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January 12, 1983

Hadley Jenner
Municipality of Anchorage
Planning Department
632 W. 6th Avenue
Anchorage, AK 99501

Dear Mr. Jenner:

As requested by you, this letter briefly summarizes how we perceive the water-supply potential in the area of massive gravel extraction near Sand Lake. To my knowledge, no other assessment for this particular area has been made by groundwater hydrologists. The data base is far from ideal, with only one documented pumping test that seems pertinent. Without the fairly complete records for the Anchorage Asphalt Company's well (USGS # SB12-4-9 DDAC1), any estimate of groundwater potential would be qualitative. Because I visited this well during construction and have full confidence in the driller's data, I have heavily based my assessment (below) upon the results of their 11 hour pumping test.

Using the classical Theis equation and related assumptions describing groundwater flow, a mathematical model was formulated that approximates the drawdown recorded in the industrial well at the end of the 11 hour test period. (The USGS file data show a drawdown of 61 ft below a static water level of 105 ft, caused by pumping 260 gal/min) The approximation was assumed to be "best" when the input parameters resulted in a drawdown of 50 ft at a radius of 1 ft (just outside the casing) after 11 hrs of simulated pumping. The 11 ft difference allows for what is called well losses, or in other words, the Anchorage Asphalt well was assumed to be 80% efficient.

The following input parameter values were used:

transmissivity in ft^3/day = 1500

storage coefficient = 1×10^{-5}

pumping rate in gal/min = 250

An HP-67 programmed calculator gave the following results:

After 1 year continuous pumping

at radius = 1 ft, drawdown = 65 ft

at radius = 100 ft, drawdown = 42 ft

at radius = 1000 ft, drawdown = 30 ft

If pumping at 250 gal/min continued for 5 years non-stop, the above drawdowns woul increase by 4 ft. This simple mathematical model does not take into account natural recharge of the aquifer, but assumes that all water is derived from storage. It is not possible to quantify the effects of recharge without comprehensive Bowl-wide computer modeling, which the USGS is currently doing.

Although natural recharge will, by itself, decrease actual observable drawdowns, the probably presence of groundwater barriers in the flow system within a quarter mile of the site will have the opposite effect. Aquifer thinning, pinchouts or permeability reductions can overshadow the effect of recharge, and result in drawdowns greater than those predicted by the Theis equation. Thus, the assessment given here should be viewed as a middle-of-the-road approximation.

Assuming the Anchorage Asphalt well is representative of the maximum yield that any hypothetical well in the area could give (and drillers logs suggest this is so), one can readily see that the water level in an area as large than 2000 ft in diameter will be lowered more than 30 feet from present levels by pumping 250 gal/min. The head level of the confined aquifer would then be at least 15 ft below mean sea level. If such a condition persisted for many months or years, brackish or saline ground water would most likely be induced upward into the aquifer. If, for example, four wells located 2000 ft apart within the tract were operated at a combined rate of 1000 gal/day, a Theis solution gives a drawdown exceeding 115 ft in the vicinity of the well field. In this case sea water intrusion is almost a certainty.

Another complicating factor is that the aquifers in the Anchorage lowland area are hydraulically interconnected. This aquifer system has been mapped and monitored for many years by the USGS. Attached is a map of potentiometric (water-level in confined aquifers) changes through time that documents a substantial decline in water levels. Water levels in the Sand Lake area apparently are significantly affected by groundwater withdrawal elsewhere in the Bowl, as well as by local groundwater extraction.

In conclusion, while the transmissivity of the only aquifer known to have supported a moderate-yielding well is relatively low due to an aquifer thickness of only 11 ft, it is the pre-pumping elevation of the water level (about 20 ft above sea level) that severely limits productivity of the aquifer. (See attached potentiometric contour map of Anchorage lowlands)

Thus, the potential for sea-water or deep brackish-water intrusion into heavily stressed aquifers is high in this general area near the Turnagain Arm Bluff. For primarily this reason, I do not recommend large-scale development of ground water in the gravel-pit tract, or for that matter, in the area southwest of Sand and Jewel Lakes.

