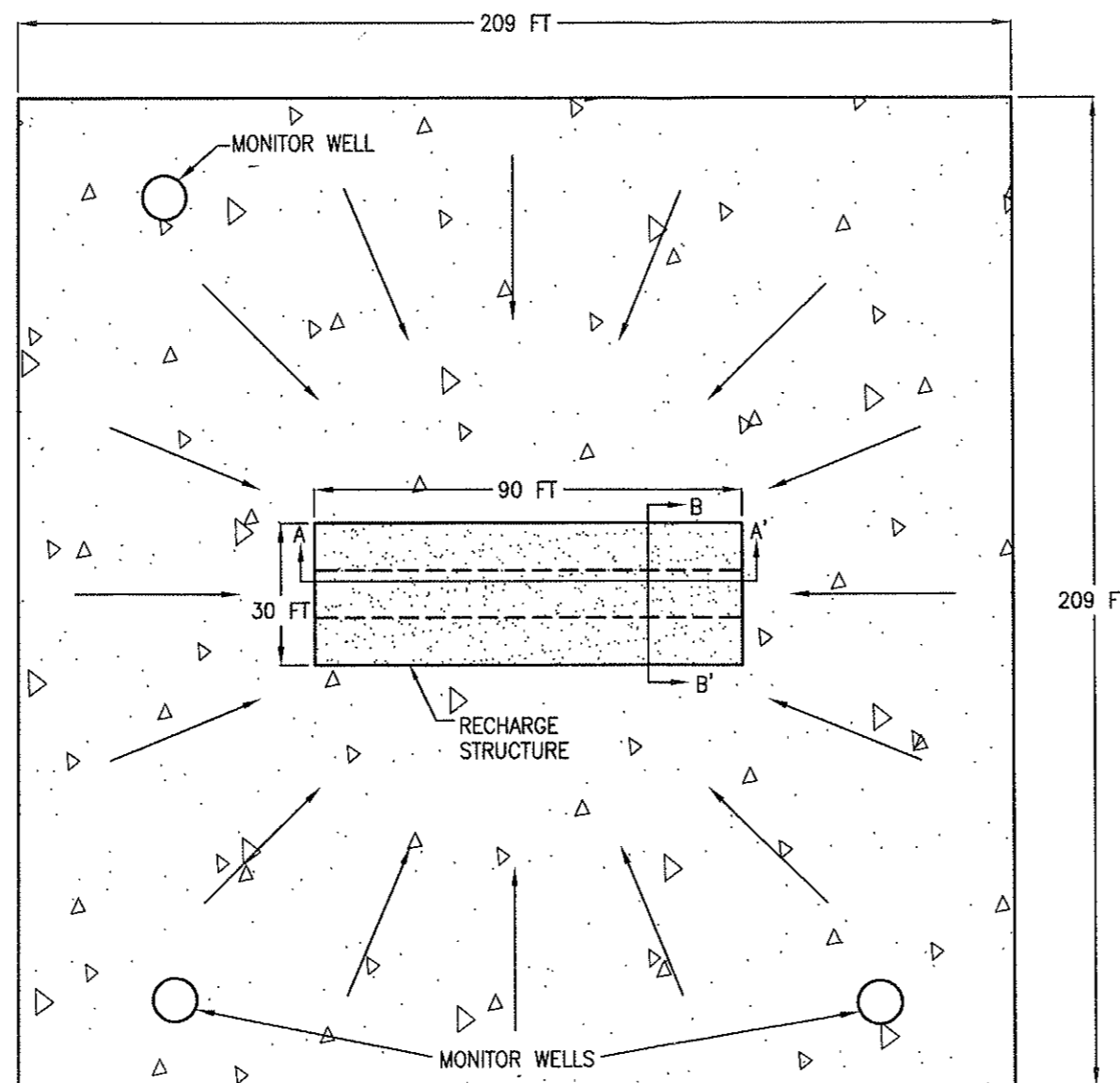
KEY PLAN

NO	DATE	DESCRIPTION

ISSUING OFFICE: Lubbock PROJECT NO: 01-2305-05

SITE LAYOUT

C-001



1-ACRE SITE GRADED TO DIRECT SURFACE FLOW TO RECHARGE STRUCTURE

GENERAL NOTES:

EXACT SITE LAYOUT WILL BE DETERMINED ONCE SITE IS SELECTED. PLACEMENT OF MONITOR WELLS WILL BE DETERMINED BY GROUNDWATER CHARACTERISTICS AND GEOLOGY OF SITE.

