INTERA Incorporated
1812 Centre Creek Drive, Suite 300
Austin, Texas 78754
Telephone: 512 425 2000
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December 8, 2014

Mr. Warren Hayes, Decker Lake Golf, LLC
8108 F.M. 973
Austin, TX 78724

RE: Memo regarding potential deep commercial well near proposed golf course

Dear Mr. Hayes,

INTERA Incorporated (INTERA) is pleased to submit the following technical memo regarding the potential for a deep commercial well near the proposed location of the golf course near Decker Lake.

Should you have any questions concerning the enclosed Statement of Work, please call me at (512) 425-2025.

Sincerely,

Neil Deeds
Principal Engineer, Vice President

Enclosure

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512.425.2000

DRAFT TECHNICAL M E M O R A N D U M

To: Warren Hayes, Decker Lake Golf, LLC

From: Neil Deeds, PhD, PE

Date: December 8, 2014

Re: Potential for a Commercial Well at the Proposed Decker Lake Golf Site

1 BACKGROUND

This memo provides a scoping level discussion of the potential for drilling a well at a site near Decker Lake in northeast Austin, and potential impacts on existing water features or water supplies in the area. The proposed well would be used for commercial and irrigation purposes, not public water supply. The estimated production rate is about 500 acre-feet per year.

2 HYDROGEOLOGY

2.1 Formations

In the area of interest near Decker Lake, surface sediments consist primarily of quaternary alluvium or terrace deposits, and upper cretaceous materials. The only major aquifer in the area is the Trinity Aquifer. While the Edwards formation exists in the area, the location is far enough east into the Balcones Fault Zone such that Edwards water is highly brackish, and productivity is unknown. The most productive formation of the Trinity Aquifer is the Hosston sandstone, which lies approximately 3,000 feet below ground surface.

2.2 Water Quality

Estimates of water quality in the Hosston are based on the nearest wells which have water quality samples available. The only wells in the area that are completed in the Hosston, as recorded in the TWDB groundwater database, are approximately three miles north in the City of Manor, and what appears to be a private well about three miles east (a converted wildcat oil well).

The most recent water quality sample in the private well shows a total dissolved solids (TDS) of 1,716 mg/L, while the most recent sample in the latest Manor well shows a TDS of 1,791 mg/L. During the original pump test of the Manor well, water temperature ranged from 111 to 115 F, depending “partly on the pumping rate of the well and partly on the length of the pumping time”.

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Although the City of Manor had historically utilized their Hosston well as a potable water source, 1,800 mg/L is considered brackish, and would not typically be used for potable water, given an alternative supply.

2.3 Productivity

The best estimate of productivity is based on the City of Manor well which had a short term specific capacity test performed. The resulting estimate was about 1.1 gallon per minute (gpm) per foot drawdown. The highest pumping rate tested was 400 gpm, and the drawdown at 2 hours was 362 feet. A similar well pumping about 310 gpm (about 500 acre feet per year) would draw down about 270 feet at 2 hours, based on a simple analytic estimate using the Theiss equation. After 5 years, drawdown at that rate would be about 470 feet, based on the same equation. The available drawdown for a well completed in the Hosston formation is well over 2,500 feet in that area.

3 POTENTIAL IMPACTS OF GROUNDWATER PRODUCTION

3.1 Existing Wells

Groundwater production creates a drawdown cone that extends radially away from the well. Drawdown is greatest at the well site, and decreases with distance from the well. The closest Hosston wells reported to the TWDB are several miles from the proposed site, so the drawdown will have decreased significantly at that distance. Based on a simple analytic estimate similar to that used in Section 2.3, the 3-mile drawdown impacts at 5 years would be less than 80 feet. Given over 2,500 feet of available drawdown, the impact relative to available drawdown is likely to be small.

Wells that are completed in shallower formations are separated from the Hosston by hundreds of feet of shales, clays, and limestone. These materials provide significant resistance to the transmission of impacts upward from the Hosston. No impact to these shallow wells would be expected, and thus no impact would be expected on water supplies that are dependent on shallow wells.

3.2 Surface Water Features

As with the shallow wells, the separation of the Hosston from the surface would preclude impacts to any surface water features, such as the lake, any streams or springs, wetlands, etc. Thus no impact would be expected on water supplies dependent on surface water.

3.3 Trinity Aquifer

The Trinity Aquifer stretches from Medina County west of San Antonio all the way north into Oklahoma. Total production from northern portion (north of the Colorado River) of the Trinity

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Aquifer in 2010 is estimated at 184,582 acre feet[1]. While a well producing 500 acre feet will have local drawdown impacts in the Trinity, there has been little regional historical drawdown in the Trinity Aquifer in Travis County, so the local impacts will be unlikely to contribute to any existing regional effects (for example, the cone of depression near the Dallas-Fort Worth area).

4 SUMMARY

Based on a scoping level analysis, a commercial well drilled in the Hosston Formation in the area of the proposed golf course could be sufficiently productive to supply 500 acre feet of water per year. The water would be hot and brackish, and unsuitable as a direct potable supply. While several hundred feet of drawdown would occur near the well, drawdown impacts to the nearest known deep existing wells are estimated to be less than 80 feet. No impacts to shallow wells or surface water features, or water supplies dependent on these sources, is expected.

[1] Kelley and others, 2014. Updated Groundwater Availability Model of the Northern Trinity and Woodbine Aquifers, contracted by the Texas Water Development Board.