

SUPPORTING DATA

FOR

FORBES PROPERTIES

IN

BENTON & CAMDEN COUNTIES, MISSOURI

Prepared By

MILLER/WILLIAMS & WORKS, INC.

409 Vandiver Drive

Building #5, Suite 100

Columbia, Missouri 65202

November 1982

Revised April 1983

FLOOD ELEVATIONS

This is in reference to the 100 year flood plain designation for the Forbes properties in Benton and Camden Counties. Flood plain maps have not been prepared for the above referenced property.

Preliminary calculations for the 100 year flood flow on major drainage areas throughout the properties have been made. Preliminary flood plain elevations have been designated on Deer Creek, Knobby Creek, Mossy Creek, Spring Branch, and the Lake of the Ozarks. Sketches have been prepared showing these preliminary elevations on Deer Creek and Knobby Creek.

Calculations on Spring Branch have indicated that the maximum elevation of the flood waters should not exceed seven feet above the natural flow line of the stream. Keep in mind that this will vary slightly from stream section to stream section. Also the deterrent effect of the dam on the upper end of Spring Branch was not considered. The detention effects were ignored.

The calculations on Mossy Creek indicate about the same to be true. Here the maximum elevation for 100 year flood flow should not exceed five feet above the natural streambed.

The maximum yearly elevations recorded on the Lake of the Ozarks have been obtained from Union Electric Company. These elevations were then compared with the rainfall data to approximate the 100 year flood elevation. According to U.S. Geological Survey data the 100 year flood flow is 112,000 cfs. This flood obtained an elevation of 672.0. With a lack of better data this should be used.

Attached are the gaging station data for the station at Warsaw on the Osage River and the yearly maximum and minimum elevations at Bagnell Dam on Lake of the Ozarks as recorded by Union Electric Company. Also attached are the sketches for Deer Creek and Knobby Creek flood areas.

The only low marsh lands on the properties are where settlement has occurred within the confines of the Lake of the Ozarks. To my knowledge all of these areas are within the properties and easement rights-of-way owned by Union Electric Company.

Magnitude and Frequency of Missouri Floods

OSAGE RIVER BASIN

6-9225. Osage River at Warsaw, Mo.

Location.--Lat 38°14'40", long 92°23'10", in NE1/4SW1/4 sec.17, T.40 N., R.22 W., at Warsaw.

Drainage area.--11,500 sq mi, approximately. Slope.--1.46 ft per mi.

Gage.--Nonrecording. At various sites and datums in vicinity prior to Aug. 6, 1925. Datum of gage is 631.80 ft above mean sea level.

Stage-discharge relation.--Defined by current-meter measurements. Affected at times by storage in Lake of the Ozarks since 1931.

Bankfull stage.--31 ft.

Historical data.--Floods in 1872, 1874, and on Feb. 1, 1916, reached stages of 33.1, 26.2, and 35.5 ft respectively, from reports of U. S. Weather Bureau.

Remarks.--Gage heights adjusted to present site and datum. Peaks for period prior to Oct. 1, 1925, and after Apr. 30, 1931, computed from plotted U. S. Weather Bureau gage readings. Base for partial-duration series, 40,000 cfs.