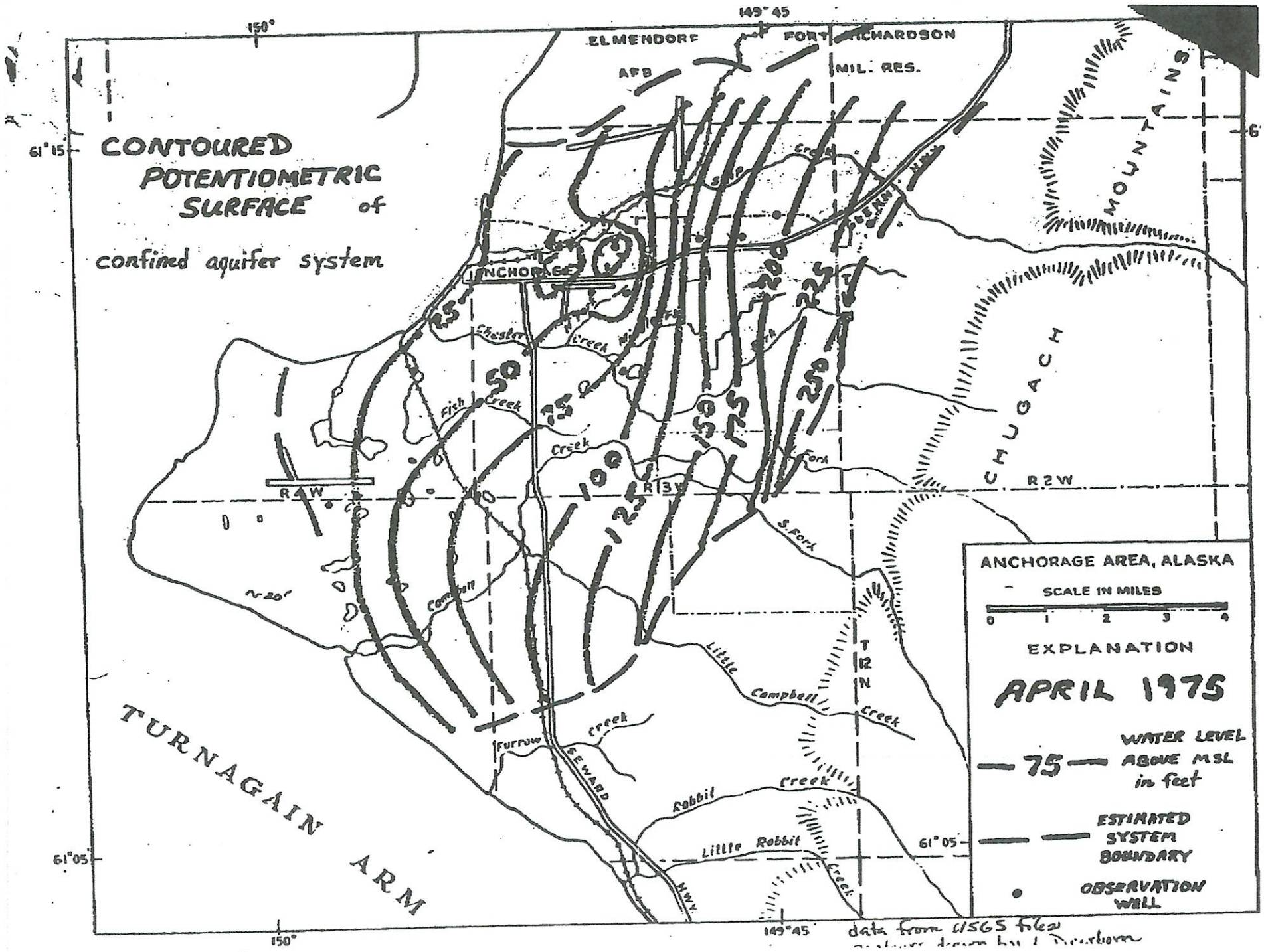
Sincerely yours,

Larry L. Dearborn
Hydrologist

LLD/jlw

Enclosures

cc Bill Barnwell