NOT SHOWN:

- PERIMETER FENCE
- AREA LIGHTING
- SIGNAGE
- ACCESS ROAD
- SOIL MOISTURE SENSORS

CLEAN-WASHED CONCRETE SAND

60mm-THICK POLYETHYLENE LINER WITH ROCK COVER

FLOW DIRECTION





LEUWCD GROUNDWATER RECHARGE STUDY

GAINES COUNTY COURTHOUSE
101 S. MAIN, #B-2
SEMINOLE, TX 79360

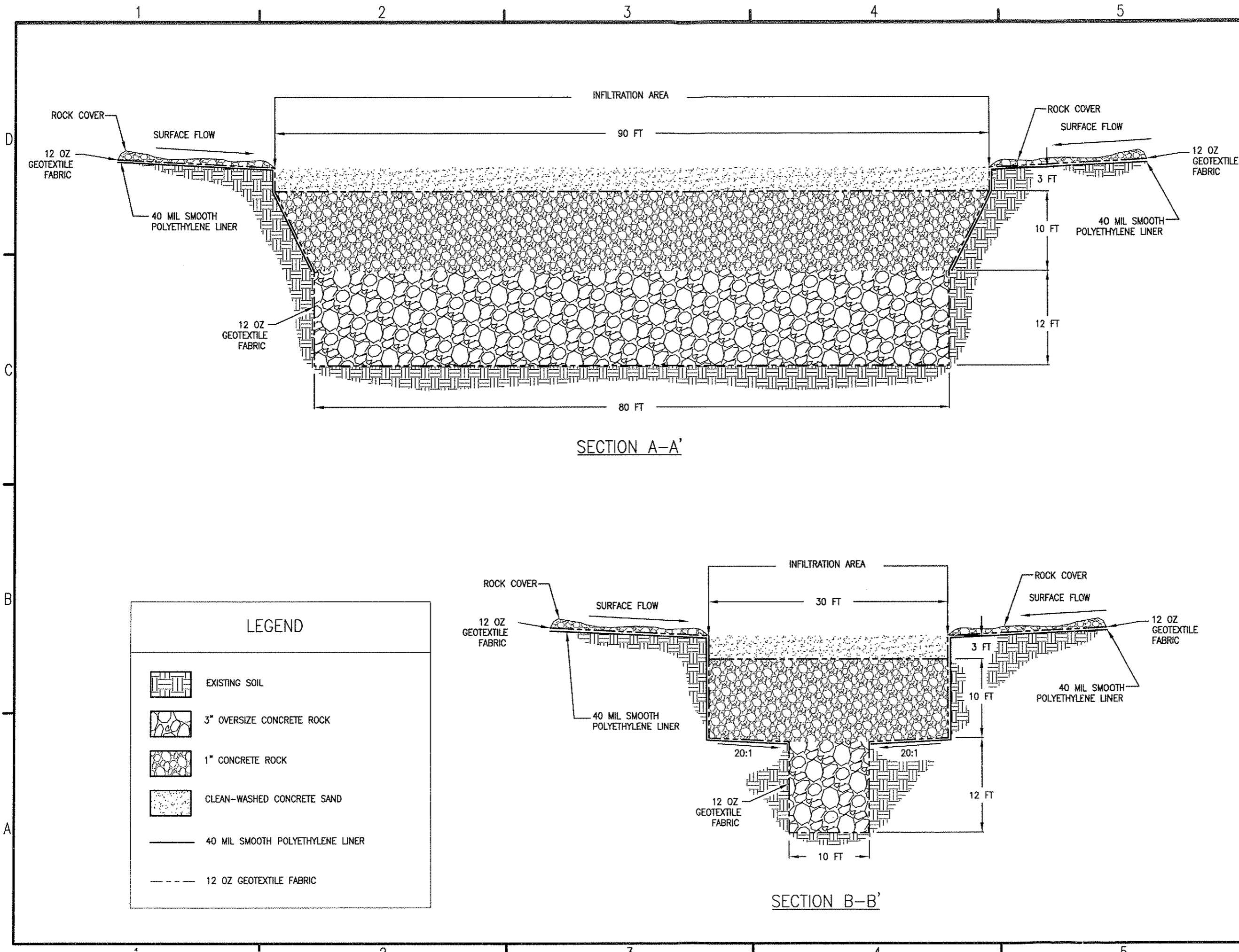
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NO	DATE	DESCRIPTION

ISSUING OFFICE: Lubbock PROJECT NO. 01-2300-06

RECHARGE STRUCTURE DETAIL

C-002



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Parkhill, Smith & Cooper, Inc.
 Engineers • Architects • Planners
 Lubbock • Paso Del Norte • Amarillo • Odessa