Water year	Date	Gage height (feet)	Peak stages and discharges				
			Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1844	June 1844	44.46	a185,000	1926	Nov. 9, 1925	20.1	41,800
1855	1855	39.5	a112,000	1927	Oct. 5, 1926	24.0	53,000
1872	1872	33.1	-		Oct. 11, 1926	24.7	55,200
1874	1874	26.2	-		Mar. 22, 1927	28.6	68,200
1896	December 1895	38.4	a108,000		Apr. 2, 1927	28.7	68,600
1905	April 1905	37.4	a104,000		Apr. 17, 1927	34.45	88,300
1916	Feb. 1, 1916	35.5	-		May 10, 1927	21.2	44,800
1918	Apr. 30, 1918	16.6	32,900	1928	June 3, 1927	26.7	61,800
1919	May 20, 1919	23.3	50,800		June 22, 1927	26.3	61,800
1920	Oct. 29, 1919	28.7	68,600		July 24, 1927	20.4	60,500
	Mar. 27, 1920	28.9	69,300		Aug. 10, 1927	31.8	79,200
	Sept. 15, 1920	20.3	42,300		Aug. 21, 1927	25.9	59,200
	Sept. 28, 1920	19.7	40,700		Oct. 3, 1927	27.0	62,800
1921	Sept. 15, 1921	21.2	a44,800		Oct. 9, 1927	28.2	66,900
1922	Mar. 15, 1922	26.7	61,800		June 11, 1928	23.7	52,000
	Mar. 20, 1922	25.7	58,500		July 1, 1928	22.2	47,600
	Apr. 1, 1922	25.5	57,800	1929	Nov. 24, 1928	28.1	66,500
	Apr. 4, 1922	26.8	62,100		Apr. 9, 1929	26.2	60,200
	Apr. 12, 1922	34.9	90,000	1930	Apr. 22, 1929	19.7	40,700
1923	June 12, 1923	22.2	47,600		Apr. 25, 1929	19.6	40,500
	June 17, 1923	23.4	51,100	1935	May 8, 1929	23.0	49,900
1924	Dec. 15, 1923	19.7	40,700		May 19, 1929	34.8	89,700
	May 31, 1924	22.7	49,000	1940	Feb. 9, 1930	16.4	32,400
	June 11, 1924	21.8	46,400	1941	June 3, 1935	34.1	a94,000
	June 21, 1924	21.0	44,200	1942	Apr. 21, 1941	33.8	a80,000
	July 15, 1924	25.5	57,800	1943	Nov. 2, 1941	34.5	a88,600
	July 22, 1924	21.1	44,500	1946	May 22, 1943	44.54	a220,000
1925	Apr. 6, 1925	17.8	35,900	1947	Aug. 14, 1946	35.2	a76,000
				1951	Apr. 27, 1947	34.40	a78,300
					July 7, 1951	40.1	a120,000

a Annual peak only.
b Estimated.

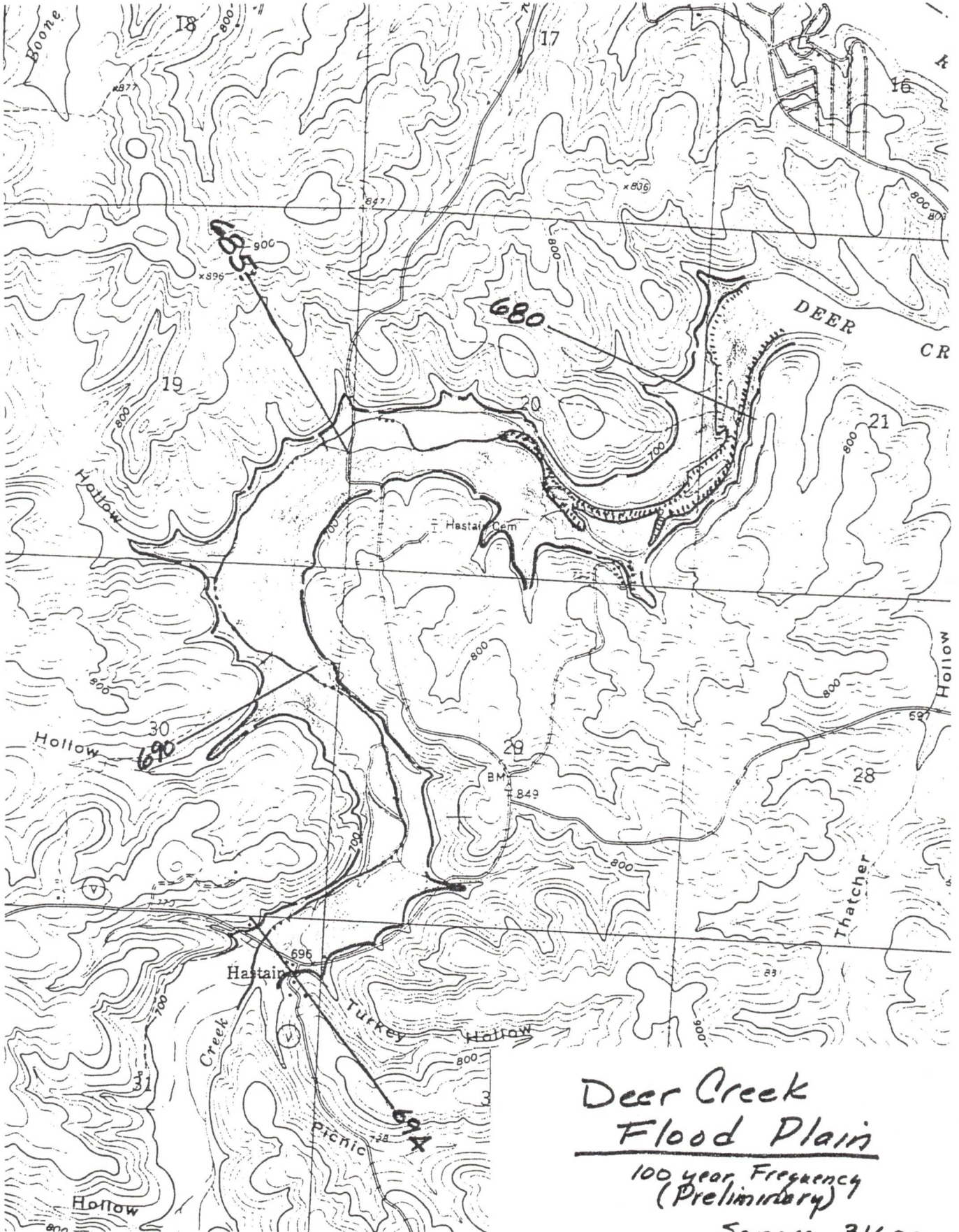
Note: No rating definition below stage of about 34 ft since construction of Bagnell Dam in 1931, due to backwater conditions at gage.