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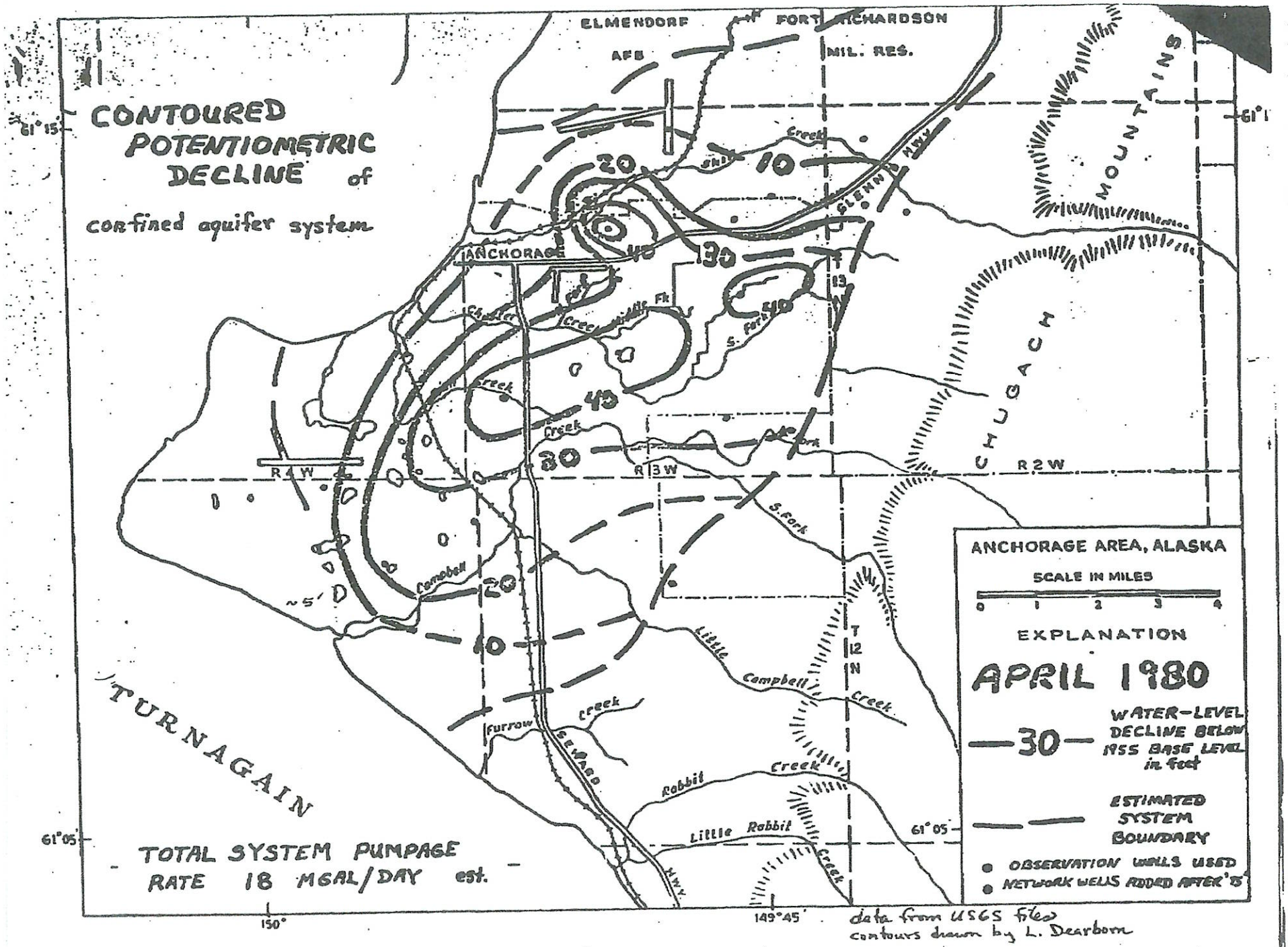

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