KANSAS GEOLOGICAL SURVEY

1930 Constant Ave., Campus West
The University of Kansas
Lawrence, Kansas 66047-3726
Phone: 785-864-3965
Fax: 785-864-5317

Donna J. Crawford, Project Coordinator
Governmental Assistance Services
905 Joseph Drive
Lawrence, KS 66049

October 12, 2005

Dear Ms. Crawford,

I am writing to comment on the nitrate problem at White City in Morris County Kansas. The well logs for the area indicate a limestone and shale lithology. The logs of monitoring wells in the vicinity of the city PWS wells show that there are voids at 40+ and 60+ feet depths. This suggests that the limestones in the area may be fractured or have dissolution features even at depth. Unfortunately the only well that the KGS has sampled was installed in 1936 and we have no well log for it.

The well chemistry that I was able to find suggests that at least one of the wells has had a history of relatively high nitrate concentration.

I spoke with Mr. Anderson, consultant for the project, and discussed the well locations and testing that has been done up to this time. Because the source of the nitrate is unknown and the area has fairly consistent high nitrate values since 1956, according to Mr. Anderson, setting the new well within one-half mile of the current well battery seems unwise. High use of the well may cause movement of the contamination towards the new well on the south side of town.

I think the well site to the north of town is the better choice even though it will involve some level of piping to transport the water to town. Mr. Anderson reported that the city had a well in the area of interest tested and the nitrate-N value was very low. I think that overall this north site (section 26) would be a better choice in the long run in order to minimize future contamination of a new well by the current contamination.

Sincerely,

Margaret A. Townsend

Margaret A. Townsend
Hydrogeologist

Margaret T.

Governmental Assistance Services

905 Joseph Drive
Lawrence, Kansas 66049
785-832-2141 • Fax 785-832-1111
Toll Free 888-832-3335
e-mail: gasdonnaa@aol.com

October 3, 2005

Dr. William Harrison
KS Geological Survey
University of Kansas
1930 Constant Ave.-Campus West
Lawrence, KS 66047

RE: Environmental Update – White City, KS – Water System Improvements Project, Previous Request May 16, 2005

Dear Dr. Harrison:

On August 1, 2005 KDHE issued a letter to the city in reference to the high nitrate levels which the city has experienced. They advise, to acquire funding, the city must address this problem and include it in their proposed system upgrade. Therefore, I am submitting well development areas for your comments.

Once a definite site has been chosen, an additional update will be submitted to your department. I would appreciate your immediate attention to my request so that I can include your comments within my grant submission document.

If you should have questions please call Todd Anderson, Bucher Willis & Ratliff, City Engineer at 785-827-3603 or my office at 888-832-3335.

Your assistance will be appreciated.

Sincerely,

Donna J. Crawford

Donna J. Crawford
Project Coordinator

TJH

KANSAS

RODERICK L. BREMBY, SECRETARY

KATHLEEN SEBELIUS, GOVERNOR

DEPARTMENT OF HEALTH AND ENVIRONMENT

August 1, 2005

Steve Ash, Mayor
City of White City
118 W Mackenzie
PO Box 4
White City, KS 66872

Re: Kansas Public Water Supply Loan Fund Projects and MCL Violations

Dear Mayor:

When the City's consultant first contacted me to put your project on the KPWSLF project priority list, the project was to replace distribution pipe. I soon discovered that White City had a nitrate level above the maximum contaminant level set by drinking water regulations. I then contacted the consultant and explained that a project with a bigger scope would be necessary.

We are prohibited by regulations from funding projects for systems that have an MCL violation, unless the project would correct that violation. Therefore, the project description was modified on the 2006 project priority list to include a nitrate solution. This letter was requested by the consultant to clarify that the loan fund application will not be accepted unless the project includes a nitrate solution.

If you have any questions, I can be contacted at 785-296-0735 or by email at bcarr@kdhe.state.ks.us.

Sincerely yours,

William J. Carr
Public Water Supply Section
Bureau of Water

pc: Bucher, Willis & Ratliff Corp.; Attention Todd Anderson P.E.

