Layne-Western *a division of Layne Christensen Company*

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August 7, 2006

City of Carter Lake
950 Locust Street
Carter Lake, IA. 51510

Attn: Mr. Russ Kramer – Mayor
RE: Water Supply Well

Dear Mr. Kramer,

Layne Western appreciates the opportunity to supply information and cost estimates for utilizing the Kiwanis Park well to add water to Carter Lake. I am sorry it took so long to get this information back to you. Our Hydro geologist was out on a project and I had trouble getting in contact with Omaha on the condition of the well and pump.

I talked with Todd Mailiero about his part in the Kiwanis Park renovation. He had nothing to do with the well pump and did not know of any plans for any future work on it. I finally got in contact with Dave Johnson with the Omaha Parks. As far as he knows, the well and pump at Kiwanis is operable. You were right when you said the fountain had its own pump and just circulated the pond water. The existing pump was designed to supply flow and pressure directly through the fountain. This is not needed any more so this pump could be down sized. If you were to use this pump for lake fill, you would save on electrical consumption by reducing the horse power. I could maintain the 1000 gallons per minute and lower the motor from a 75 H.P. to a 40 H.P. This would be a huge savings during long time pump use.

I looked at the well design again. This well only has 20' of screen which limits how much water we can pump and not create potential rehabilitation problems. The recommended entrance velocity of a well is no more then .1 foot per second. This amounts to 1000 gallon per minute which is the original design. If you want to pump more then this I would recommend a new well with more screen and a larger diameter. I don't think it needs to be larger.

If you want to use this well for lake fill I recommend a study to determine if there is any water circulation between the well and the lake. I have talked with our Hydro geologist about cost to do this study. He has a great amount of expertise with this type of project and he is currently doing the model for the new M.U.D. well field. He has two approaches to get this information. One is the least expensive where he uses current information and rules of thumb to model the circulation influence. The second scope would be to run a full scale pump test. This is more expensive but we could be more accurate with the report. You don't want to invest a lot of money into pumping into the lake and find out later that we are circulating a large amount of what we are pumping in. This option would also allow us to pump into the lake for a full week. We could observe the area of discharge for any iron precipitation problems.

To run the pump test we would need to run the Kiwanis Park well for one week. We would use electronic water level indicators in the pumping well and three piezometers that would need to be constructed. At this time we don't know the condition of this well or pump. I would recommend having us come down first and perform a flow test on the well. If it checks out good we can proceed with the test. If there is a problem we would either need to fix the pump, clean the well or both before the pumping test could start.

PROJECT COST

Option 1 – A simple groundwater model will be constructed to estimate how much water is obtained by a pumping well from induced infiltration of the lake. This water represents water that is re-circulated. The model will be constructed to simulate current pumping and lake conditions.

- **Model construction----------$2,280.00**

Option 2 – A pumping test will be performed to estimate an appropriate spacing distance from the lake for a new supply well. The test will be run continuously for seven days. We will collect three water samples during the test to confirm iron content and twelve other minerals. For this test, it is assumed that a pumping well and three observation wells, located between the lake and the pumping well will be installed. Task for the phase include; pump test design, pump test analysis, and well spacing recommendations. When the pump test is complete, the model will be run using data obtained from the pumping test. The objective of the model will be to develop a distance from the lake that minimizes water re-circulation.

Estimated Cost

- Well and pump flow test (lump sum) ----------$450.00
- Pump test design (4 hrs. at $95.00 per hour) ---------- 380.00
- Pump test field support (16 hrs. at $95.00 per hour) ----------1,520.00
- Travel Time (8 hrs. at $95.00 per hour) ---------- 760.00
- Data Review and Analysis (20 hrs. at $95.00 per hour) ----------1,900.00
- Design Peer Review (5 hrs. at $95.00 per hour) ---------- 475.00
- Summary Report (lump sum) ----------1,140.00
- Hotel Charges (2 days at $100.00 per day) ---------- 200.00
- Vehicle Rental (2 days at $70..00 per day) ---------- 140.00
- Per Diem (2 days at $100.00 per day) ---------- 200.00
- UPS Charges (lump sum) ---------- 110.00
- Water samples (lump sum) ---------- 218.00
- Water level indicator rental (lump sum) ---------- 1,600.00
- Construct three piezometers, run 1000 feet of discharge pipe, adapt to pump blow off; man the test for seven days (lump sum) ----------$20,221.00

Total estimate ---------- $29,314.00

After we run the flow test on the well we will know if it can be used as is for the extended test. If the well capacity is poor and the well needs rehabilitation I have included a cost to do this. I have also supplied a well rehabilitation scope sheet with this proposal. The pump will need to be pulled to do this work if needed.

Well rehabilitation per scope sheet (lump sum) ----------$11,430.00

If you have any questions please feel free to give me a call.

PROPOSED WELL REHABILITATION
KIWANIS PARK WELL

* Mobilize two-man pump crew to site and run initial performance test to determine condition of well and pump. Check the well specific capacity and the pump performance against original conditions.
* Remove pump from well and perform field inspection. Furnish a complete list of needed repair parts with pricing for your approval.
* Check well depth and bail any fill material from the well.
* Perform television survey of well using Layne down-hole equipment.
* Sonar-Jet well screen twice. Sonar-Jet treatment is effective in removing mineral encrustation from well screen. Fine sand is also removed from gravel pack due to pulsating action of the Sonar-Jet treatment. Pump the solution to waste using a Layne submersible test pump and conduct well performance test to determine the progress achieved.
* Introduce 1,000 gallons of Layne QC-21 solution with surfactants and inhibitors into the well through a tremie pipe set at the top of the screen. The Layne QC-21 solution is effective in removing mineral encrustation from the screen and surrounding formation. The Layne QC-21 solution has a high capacity to carry dissolved minerals out of the well. The Layne QC-21 solution is also effective at penetrating any bacterial slime that may be in the well.
* Surge the QC-21 solution using a double-disk surge block for a period of six to eight hours. A pump would be set inside the double-disk surge block to help distribute and agitate the treatment solution. The double-disk surge block method is effective in breaking down the encrustation as well as redeveloping the well by removing any fine sand that may have accumulated in the gravel pack.
* Following the surging operation, pump the QC-21 solution to waste using the Layne submersible test pump through the double-disk surge block. Conduct well performance test again to document progress achieved. Neutralize the QC-21 solution using a Layne Neutralization Chamber.
* Introduce 1,000 gallons of Laynite bactericide solution with surfactants through a tremie pipe set at the top of the screen. The final bactericide treatment is effective in removing any remaining bacteria, as well as disinfecting the permanent pump.
* Reinstall the repaired permanent pump, pump the final bactericide treatment to waste and perform a final pumping test to determine the final results achieved. Dechlorinate the bactericide solution during pump off using a Layne Neutralization Chamber.
* Provide a final report detailing all work completed along with results.

Sincerely,

LAYNE-WESTERN,
A division of Layne Christensen Company

Brad Harris,
Sales Engineer.

LAYNE-WESTERN

By: _____

Title: Sales Engineer

Date: 8/8/06

Purchaser: _____

by: _____

Title: _____

Date: _____