Calculated 100 yr flood - 112,000 cfs
 Estimated 100 yr Elev. - 672.00 based on the fact that the 1951 flood flow slightly exceeds the calculated flood flow of 112,000 cfs (according to U.S. Geological Survey data).

Bagnell Dam
Rte. 3, Box 234
Eldon, Missouri 65026

Lake of the OzarksLake Levels

<u>MAXIMUM</u>		<u>CALENDAR</u>	<u>MINIMUM</u>	
<u>Elevation</u>	<u>Date</u>	<u>YEAR</u>	<u>Elevation</u>	<u>Date</u>
659.99	December 1	1931		
660.00	July 9, 11, 13; Dec. 27	1932	644.18	April 14
660.11	May 25	1933	642.14	April 5
660.00	December 3, 4	1934	640.41	March 24
660.66	June	1935	649.48	March 2
660.10	November 4	1936	640.70	September 6
661.03	June 10	1937	652.29	October 2
660.78	May 24	1938	647.40	March 26
658.42	May 15	1939	646.18	March 24
660.74	June 24	1940	649.21	January 5
662.42	October 5	1941	656.44	March 12
662.48	June 19	1942	657.62	April 8
665.45	May 22	1943	652.94	March 11
661.46	May 3	1944	652.15	February 17
661.78	April 18	1945	653.40	February 16
663.90	August 15	1946	652.62	April 5
661.78	April 27	1947	651.65	September 20
663.08	June 24	1948	639.95	February 13
661.11	January 25	1949	650.68	November 29
660.68	August 15	1950	648.65	March 3
664.41	July 7	1951	642.48	December 21
659.12	February 9	1952	649.05	March 10
656.43	April 27	1953	646.70	September 30
658.24	October 25	1954	643.82	March-April
659.88	January 11	1955	649.49	April 29
654.70	August 16, 18	1956	643.24	April 30
660.03	July 2	1957	647.46	March 22
661.75	August 1	1958	654.32	February 25
660.03	October 11	1959	644.08	March 5
659.39	May 7, 8	1960	651.71	March 18
663.32	May 12	1961	653.83	February 3
659.30	March 22	1962	655.45	June 1
659.15	July 13	1963	655.66	March 19
659.90	June 15, 16	1964	651.50	February 12
661.58	September 5	1965	653.80	November 17
658.92	January 9	1966	652.10	July 18
661.45	July 3, 4	1967	652.32	December 6
659.96	December 31	1968	655.10	April 5
661.83	July 3	1969	655.15	September 6
661.80	May 1, 2	1970	649.71	January 24
659.10	December 22	1971	651.80	April 16
661.00	November 14, 15	1972	653.50	April 7
661.91	April 1	1973	655.05	October 1
660.73	March 12	1974	653.82	January 16
660.54	February 4	1975	653.85	March 11
659.19	July 7	1976	653.48	May 12
660.63	July 3	1977	646.25	February 10
658.95	August 21	1978	653.70	March 23
658.24	September 9	1979	649.30	February 20
657.42	December 18	1980	652.10	March 13
659.50	June 26	1981	651.66	April 14 & 15



Deer Creek
Flood Plain

100 year Frequency
(Preliminary)