FACSIMILE

To: Donna Crawford
Governmental Assistance Services
Lawrence, KS
Telephone: _____
FAX # 785-832-1111

From: Todd Anderson
Title: _____
BWR Project No. 2005-0558.01
Number of Pages
including Cover Page: 2
Date: Tuesday, October 04, 2005

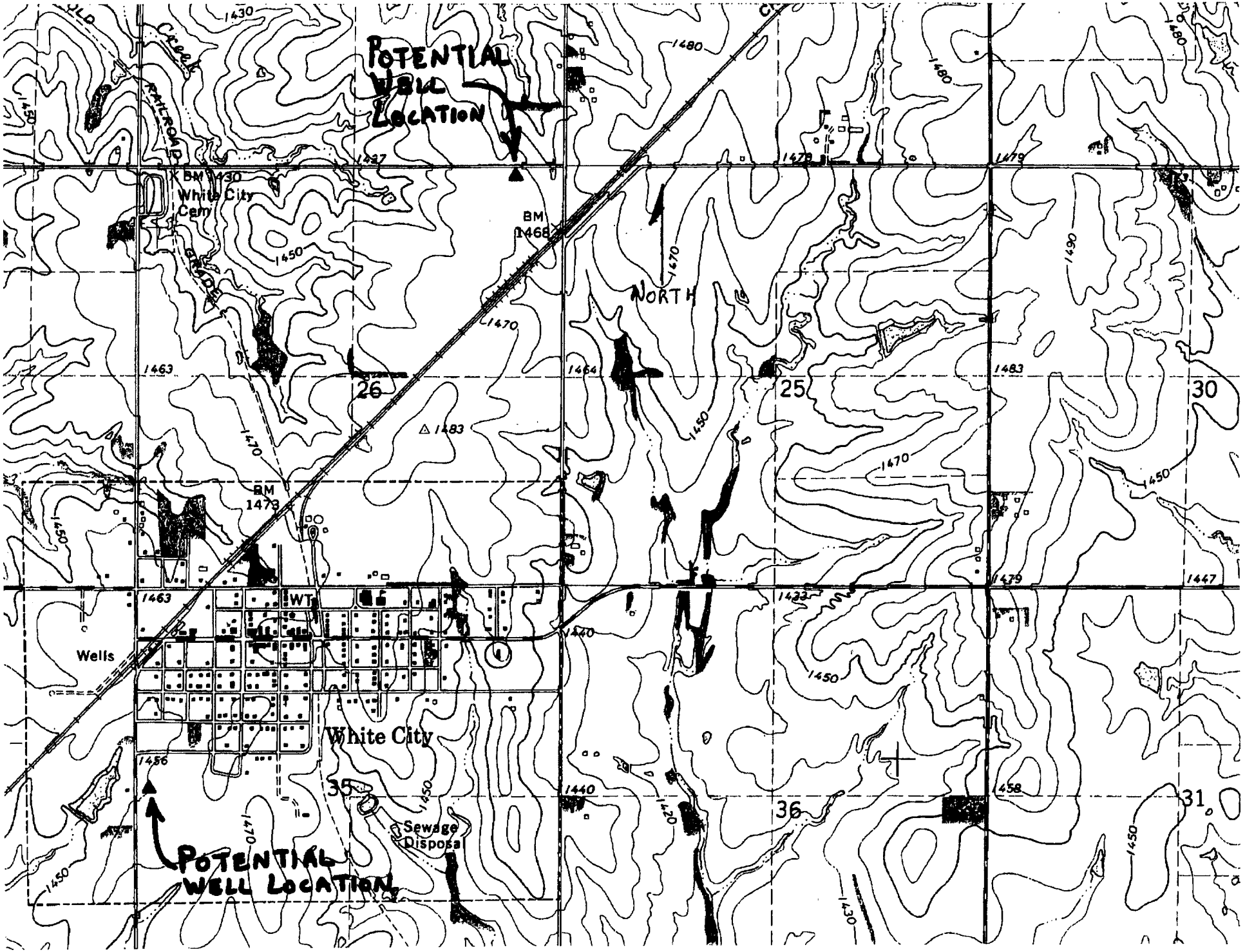
Re: White City potential well site map – 2 locations

Notes: Donna –

Transmitted herewith is a map illustrating the 2 potential well sites for the City of White City.
As you know, one site is on property owned by Jim Barber and is in the NW ¼, Section 35, Township 14 South, Range 6 East.
The other site (Marlow property) is located in the NE 1/4, Section 26, Township 14 South, Range 6 East.