LEUWCD GROUNDWATER RECHARGE STUDY

GAINES COUNTY COURTHOUSE
 101 S. MAIN, #B-2
 SEMINOLE, TX 79360

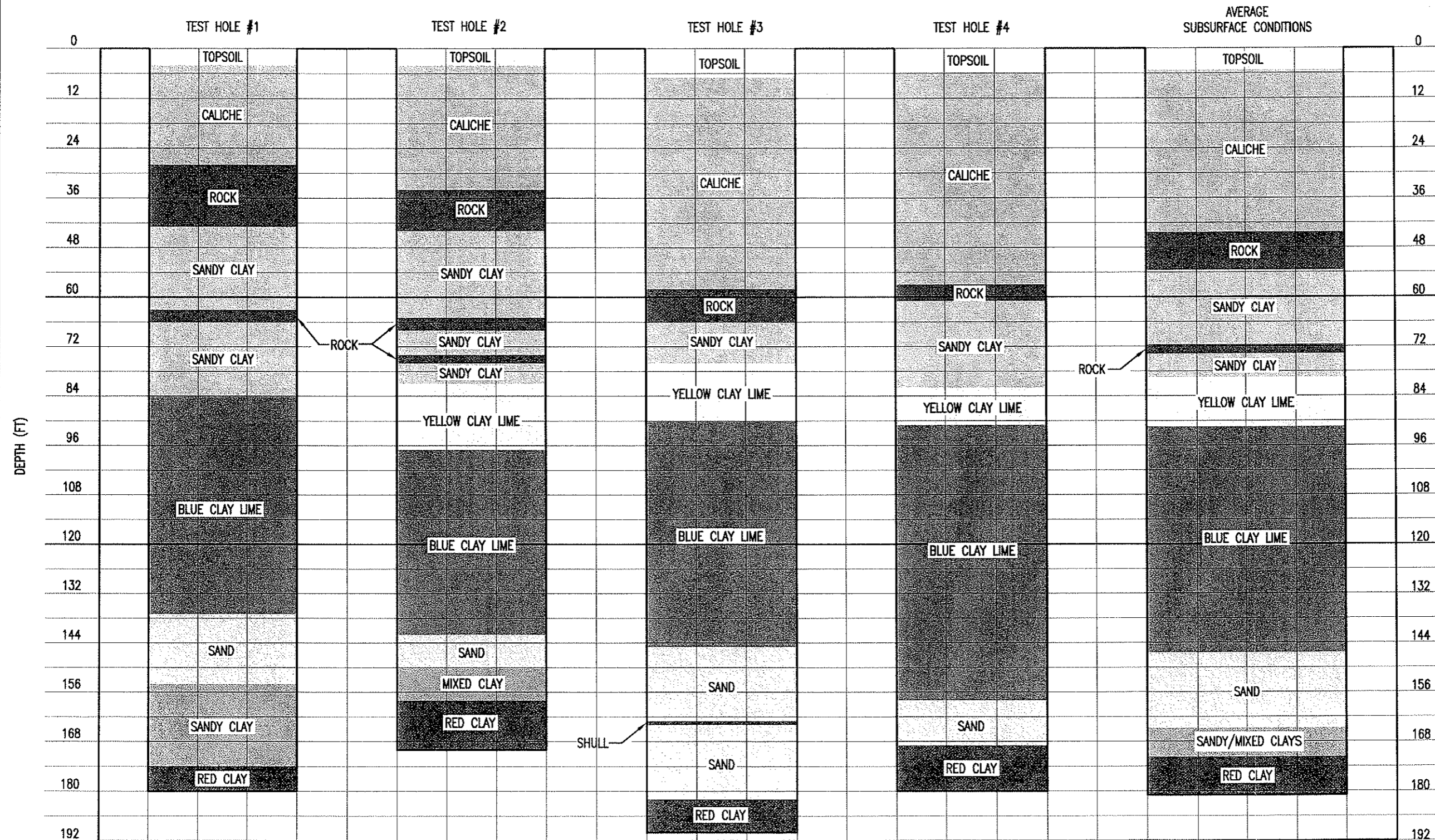
KEY PLAN

NO.	DATE	DESCRIPTION

ISSUING OFFICE: Lubbock PROJECT NO.: 01-2305-08

SOIL STRATIGRAPHY

C-003



NOTE:
 THESE GRAPHS DISPLAY SOIL LAYERS AT TEST HOLES LOCATED NORTH OF SEMINOLE, ADJACENT TO HIGHWAY 62/385. THEY SHOW THE VARIABILITY OF SOIL CONDITIONS IN THE AREA, AS ALL WERE TAKEN AT ONE SITE. THE AVERAGE SUBSURFACE CONDITIONS GRAPH REPRESENTS THE AVERAGE OF THE FOUR DISPLAYED, AND DOES NOT DEPICT A COUNTY AVERAGE CONDITION