Songre 31600

Computed by _____
Checked by _____

Subject Flood Plain on
Knobby Creek
Client Sangre

Sheet 1 of _____
Job No. 31600
Date 10-82

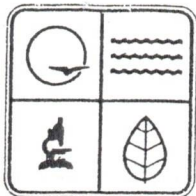
Preliminary 100 yr Flood Plain - shaded



WATER SUPPLY WELLS

A request was presented to the Division of Geology, Missouri Department of Natural Resources regarding their recommendation for private wells on the Forbes properties in Benton and Camden Counties. The State Geologist office advised that all wells should have a minimum casing depth of 100 feet or 20 feet into clean unstained rock. The total well depth will range from about 300 feet in the eastern part of the property to approximately 350 feet on the west portion of the tract. This will permit the water supply to be drawn from the Lower Gasconade formation. This is a dolomitic formation and should yield at least 15 gpm. Higher volumes may be obtained at these depths or even at shallower depths. Bacteria sampling should be performed on all wells before they are placed in use.

The following letter is the response from the Water Resources section of the Division of Geology and Land Survey concerning the private water well construction.



April 5, 1982

RECEIVED

APR 06 1982

Mr. Bill R. Crockett, P.E.
Williams & Works
409 Vandiver Drive
Building 5, Suite 100
Columbia, MO 65202

WILLIAMS & WORKS
COLUMBIA, MO.

Dear Bill:

Our File: Benton - Camden Counties
T. 40 N., R. 20 & 21 W.
Forbes Project

This is in reply to your letter of March 30 requesting information on the recommended construction of private wells for the Forbes site.

I think it would be wise to plan on a minimum casing depth of 100 feet. This amount is probably more than enough for most drill sites and since it will be designated as the minimum amount which is acceptable, problems which are encountered below that depth can be dealt with by setting more casing. We are not trying to case the wells to any particular stratigraphic interval. We are however, interested in casing to a point which is below any actively weathered zone which has connection with the surface. In the eastern part of the area, 100 feet will place the bottom of the casing just above or just below the contact between the Roubidoux Formation and the Upper Gasconade Dolomite. In the western part of the area, the bottom of the casing will be near the contact between the Jefferson City Dolomite and the Roubidoux Formation.

It would be extremely difficult for the driller or engineer to determine stratigraphic intervals from the drill cuttings. It will however, be possible to determine casing intervals using the premise that the casing be set a minimum of 100 or 20 feet into clean, unstained rock.

Total depths will range from approximately 300 feet in the eastern part of the area (middle of the Lower Gasconade Dolomite) to approximately 350 feet in the western part of the area (upper part of the Lower Gasconade Dolomite). At these depths, yields could range from 15 to 30 gallons a minute.

MISSOURI DEPARTMENT OF NATURAL RESOURCES
P.O. Box 250 Rolla, Missouri 65401 (314) 364-1752

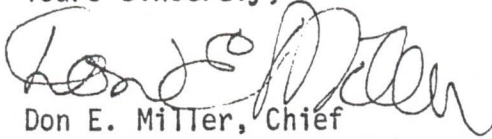
Christopher S. Bond Governor
Fred A. Lafser Director

Division of Geology and Land Survey
Wallace B. Howe Director

Mr. Bill R. Crockett
April 5, 1982

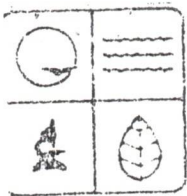
When I may be of further assistance, please feel free to
contact me.

Yours sincerely,

A handwritten signature in cursive script, appearing to read "Don E. Mitter".

Don E. Mitter, Chief
Water Resources Data & Research
Geology and Land Survey

DEM:djh



RECEIVED

April 6, 1983

APR 06 1983

WILLIAMS & WORKS
COLUMBIA, MO.

Mr. Bill R. Crockett, P.E.
Miller, Williams and Works
409 Vandiver Drive
Building 5, Suite 100
Columbia, MO 65202

Dear Bill:

Our File: Benton-Camden Counties
T. 40 N., R. 20 and 21 W.
Forbes Project

This is in reply to your inquiry requesting information on the availability and dependability of groundwater supplies in the above area of Benton and Camden Counties.

This is an area where large amounts of groundwater are available. There is absolutely no chance of drilling a dry well. If at a certain depth the drill hole is still not producing water, all that is necessary is that the hole be drilled deeper. Water is available at every drill site.

This area is underlain by 1,500 to 2,000 feet of Cambrian-Ordovician dolomites and sandstones. These deposits contain water-bearing intervals for their full thickness. Some of these intervals contain more water than others. Area wide, some drill sites are better than others because of differing geologic conditions from site to site. There will, however, be water available at all sites. All that is needed is that the well be drilled deep enough to encounter water-bearing zones.