I hope this helps.

Todd Anderson, P.E.
Bucher, Willis & Ratliff Corporation


POTENTIAL WELL LOCATION
White City Cem
BM 1468
NORTH
26
25
30
35
36
31
BM 1473
WT
Wells
White City
Sewage Disposa
POTENTIAL WELL LOCATION

Proposed Project for Application to the Kansas Department of Commerce, and Kansas Department of Health and Environment or USDA Rural Development for grants and loans for a public water supply system.

Applicant: City of White City
Water Distribution System upgrade

Contact Person: Donna J. Crawford

Address: Governmental Assistance Services
905 Joseph Dr.
Lawrence, KS 66059

Sent to the Kansas Geological Survey for environmental review.

Agency Review Comments:

The long-term benefits of reductions in water losses and decreases in maintenance costs should offset any short-term adverse impacts during construction involved with upgrading the water distribution system.

Recommended Action:

__X__ 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

Donald Whittemore	Geohydrology Section, Kansas Geological Survey	6/20/05
Reviewer's Name	Division/Agency	Date

Donald Whittemore
Reviewer's Signature

tandersone bwrcorp.com

Governmental Assistance Services
905 Joseph Drive
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e-mail: gasdonnaa@aol.com

May 16, 2005

Dr. William Harrison
Kansas Geological Survey
University of Kansas
1930 Constant Avenue-Campus West
Lawrence, KS 66047

RE: Environmental Review – White City, KS – Water Distribution System

Dear Dr. Harrison:

The City of White City, Kansas is proposing to upgrade their entire water distribution system. The estimate of cost is $1,152,538.91. The city will be requesting $400,000 from the Kansas Department of Commerce. The local injection will be financed with either a KDHE loan or Rural Development financing.

The city is located on Highway 4 in northern Morris County.

Please submit all comments to Governmental Assistance Services, 905 Joseph Dr., Lawrence, KS 66049.

If you have questions please call me at 832-2141 or Todd Anderson of Bucher, Willis & Ratliff Corporation at 785-827-3603.

Sincerely,

Donna J Crawford

Donna J. Crawford
Project Coordinator

Enc/ Eng. Report Info
Project Map
Topo Map

2. EXISTING DISTRIBUTION SYSTEM

2.1 Distribution Main Lines

The original water distribution system was constructed in the late 1930s and is comprised of old cast iron pipe with lead-packed joints. The system consists of 2-inch, 4-inch and 6-inch water mains. Included in Appendix 1 is an illustration of the original water distribution system. A few additional 2-inch and 4-inch water mains have been added to the system over the years bringing the total amount of pipe to nearly 39,500 feet. The vast majority of the pipe material is of cast iron fabrication, utilizing the old sand-cast method. This old pipe was not as stable with respect to soil reactions as current cast iron (ductile) pipe. Also, the old pipe was more susceptible to both internal and external corrosion than later versions of cast and ductile iron pipe.

Most of the original water mains have surpassed their useful life. Corrosion on the pipe, both external and internal, has caused the pipes to weaken, thus resulting in numerous breaks and leaks. For example, between November 25, 2004 and January 14, 2005 alone, eight leaks requiring significant repairs were recorded. In the past five years, the City staff has installed over 28 documented, repair sleeves throughout town. In part as a result of these leaks and breaks in the system, the City has experienced considerable quantities of unaccounted for water, totaling approximately 3.1 million gallons (MG) in 2002, 4.7 MG in 2003, and 6.4 MG in 2004.

Many years of use and existence in the soil have caused considerable thinning of the pipe wall thickness. Often, when a leak manifests instead and repairs ensue, multiple additional leaks are created. Due to the thin pipe walls, pinholes as well as larger holes are often created near the original leak while manipulating the pipe during a repair. Typically, rather than merely addressing a small hole or leak in the pipe, the fix becomes a repair of several holes or the complete replacement of several feet of pipe. The 28 repair sleeves mentioned above constitute repairs on the *original* leaks. The additional leaks created and subsequently repaired as a result of fixing the initial leak have not been documented. A conservative estimate of these "repair-induced" leaks is 60, as it is common to create at least 2 additional leaks during a repair.

