provides additional information about the bathymetric survey. Surfacewater flow rates and sediment transport are discussed in Subsections 2.3.1.2.3 and 2.3.1.2.4.

6.3.1.2 Groundwater

A total of forty-seven groundwater monitoring wells were installed at the site in October and November of 2006. An aquifer test well and three observation wells were installed at the site in February 2007. The well locations are shown on Figure 6.3-1. Due to the highly variable nature of the Glen Rose formation (Subsection 2.3.1.5.5), twenty well clusters were installed across the CPNPP site from west to east of the proposed reactor areas to define the groundwater bearing capabilities and properties of the zones of interest, and to identify the hydraulic connectivity between the zones. Monitoring wells were designated as follows, where X denotes the well cluster number:

- Regolith/undifferentiated fill monitoring well: MW-12XXa (where present).
- Shallow bedrock monitoring well: MW-12XXb (where required).
- Bedrock monitoring well: MW-12XXc.

The high density of wells shown within and surrounding the proposed reactor areas in Figure 2.3-26 were placed to determine, or confirm, the groundwater conditions in the immediate vicinity, and to provide sufficient information for the performance of an aquifer pump test (Subsection 2.3.1.5.5). No aquifer test data have been found that addresses the aquifer characteristics in the regolith or the Glen Rose Formation (four zones), or to address the vertical conductivity between the connected zones and geologic formations. Aquifer pump test data and slug-test data were used to confirm, supplement, or replace any existing aquifer test data as supporting information for FSAR Subsections 2.4.12 and 2.4.13.

Continuous rock and soil sampling methods were selected to allow a thorough description of the rock, residual soils and overburden materials, and the documentation of soil characteristics that may affect groundwater movement (e.g., perched water intervals, clay seams, sand lenses, etc.). These methods also assisted in the selection of the subsurface soil samples for analyses and to determine the depth to the top of the saturated zone for regolith well screen placement.

Ten groundwater monitoring wells were chosen for sampling to characterize groundwater conditions prior to construction and operations. The monitoring wells were selected across a broad spatial area, with an emphasis on wells within the groundwater flow paths. Groundwater pathways are discussed in Subsection 2.3.1.5.6. As part of this baseline water quality study, quarterly groundwater samples were collected and analyzed within a one-year period (January 2007, April 2007, July 2007, and October 2007), from 10 monitoring wells at the CPNPP site.

Groundwater monitoring well locations and quarterly groundwater potentiometric elevations of the monitoring wells that were installed and monitored in support of the COL application investigation are shown on Figure 2.3-27 (Sheets 1 to 6). ~~12). A one-year program of monthly well gauging began in January 2007, and~~ Table 2.3-30 provides a summary of the monthly water level data collected between November 2006 and November 2007, January to May 2008, and August to December 2012. Depth to water at each groundwater monitoring well location was measured

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with a direct-reading water level meter. The water level meter was equipped with an audible alarm that sounded when the probe tip encountered the water surface. Depth to groundwater from below the top of the casing was read directly from the measuring tape. Groundwater depth measurements were then subtracted from a surveyed top-of-casing elevation to determine the groundwater surface elevation.

Based on an evaluation of the current groundwater elevation data, several groundwater monitoring wells exhibited very slow recharge or equalization characteristics, or were found to have no producible groundwater. These wells included the shallow regolith “a” wells, the shallow bedrock “b” wells, and the bedrock “c” wells. Until the monitoring well had a minimum of one ft of groundwater at the time of the elevation measurement, these wells were not used to determine the groundwater gradient and subsurface flow characteristics.

Groundwater flow velocities are discussed in Subsection 2.3.1.5.6. Transient variations in groundwater velocity and quality parameters are discussed in Subsections 2.3.1.5.6 and 2.3.3.2.2. The groundwater flow for the wells screened as regolith wells (MW-12XXa) generally follows the surface topography and flows towards SCR. In general, the groundwater flow in the shallow bedrock and bedrock wells (MW-12XXb and MW-12XXc) is towards the east and tends to follow the general dip of the Glen Rose Formation.

