

KANSAS GEOLOGICAL SURVEY

1930 Constant Ave., Campus West
The University of Kansas
Lawrence, Kansas 66047-3726
phone 785-864-3965
fax 785-864-5317

May 19, 2003

Kathleen Holt
P.O. Box 633
Cimarron, KS 67835

Dear Ms. Holt:

RE: Proposed Project of the City of Ingalls for Application to the Kansas Department of Health and Environment for the Kansas Public Water Supply Loan Fund for installation of a water supply well in Dakota aquifer and connection to the public water-supply system, and plugging of Well #1

Agency Review Comments:

The documents sent to the Kansas Geological Survey for review of the proposed project were not complete enough to appropriately evaluate the impact of the proposed project. Thus, I called the City of Ingalls to obtain additional information. I appreciate the additional information that you gave to me over the telephone and by fax. After you indicated that Robert Vincent of Ground Water Associates, Inc. was involved in preparation of documents for the proposed project, I called Mr. Vincent to discuss the construction of the well in the Dakota aquifer. He also faxed to me information relevant to the project.

My concern was that the information originally sent did not indicate whether the public water supply well to be installed in the Dakota aquifer would be sealed from potential contamination from the overlying Ogallala-High Plains aquifer. Saline water from the Arkansas River, when it flows past Ingalls, seeps into the alluvial aquifer and then into the underlying Ogallala-High Plains aquifer. As you indicated, the Ogallala-High Plains aquifer in the vicinity of Ingalls also contains high nitrate concentrations that have slightly exceeded the drinking-water standard in the new Well #3 in the Ogallala. The saline and high nitrate ground water could potentially flow down the annular space between the borehole and the casing of the proposed Dakota well if there was sand or gravel placed in the annulus from above the well screen up through the lower part of the Ogallala-High Plains aquifer. The original information sent to me did not include the complete schematic for the proposed well. The diagram for the proposed well construction that both you and Mr. Vincent faxed to me show that bentonite holeplug is to be placed above the gravel pack in the annular space followed by a cement and sand mixture. The seal of cement, sand, and bentonite will occupy a depth interval of 50 ft across the top of the Dakota strata. Mr. Vincent said that there was shale in the interval of Dakota strata along which the annular seal is to be placed. This should provide good protection of the Dakota aquifer water to be pumped from proposed Well #4 from overlying contaminated ground water.

Mr. Vincent also faxed me an analysis of ground water from a test hole drilled into the Dakota aquifer at the proposed location for Well #4. The nitrate concentration of the Dakota ground

water is so low that it was undetectable. A detectable amount of ammonium ion (0.11 mg/L as ammonia-nitrogen, $\text{NH}_4\text{-N}$) was found that, if oxidized to nitrate by the time it reached distribution points in the public water supply system would be equivalent to about 0.1 mg/L nitrate (as nitrate-nitrogen, $\text{NO}_3\text{-N}$). This is 1% of the 10 mg/L nitrate-nitrogen standard (maximum contaminant level) for drinking water. The sulfate and chloride concentrations of the Dakota ground water are about an order of magnitude (one tenth) less than in some of the ground water in the Ogallala-High Plains aquifer impacted by the infiltration of saline Arkansas River water in the Ingalls area. The Dakota aquifer water is also much softer than the ground water in the Ogallala-High Plains aquifer. Thus, blending of the ground water from proposed Well #4 in the Dakota aquifer with the water from Well #3 in the Ogallala-High Plains aquifer should produce a mixture that has lower nitrate, sulfate, chloride, and hardness concentrations than in the Ogallala water. The amount of water that can be pumped from the Dakota aquifer is not expected to be as great as from the Ogallala-High Plains aquifer. Therefore, both wells will probably be needed for the future to supply sufficient quantities of water to handle high demand periods such as in the summer and for extinguishing fires.

The cost estimate sheet for the proposed activities shows item 9) Capping and plugging Well #1 at a cost of \$4,800. Older water-supply wells typically have gravel or sand pack in the annular space up to near the ground surface. Contaminated ground water in the shallow alluvial aquifer can travel down the gravel or sand pack in the annular space down to zones where water is pumped for supplies from the Ogallala-High Plains aquifer, especially because ground-water levels have been slowly dropping in the Ogallala. Assuming that Well #1 is screened in the Ogallala-High Plains aquifer, it will be important for the casing of Well #1 to be perforated across the lower part of the alluvial aquifer and the upper part of the Ogallala-High Plains aquifer, followed by pressure injection of grout into the gravel pack, to prevent the transport of contamination along the well annulus from the shallow aquifer into the deeper aquifer. The cost of \$4,800 is substantially greater than usual for just plugging the inside of the casing of a supply well. This cost may very well include the perforation and grout injection but no information was included in the application concerning the plugging procedure to be used. I recommend that the City of Ingalls work with Mr. Vincent to ensure that Well #1 is plugged in a manner to prevent contamination down the annular space.