2.2 Service Lines & Meter Connections

The service lines are comprised of varying types of material throughout the system, primarily, galvanized steel, copper and recently PVC. These service lines vary greatly in physical condition from good to very poor. Many will need to be extended for reconnection when the mains are relocated. Complete replacement of some may be necessary.

Most meter connections are original and are in need of replacement due to developing pinhole leaks and eventually complete failures. Due to the age of most meters, it is likely that they register incorrectly and low. This may explain some of the unaccounted for water.

2.3 Water Storage

Existing water storage is provided via a 50,000 gallon elevated storage tank. It is the original storage tank constructed at the time of the distribution system. Through routine maintenance, the tower remains in relatively good condition.

3. SYSTEM OPERATION AND PARAMETERS

3.1 SYSTEM OPERATION

As previously stated, the City's water distribution system contains one elevated storage tank and, at present, three operating supply wells. Pressure switches operate a valve that opens and closes as the level in the tank fluctuates in response to demands in the City's water distribution system. The three pumps each reportedly pump 40 gallons per minute.

The City also has another groundwater well that could be connected to the system if necessary. The City may indeed connect it in the future to provide additional flexibility in mixing the water supply.

3.2 SYSTEM PARAMETERS

3.2.1 Population

The water system must be able to provide adequate quantities of water to meet both present and future populations of the City. A typical planning period for municipal infrastructure improvements is 20 years. From the population projections published by the *Kansas Water Office* (KWO), White City's population was projected to be 593 in 2020 and 615 in 2030. Appendix 2 contains a portion of the KWO's population projections. Interpolating between the years' 2020 and 2030 population projection yield a population of 604 for 2025, or twenty years from today. For planning purposes within this study, a population of 604 is used to evaluate the adequacy of the system for the 20 year planning period.

3.2.2 Water Demand

Presently, average water demand for the system is 40,827 gallons per day (gpd) (See Appendix 3, *Water Use Records*). Due to there being no industries in White City that operate through the night and realizing that there is little water demand during the night, for purposes of this report, it is estimated that ninety-five percent of the daily water demand occurs in an 18 hour period for an average of 36 gallons per minute (gpm) (40,827 gpd x 95% = 38,786 gallons divided by 18 hours divided by 60 minutes per hour = 36 gpm). Since there is no instantaneous flow monitoring for the water system, for analysis purposes it is assumed that peak demand in the system is 3.5 times that of average flows. Therefore, the distribution system must be capable of providing those peak flows of approximately 126 gpm (3.5 x 36 gpm).

From the average daily water demand of 40,827 and with a population of 542, the average per capita daily consumption for the City of White City is 75 gallons (gpcd). Therefore, the water system must be able to provide both average and peak demands for the 20-year planning period as well. It is assumed that per capita consumption will remain constant during the planning period. Therefore, by taking the per capita consumption times the future population we derive the projected average flow which the system must be able to supply (i.e., 75 x 604 = 45,300 gpd). Likewise, the projected peak demand in the system is estimated to be 3.5 times the average demand. As before, it is estimated that ninety-five percent of the demand will occur over an 18 hour period. Thus, the peak demand will be 140 gpm (45,300 x 95% divided by 18 hours divided by 60 minutes per hour x 3.5 peaking factor = 140 gpm).

The single largest demand in most water systems, however, is that required during a fire event. The Insurance Services Office, Inc. (ISO) stipulates that typical residential fire flow protection be 500 to 1,500 gpm. The purpose of this report is not to evaluate the adequacy of the City's fire protection system. Many factors influence the overall insurance ratings for the City and that is for the City's insurance provider to review. However, from an engineering perspective, a design goal is to improve the water system so that it can improve flows to at least approach or exceed those minimums set by the ISO.

