4. CONCLUSIONS AND RECOMMENDATIONS

Based on the exploratory boring analysis of EVE-EXP-01, hydrogeologic conditions and groundwater quality appear favorable for the installation of two industrial water supply wells on the subject property and meet the yield goal of at least 800 gpm for each well. The yield goal can likely be met by only developing groundwater from saturated portions of the Upper Sandy Unit (300 to 810 feet bls), but chloride and TDS concentrations in the groundwater are estimated to be excessively elevated.

Based on hydraulic testing and groundwater quality of individual interval zones, Table 4-5 tabulates calculated estimates of constituent concentrations for a completed well only developing groundwater from saturated portions of the Upper Sandy Unit (300 to 810 feet bls). Specific capacity of a completed well based on hydraulic testing is estimated at about 5 to 6 gallons per foot of drawdown (gpm/ft).

Specific capacity is the ratio of yield in gpm to the steady-state water-level drawdown from pumping in feet. Well performance as well as yield potential is greater for wells with greater specific capacity. For example, a well that yields 1,000 gpm with a steady-state drawdown from pumping of 100 feet has a calculated specific capacity of 10 gpm/ft.

TABLE 4-5. EVE-EXP-01 - EST. INORGANIC GROUNDWATER QUALITY OF COMPLETED WELL FOR SELECTED CONSTITUENTS (DEVELOP GROUNDWATER FROM PORTIONS OF UPPER SANDY UNIT ONLY)

CONSTITUENT						
ARSENIC (µG/L)	CHLORIDE (MG/L)	SULFATE (MG/L)	MAGNESIUM (MG/L)	FLUORIDE (MG/L)	TDS (MG/L)	TEMPERATURE (F)
3	1640	660	40	2	3550	91

To minimize chloride and TDS concentrations as well as maximizing temperature of developed groundwater for Evelution Energy requires development of groundwater from both saturated portions of the Upper Sandy Unit and Lower Unit (300 to 520 ft bls and 1,160 to 1,500 ft bls). Based on hydraulic testing and groundwater quality of individual interval zones, Table 4-6 tabulates calculated estimates of constituent concentrations for a completed well developing groundwater from saturated portions of the Upper Sandy Unit and Lower Unit. Specific capacity of a completed well based on hydraulic testing is estimated at about 6 to 8 gpm/ft.

TABLE 4-6. EVE-EXP-01 - EST. INORGANIC GROUNDWATER QUALITY OF COMPLETED WELL FOR SELECTED CONSTITUENTS (DEVELOP GROUNDWATER FROM PORTIONS OF UPPER SANDY UNIT AND LOWER UNIT)						
CONSTITUENT						
ARSENIC (µG/L)	CHLORIDE (MG/L)	SULFATE (MG/L)	MAGNESIUM (MG/L)	FLUORIDE (MG/L)	TDS (MG/L)	TEMPERATURE (F)
3	930	510	20	2	2210	95

Recommended final well design based on hydrogeology and groundwater quality data is depicted on Figure 4-1. Screened intervals for the wells are from 300 to 520 producing groundwater from the Upper Sandy Unit and 1,160 to 1,500 feet bls producing groundwater from the Lower Unit, totaling 570 feet of screen. Blank casing from 520 to 1,160 feet bls will serve as a pump gallery and blank casing from 1,500 to 1,520 feet bls will serve as a well sump. Annular bentonite seals are included above and below the screen intervals to prevent vertical flow of groundwater of inferior quality through the filter pack.

Based on evaluation of sieve analyses of drill cutting samples of formations to be juxtaposed to the screen intervals, it is recommended that the upper well screen shall consist of 14⅝-inch diameter, mill-slotted steel pipe having a slot size of 0.030-inches with a filter pack size of United States (US) sieve No. 8 to No. 30 gravel. The lower well screen shall consist of 14⅝-inch diameter, Roscoe Moss Company "Ful Flo" louvered steel pipe having an aperture size of 0.080-inches with a filter pack size of United States (US) sieve No. 4 to No. 12 gravel. Sieve analysis graph of selected composite drill cutting samples from the boring is included in Appendix B. Due to the suspected corrosive nature of local groundwater, well casing shall either be manufactured with Type 304L stainless steel (SS) or high-strength low-alloy steel (HSLA). Bidding can provide costs for both options to aid in the selection process.