Recommended Action:

- ☐ Clearance of project should be granted
- ☐ Clearance of project should not be granted
- ☐ Clearance of project should be delayed until the issues or questions have been clarified
- ☒ Clearance of project should not be delayed, but the applicant (in the application) should address or clarify the questions or concerns indicated above relative to plugging Well #1

Sincerely,



Donald Whittemore
Senior Scientist
785-864-2182

City of Ingalls

April 28, 2003

Kansas Geological Survey
University of Kansas
1930 Constant Avenue, Campus West
Lawrence KS 66047

Re: City of Ingalls
Kansas Public Water Supply Loan Fund
City Well # 4 Project # 2356

Dear Sir or Madam:

The City of Ingalls is preparing an application to the Kansas Department of Health and Environment for a loan from the Kansas Public Water Supply Loan Fund for the referenced project.

City Well # 4 will draw from the Dakota Aquifer and will be connected to an existing well house currently serving City Well # 3 (in the Ogallah Aquifer). All permits are in place. Further, the well and well-house are located on property owned by the City, so no acquisition is required. A project summary, cost estimates and a site map are enclosed.

The estimated project start date is October 1, 2003.

We would appreciate your review of the project description and location. Please complete the enclosed project review form and return it within 30 days with any comments you may have.

Sincerely,



Ron Wilson
Mayor

RW/k
Enc (4)

265-2942-1

SCOPE OF WORK

The City of Ingalls will drill, complete and test a new, gravel-packed well to be Well # 4, sited approximately 310' northwest of Well No. 3, located approximately 5900' north and 2750' west of the southeast corner of Section 1, T26S, R29W, Gray County, immediately east of the City.

Well No. 4 is to be completed in the Dakota Formation at a depth of 638'. It shall be drilled 30" in diameter. The well will be equipped with 12" I.D. screen and casing and shall be gravel packed and properly grouted, and then tested for straightness, developed and test pumped.

The permanent well shall be of the gravel wall or gravel filter type, using the reverse circulation rotary hydraulic method. If clay problems are encountered in this area, Baroid's EZ mud or Ply-Bore may be added to the drilling water to stabilize the walls of the drilled hole. No other drilling additives will be allowed to be used. The drilled well hole shall be 30 inches in diameter for Well # 4 (Dakota) for the total depth of the well. A drawing showing the basic well construction is included in this application.

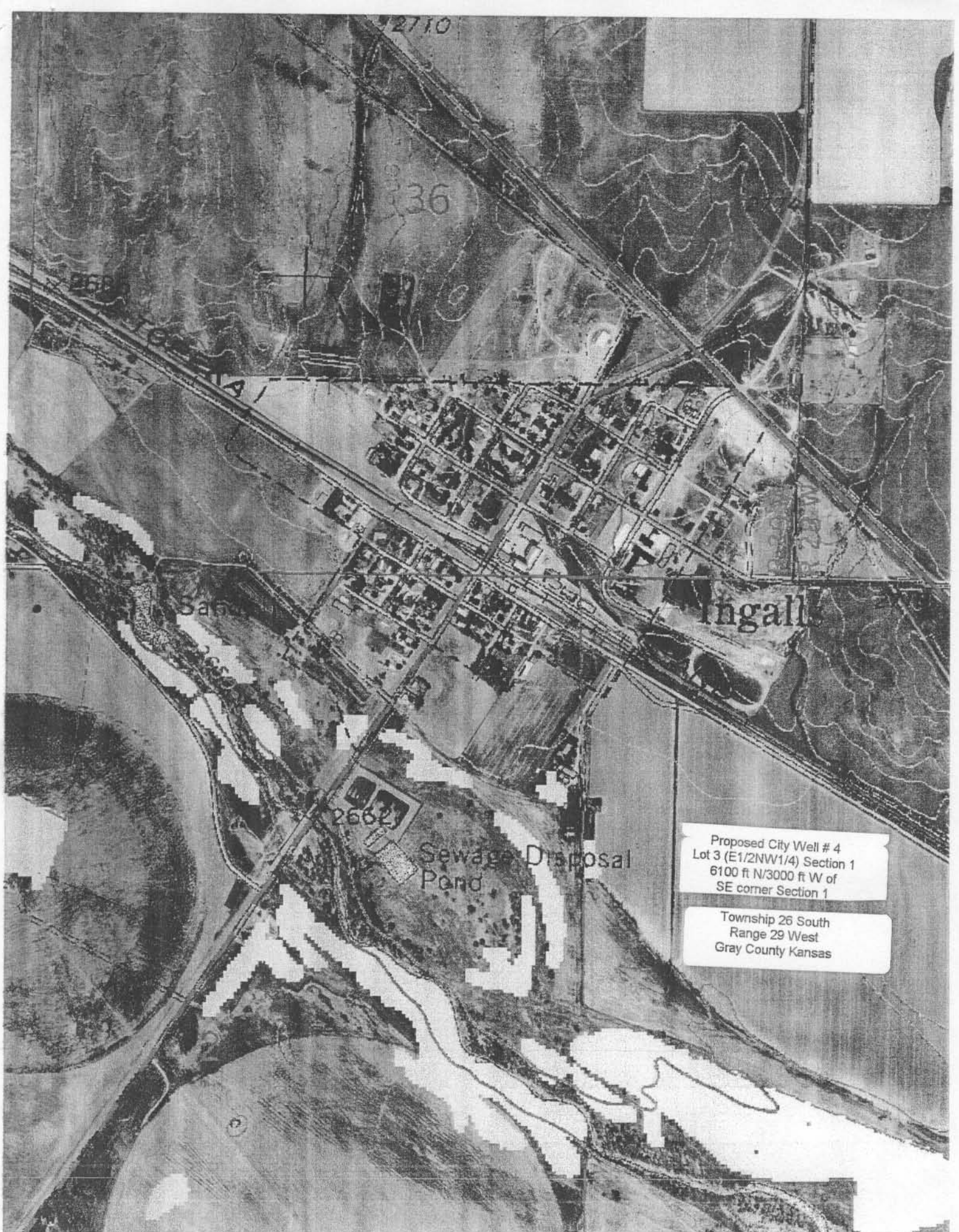
The well casing shall consist of new prime 12" I.D., 49.56 pounds per foot wrought steel having a wall thickness of .0375 inches, conforming to ASTM A120 or API 5L Grade B. if requested, the Contractor shall furnish mill certificates on the pipe.