4. ALTERNATIVES

4.1 DISTRIBUTION SYSTEM MODIFICATIONS

- Alternative 1 – Complete System Replacement: Replace the entire distribution system piping with new 6-inch, 4-inch, and 2-inch PVC meeting AWWA C900 (for 6- and 4-inch) and Class 200 (for 2-inch) classification. Also replace necessary fire hydrants and service connections that have significantly deteriorated or have limited flow capabilities due to age and size limitations. Also, replace meter assemblies as required.

  Result: Most importantly, this would eliminate the majority of the numerous and costly yearly system breaks, and much of the unaccounted for water.

- Alternative 2 - Partial System Replacement: Replace only those areas of the water distribution system identified with a history of having the most numerous repairs, and those areas with dead-end service lines (Phase One). Again, install 6-inch, 4-inch, and 2-inch PVC pipe and replace selected hydrants and service assemblies that are inadequate or extensively worn, as well as replacing meter assemblies where required.

  Result: This would localize the solution by eliminating those areas identified as the most problematic (i.e., numerous breaks, dead-end lines and poor water quality). Areas without replacement would continue having the previously described problems but could be replaced in the near future under another phase, Phase Two.

- Alternative 3 – Clean and Reuse Existing System: Clean existing water lines and put back into service.

  Result: This alternative is not as viable due to the loss of wall integrity of the pipe caused by years of corrosion, and would probably cause more damage than any good that could be realized. Also, this would not address the elimination of dead-end lines through looping. Due to the age of the lines, many would not withstand the forces of cleaning and the final result may not be satisfactory.

All locations that require replacement of water mains should also replace aging service lines and meter connections. All galvanized services will be replaced with new polyethylene plastic lines or copper. Meters and meter setters will be replaced in locations that have not recently been changed. The meters have aged and some of the meter setters have developed leaks. The older lines and meters do not function properly and old meters do not accurately monitor the water consumed by the individual users.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 DISTRIBUTION SYSTEM MODIFICATIONS

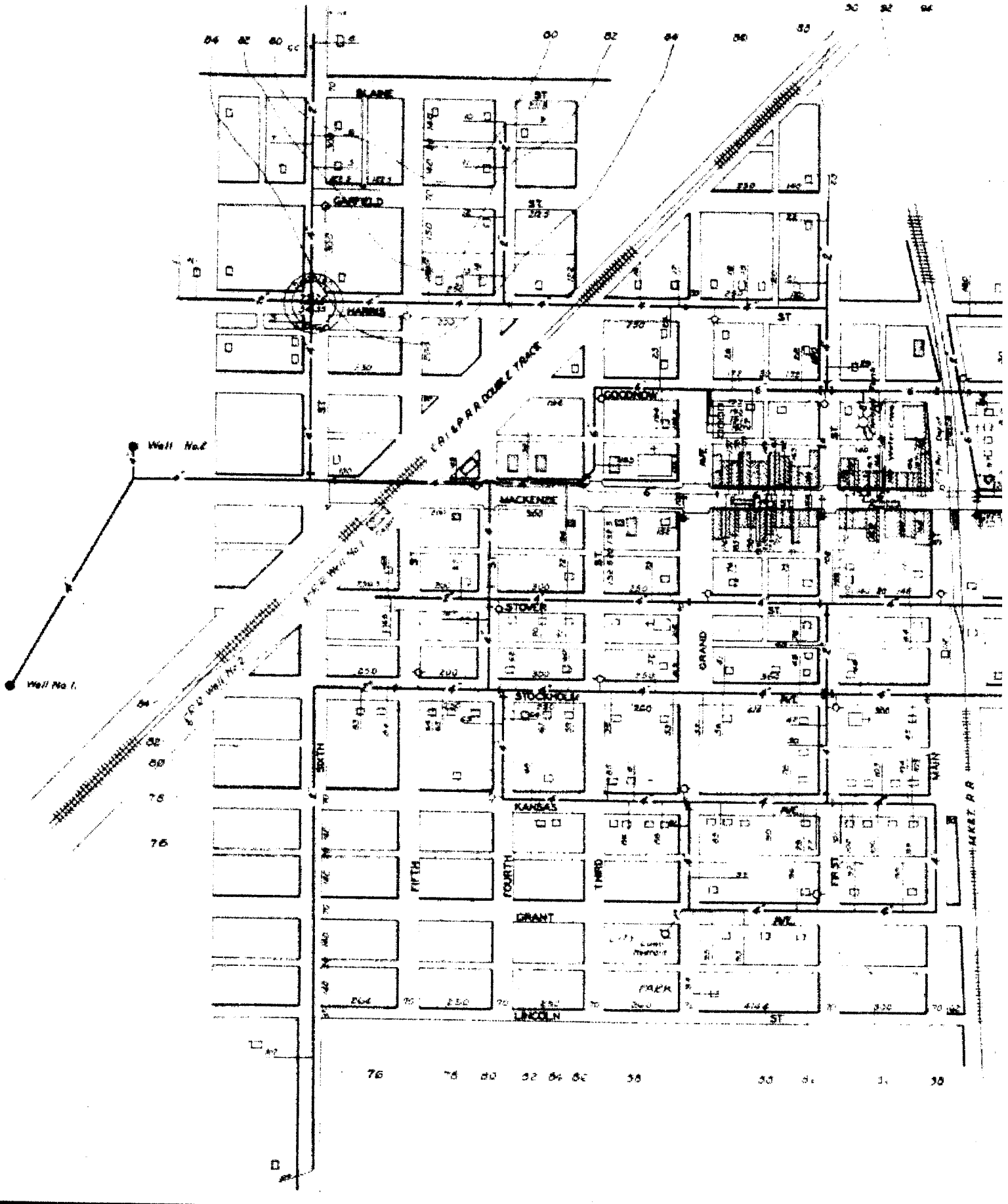
The primary problem concerning the water system in the City of White City is excessive water main failures due to the age of the system and the physical condition of the distribution system piping. In short, the City has a distribution system that has reached its useful life. The maintenance costs and the loss of water due to leaks have become very expensive maintenance items.