If you should have further questions concerning the availability of groundwater in the Forbes Project area, please don't hesitate to contact me.

Yours sincerely,

Don E. Miller, Chief
Water Resources Data & Research
Geology and Land Survey

DEM:djh

MISSOURI DEPARTMENT OF NATURAL RESOURCES

P.O. Box 250 Rolla, Missouri 65401 (314) 364-1752

Christopher S. Bond Governor
Fred A. Lofser Director

Division of Geology and Land Survey
Wallace B. Howe Director

GEOLOGICAL HAZARDS

Three geologic formations make up the parent materials on the Forbes properties in Benton and Camden Counties. These formations consist of the Upper Gasconade, the Roubidoux, and a combination of the Jefferson City-Cotter.

Often the Upper Gasconade contains numerous caves and solution channels. This formation, as it exists on the site, does contain such solution but not to a great extent. Several small sinkholes are present on the site in the Roubidoux that represent eroding within the dolomitic formation. These openings are not to be considered as karstification of the formation.

Man-made geological hazards such as incorrectly constructed water wells or abandoned wells can provide an avenue of deep recharge penetration which could contaminate that portion of the water bearing aquifer. Proper procedures will eliminate this potential hazard.

WATER QUALITY

Water samples were collected from five wells on or adjacent to the Forbes properties for chemical analysis. The parameters evaluated are those required by the Division of Environmental Quality, Missouri Department of Natural Resources for public water supply wells. The chemical analysis on the samples indicate the aquifer to be acceptable as a water supply source.

Attached is a copy of the analytical results and the recommended maximum contaminant levels of the Missouri Public Drinking Water Regulations.

Organic chemical contaminants were not analyzed. These contaminants include the chlorinated hydrocarbons and chlorophenoxys. At this point, this testing is not recommended.

Samples from three existing wells and Deer Creek were analyzed for radioactivity (gross alpha and gross beta). The limitations for gross alpha is 15 pCi/l and 50 PCi/l for gross beta. Should the analysis be more than 5 pCi/l and 15 pCI/l respectively then additional sampling and testing would be required.

The analysis performed indicated that the radioactivity is less than the acceptable limits for public consumption. Attached is the results of the analysis.

Samples from seven wells on or adjacent to the Forbes properties were collected for standard bacteriological analysis. These samples were analyzed in accordance with the Division of Health bacteriological standards. The recommended maximum concentration level of these secondary contaminants is presented later.

A second set of bacteriological samples were collected and analyzed on the same wells in November, 1982. These samples indicated that all samples collected were safe. This is a further indication that the ground water quality of the area is quite acceptable for the development of water supply wells.

The analysis indicated that six of the seven samples collected were "safe". The seventh sample was "questionable". The follow-up samples will further clarify the "questionable" results since this sample was from a newly constructed well.

Enclosed are the "Reports of Bacteriological Examination of Water Samples" for the above samples.

Environmental Data Inc.

a subsidiary of WILLIAMS & WORKS



April 22, 1982

Mr. William Crockett
Williams & Works, Inc.
Bldg. #5, Suite 100
409 Vandiver Drive
Columbia, MO 65202

RECEIVED

APR 26 1982

WILLIAMS & WORKS
COLUMBIA, MO.

Dear Mr. Crockett:

Enclosed are your copies of the laboratory report for the samples you submitted on April 12, 1982.

I would also like to take this opportunity to introduce myself as the Director of Laboratories for Environmental Data, Inc. Doug Kriscunas, the previous laboratory director, has moved to the Environmental Assessment Division of EDI.

In addition to seven years of prior laboratory management experience, I have recently completed three years of research as the principal investigator for an EPA study concerning the environmental fate of toxic organic chemicals in a large land treatment system. This background will provide a solid technical foundation for EDI's hazardous waste analysis and laboratory services operations.

I look forward to serving your testing requirements with accurate and prompt analyses. If you have any questions regarding this report, or require further services or technical guidance, please feel free to contact me.

Very truly yours,

ENVIRONMENTAL DATA, INC.

A handwritten signature in cursive script that reads "Richard R. Rediske".