The gradient in the bedrock monitoring wells is consistent with the historical gradient reported from previous investigations conducted at the CPNPP site, as presented in Subsection 2.3.1.5.4. Based on the ~~current~~ groundwater measurements collected between December 2006 and November 2007, the groundwater flow appears restricted in the regolith material where the bedrock is absent at or near the surface during the wet weather periods. Shallow groundwater flow during these periods appears to be controlled by gravity and follows the surface topography towards SCR. The exception to this flow is noted in a fill area that is located between the CPNPP Unit 3 and the intake location for CPNPP Units 1 and 2 where it appears that the groundwater is in direct communication with SCR. This information is discussed in detail in Subsection 2.3.3.

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6.3.1.3 Sediment Transport and Erodibility

Information on sediment transport for Lake Granbury and the Brazos River is provided in Subsection 2.3.1.2.4. However, published information for specific sediment transport analyses such as rate, bed and suspended load fractions, and graduation analyses, and erosion studies in the CPNPP vicinity is not readily accessible or has not been performed. The majority of the soils on the CPNPP site consist of the Tarrant-Bolar association, hilly (48); and the Tarrant-Purves association, undulating (49) (USDA 1978). These soil types typically have slopes ranging from 1 to 30 percent, with some areas exhibiting as much as a 45-percent slope. Fragments of limestone, ranging from 3 in to 4 ft in diameter, cover from 2 to 60 percent of the surface. These soils are located on narrow ridgetops, edges of benches, and steeper slope breaks, and typically they have moderately slow permeability, very low available water capacity, and are not easily erodible. These soils have a medium potential for range use because of stones, low available water capacity, and shallow root zone, and have a low potential as cropland and pasture land (USDA 1978). Subsection 2.3.1.5.2 provides a discussion on the local and regional geology. Figure 2.3-24 shows the major geomorphic features for the area and the regional geologic formations. In addition, Figure 2.3-28 shows the soil types found at the CPNPP site.

sampling program supports the environmental descriptions for hydrology, water use, water quality, aquatic ecology, and water supply discussed in Chapters 2 and 3.

6.6.1.2 Preapplication Groundwater Monitoring

In January 2007, a groundwater sampling program was initiated as part of a subsurface study to evaluate current geologic and hydrogeologic conditions at the CPNPP site. Twenty groundwater monitoring well clusters (47 wells total), one aquifer test recovery well, and three aquifer test observation wells were installed from October 2006 to February 2007. The groundwater monitoring wells were developed, and water levels were measured monthly from December 2006 through December 2007, January to May 2008, and August to December 2012. A list of the monitoring wells and relevant installation data are presented in Subsection 2.3.1.5.5 (Table 2.3-29) and FSAR Subsection 2.4.12 (FSAR Table 2.4.12-201). The locations of the groundwater monitoring wells are presented in Figure 2.3-26 and FSAR Figure 2.4.12-208. In addition to the water level measurements, quarterly groundwater samples were taken from 10 of the wells and analyzed for a variety of constituents, and the results of the groundwater sampling are presented in Subsection 2.3.1.5.5 (Table 2.3-50). The groundwater samples were obtained following generally accepted field sampling procedures, including the use of clean sampling devices, and clean and prepared sample containers supplied by the laboratory that performs the analysis. The samples were taken on approximately 90-day intervals. Sample preservation and analysis followed the procedures for groundwater sampling and analysis. Groundwater samples were submitted in accordance with chain-of-custody protocol to independent third-party commercial laboratories.

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6.6.2 CONSTRUCTION MONITORING

A construction monitoring program may be required by TCEQ to provide data necessary to assess surfacewater quality changes resulting from construction of CPNPP Units 3 and 4, especially in relation to construction-area stormwater runoff. The land area disturbed by construction of CPNPP Units 3 and 4 is expected to be 675 ac, which exceeds the one-ac limit, requiring a stormwater construction permit in accordance with 40 CFR 122.26 (Subsection 4.2.1.10).

If construction monitoring is required by TCEQ, the results can be compared with the preapplication quarterly surfacewater and groundwater sampling program discussed in Subsections 6.6.1.1 and 6.6.1.2 and used to detect any deviations from the baseline water quality.

6.6.2.1 Construction Surfacewater Monitoring

Construction activities for CPNPP Units 3 and 4 require a TPDES stormwater construction permit in accordance with 40 CFR 122.26 and the Texas Water Code (TCEQ 2007). The CPNPP site preparation and construction activities are expected to be performed under a TPDES permit, with all requirements implemented in the monitoring program, as required.