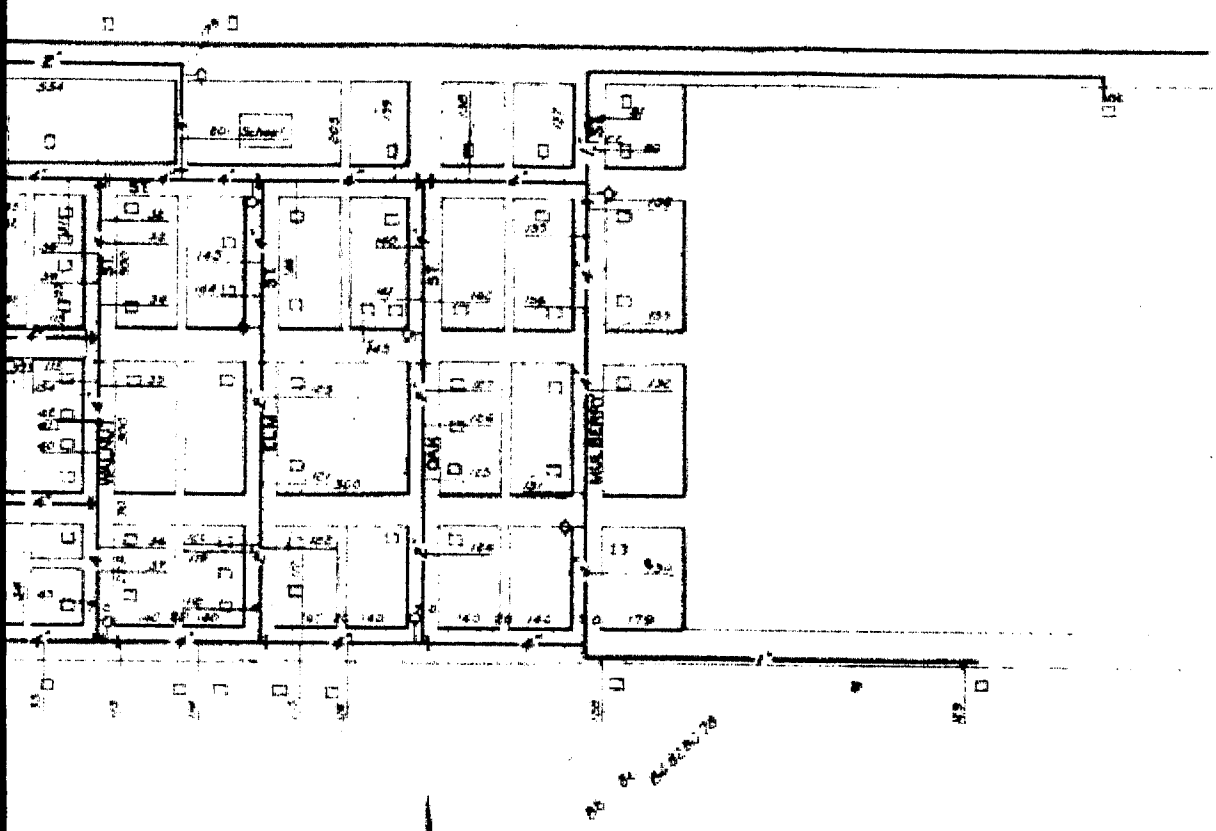
Alternative 1, replacing the entire distribution system, is the only viable option with which to resolve the problems within the distribution system in a timely manner. Alternative 2, replacing only the most problematic areas of the distribution system, would result in a system that still contained portions with badly deteriorated piping. Alternative 3, cleaning the existing water lines and placing them back into service, is not viable due to the small diameter pipe and the lack of wall integrity. Therefore, ***if it is economically feasible***, BWR recommends that Alternative 1 be selected and implemented.