TABLE 4-7. EVE-EXP-01 - EST. INORGANIC GROUNDWATER QUALITY OF COMPLETED WELL FOR SELECTED CONSTITUENTS (DEVELOP GROUNDWATER FROM PORTIONS OF LOWER UNIT ONLY)						
CONSTITUENT						
ARSENIC (µG/L)	CHLORIDE (MG/L)	SULFATE (MG/L)	MAGNESIUM (MG/L)	FLUORIDE (MG/L)	TDS (MG/L)	TEMPERATURE (F)
3	740	610	20	2	2140	97

To maximize the minimization of chloride and TDS concentrations of developed groundwater for purpose of irrigation for WMIDD, only saturated portions of Lower Unit should be developed (1,160 to 1,500 ft bls). Based on hydraulic testing and groundwater quality of individual interval zones, Table 4-7 tabulates calculated estimates of constituent concentrations for a completed well only developing groundwater

from the Lower Unit to a depth of 1,500 feet. Specific capacity of a completed well based on hydraulic testing is estimated at about 3 to 4 gpm/ft.

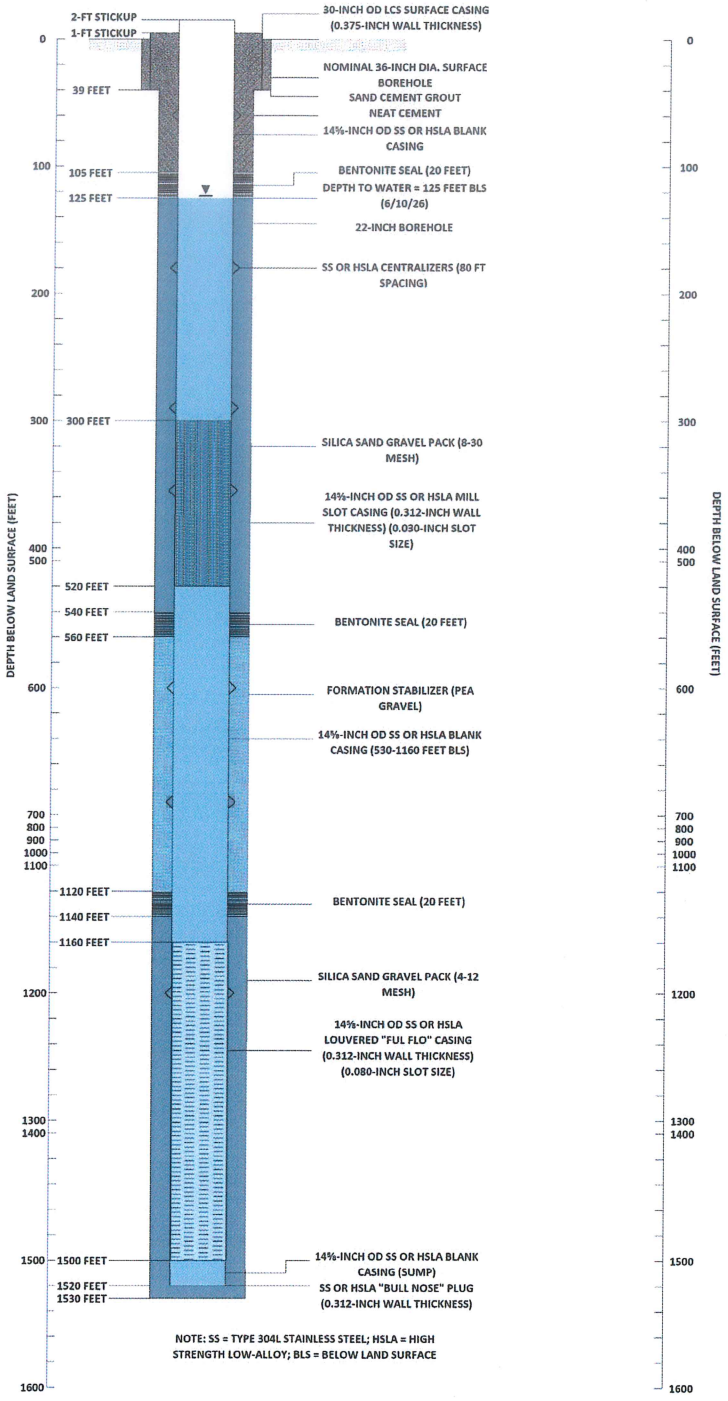

Figure 4-1 – Recommended Final Well Design for Evelution Energy Wells Nos. 1 and 2

It is recommended that future deep groundwater exploration investigations for irrigation purposes for WMIDD be performed to depths greater than 1,500 feet to evaluate yield potential and chloride and TDS concentrations of these portions of the regional aquifer. Trends of chloride and TDS concentrations lessons with depth in lower portions of the local aquifer tested (See Table 3-3) and may result in the potential to develop groundwater from irrigation wells completed to these depths with improved groundwater quality and greater specific capacities and yield potential.