The well screens shall be extra strong, wire wrapped type, 12" I.D., fabricated of 18-8 type 304 stainless steel with extra strong couplings, as manufactured by Johnson Filtration Systems of Wheelabrator Technologies, Inc., or an approved equal by the Engineer. The actual screen construction (vertical rod area and horizontal wire width) shall be as recommended and guaranteed by the screen manufacturer for screen settings up to 633' in Well # 4. The screen slot openings shall be 0.030 inch in Well # 4 as shown on the well drawing. The screen and casing shall be securely fastened either by welding or with threaded and coupled connections. All casing from an elevation above ground to the screen shall be watertight. The bottom of the casing shall be sealed with a 0.50" thick steel plate. Casing centralizers, designed to hold the screen and casing in the center of the drilled hole, shall be placed on the casing immediately above and below each screen section, and 40 feet above the top screen section. No welding will be permitted on the screen wire.

Gravel used for the artificial wall around the screen shall be graded and washed particles of such size as specified. Gravel shall be well rounded siliceous material having not more than 5% soluble in hydrochloric acid. The annular space between the 12 inch casing and the drilled hole shall be filled with concrete grout as shown on the drawing. The concrete shall be placed by the tremie pipe method when placed below water level. From a depth of 80' to 100' below the land surface in the well, the annulus shall be filled with a 50-50 mixture of road sand and bentonite. The remainder of the annulus in the well shall be filled with a heterogeneous road sand as shown on the drawing.

INGALLS - WELL # 4

Item No.	Item	Quantity	Unit	ENGINEER'S ESTIMATE	
				Unit Cost	Extension
1)	Mobilization	1	L.S.	\$ 10,000.00	\$ 10,000.00
	Construction Staking	1	L.S.	\$ 3,500.00	\$ 3,500.00
2)	Drilling & Casing of Well	1	L.S.	\$ 92,000.00	\$ 92,000.00
3)	Well Pump	1	L.S.	\$ 44,500.00	\$ 44,500.00
4)	Electrical	1	L.S.	\$ 6,400.00	\$ 6,400.00
5)	6" PVC Water	300	L.F.	\$ 16.00	\$ 4,800.00
6)	Connect to Exist. 6" Line	1	L.S.	\$ 200.00	\$ 200.00
7)	2" conduit	300	L.F.	\$ 4.00	\$ 1,200.00
8)	Additional Pump Wire	300	L.F.	\$ 18.00	\$ 5,400.00
9)	Capping and Plugging Well # 1	1	L.S.	\$ 4,800.00	\$ 4,800.00
		Subtotal Construction Costs			\$ 172,800.00
	Engineering - Complete			0	
	Inspection			5,040.00	
	Grant Administration			7,500.00	
	(.25%) Loan Origination Fee			500.00	
		Total Estimated Cost			\$ 185,840.00



Proposed City Well # 4
Lot 3 (E1/2NW1/4) Section 1
6100 ft N/3000 ft W of
SE corner Section 1

Township 26 South
Range 29 West
Gray County Kansas