Complete replacement of the distribution system piping would include an estimated 4,700 linear feet (LF) of 6-inch water main, 25,760 LF of 4-inch main, and 7,160 LF of 2-inch line.

TABLE 1
Engineer's Opinion of Probable Project Costs
Alternative 1 - Complete System Replacement

Item	Description	Quantity	Unit	Unit Cost	Extension
1	Waterline				
	6" C900 PVC	4700	L.F.	10.68	$ 50,196.00
	4" C900 PVC	25760	L.F.	8.33	$ 214,580.80
	2" Cl 200 PVC	7160	L.F.	7.45	$ 53,342.00
	3/4" Copper Service Line	8860	L.F.	13.14	$ 116,420.40
2	Water Valves				
	6"	14	Each	587.47	$ 8,224.58
	4"	27	Each	480.12	$ 12,963.24
	2"	4	Each	334.74	$ 1,338.96
3	Service Connections	262	Each	213.36	$ 55,900.32
4	Waterline Fittings	1	Lump Sum	17,310.00	$ 17,310.00
5	Meter Installation	262	Each	470.84	$ 123,360.08
6	Fire Hydrants	36	Each	1,650.00	$ 59,400.00
7	Remove & Replace Surfacing				
	Gravel Surfacing	1898	L.F.	7.71	$ 14,633.58
	Asphalt Surfacing	330	L.F.	13.50	$ 4,455.00
	Concrete Surfacing	270	L.F.	33.46	$ 9,034.20
	Brick Pavement	2200	L.F.	32.32	$ 71,104.00
	Concrete Sidewalk	448	L.F.	30.74	$ 13,771.52
8	Mobilization	1	Lump Sum	12175	$ 12,175.00
	Subtotal Probable Construction Costs				$ 838,209.68
	Construction Contingencies (10%)				$ 83,820.97
	Total Probable Construction Costs				$ 922,030.65
	Engineering, Legal, Admin., Fiscal Costs (25%)				$ 230,507.66
	Total Probable Project Costs				$ 1,152,538.31


BLAKE
GARFIELD
HARRIS
GOODNOW
MACKENZIE
STOVER
STOCKBRIDGE
KANSAS
GRANT
LINCOLN
FIFTH
FOURTH
THIRD
GRAND
MAIN
Well No.2
Well No.1
A.T.& S.F. R.R. DOUBLE TRACK
MKT R.R.



LEGEND

Existing Hydrants
Proposed Hydrants
Existing Main 6"
Proposed Main 6"
Valves

WHITE CITY KANSAS

WATERWORKS SYSTEM

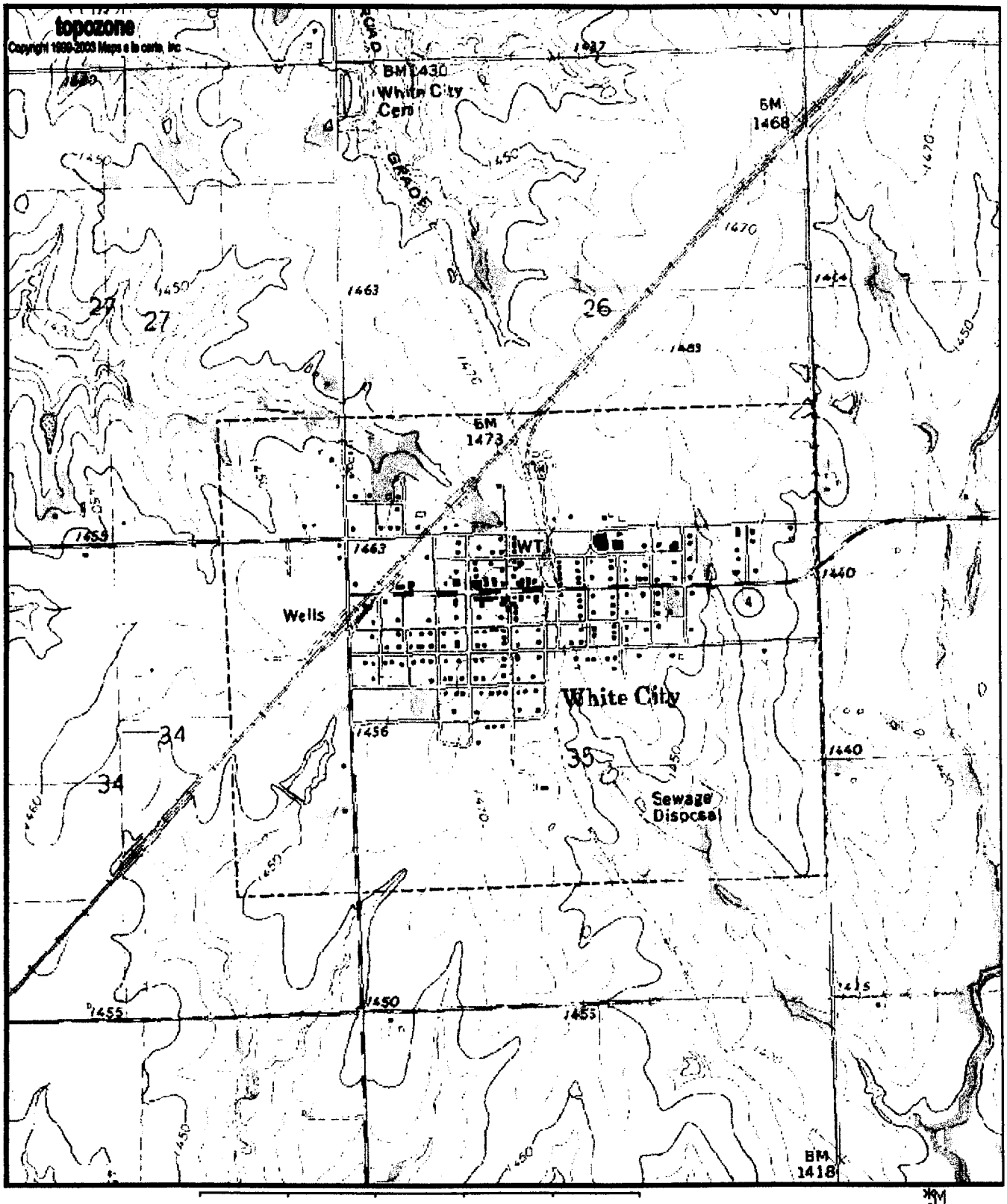
SCALE 1" = 200'

PAULETTE & WILSON

SALINA KANSAS

1938

2



Map center is UTM 14 696631E 4296525N (WGS84/NAD83)
White City quadrangle
Projection is UTM Zone 14 NAD83 Datum

M=4.749
G=1.419