Richard R. Rediske
Director of Laboratories

RR/ael

enclosures



Environmental Data Inc.
ENVIRONMENTAL SCIENTISTS/ENGINEERS/GEOLOGISTS/CHEMISTS
 811 CASCADE WEST PARKWAY, S.E., P.O. BOX 8510, GRAND RAPIDS, MICHIGAN 49508

WATER · WASTEWATER · BIOLOGICAL STUDIES
 ORGANICS · TOXIC SUBSTANCE ANALYSIS
 TREATABILITY STUDIES · ENVIR. EVALUATIONS

ANALYTICAL SERVICES

PROJECT: W&W Missouri DATE SAMPLED: _____ TIME: _____
 JOB #: 25212 DATE RECEIVED: 4/12/82 TIME: 4:30 PM
 SAMPLING LOCATION: _____ DATE COMPLETED: 4/20/82
 SAMPLED BY: Bill R. Crockett SCHEDULED COMPLETION: 4/20/82
 SAMPLE DESCRIPTION: _____ ANALYST: MS, DJJ, KLM, DMT
 _____ QUALITY CONTROL REVIEW BY: DMF
 COMMENTS: _____

	40-20-18-1	40-20-26-4	40-20-31-4	40-21-13-3	40-21-22-4	DATE OF ANALYSIS	DL
EDI SAMPLE NO.	23670	23671	23672	23673	23674		
Alkalinity, Total (asCaCO ₃)	340 mg/l	220 mg/l	350 mg/l	390 mg/l	350 mg/l	4/13/82	2.4 mg/l
Arsenic, Total	<2.0 ug/l	<2.0 ug/l	<2.0 ug/l	<2.0 ug/l	<2.0 ug/l	4/19/82	2.0 ug/l
Barium, Total	0.14 mg/l	<0.10 mg/l	<0.10 mg/l	0.11 mg/l	<0.04 mg/l	4/15/82	0.10 mg/l
Cadmium, Total	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	4/13/82	0.02 mg/l
Calcium, Total	68 mg/l	41 mg/l	69 mg/l	93 mg/l	75 mg/l	4/14/82	0.02 mg/l
Chloride	5.7 mg/l	5.4 mg/l	16 mg/l	12 mg/l	11 mg/l	4/13/82	1 mg/l
Chromium, Total	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	4/13/82	0.02 mg/l
Copper, Total	0.04 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	0.08 mg/l	4/14/82	0.02 mg/l
Fluoride	0.1 mg/l	<0.1 mg/l	<0.1 mg/l	0.1 mg/l	<0.1 mg/l	4/13/82	0.1 mg/l
Iron, Total	0.06 mg/l	0.05 mg/l	0.16 mg/l	0.06 mg/l	0.09 mg/l	4/14/82	0.02 mg/l
Lead, Total	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	4/14/82	0.02 mg/l



ANALYTICAL SERVICES

PROJECT: W&W Missouri DATE SAMPLED: _____ TIME: _____
 JOB #: 25212 DATE RECEIVED: 4/12/82 TIME: 4:30 PM
 SAMPLING LOCATION: _____ DATE COMPLETED: 4/20/82
 SAMPLED BY: Bill Crockett SCHEDULED COMPLETION: 4/20/82
 SAMPLE DESCRIPTION: _____ ANALYST: MS, DJJ, KLM, DMT
 _____ QUALITY CONTROL REVIEW BY: DMF
 COMMENTS: _____

	40-20-18-1	40-20-26-4	40-20-31-4	40-21-13-3	40-21-22-4	DATE OF ANALYSIS	DL
EDI SAMPLE NO.	23670	23671	23672	23673	23674		
Magnesium, Total	44 mg/l	30 mg/l	49 mg/l	59 mg/l	52 mg/l	4/14/82	0.02 mg/l
Manganese, Total	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	4/15/82	0.02 mg/l
Mercury, Total	<0.25 µg/l	<0.25 µg/l	<0.25 µg/l	<0.25 µg/l	<0.25 µg/l	4/15/82	0.25 µg/l
Nitrogen, Nitrate	0.09 mg/l	1.8 mg/l	4.8 mg/l	7.6 mg/l	6.2 mg/l	4/15/82	0.05 mg/l
pH	7.9	8.1	8.0	8.0	8.0	4/13/82	---
Potassium, Total	0.98 mg/l	1.1 mg/l	1.0 mg/l	0.70 mg/l	0.75 mg/l	4/15/82	0.02 mg/l
Residue, Total Dissolved	310 mg/l	240 mg/l	400 mg/l	450 mg/l	410 mg/l	4/14/82	0.5 mg/l
Selenium, Total	<2.0 µg/l	<2.0 µg/l	<2.0 µg/l	<2.0 µg/l	<2.0 µg/l	4/19/82	2.0 µg/l

Section 10 CSR 60 - 4.030(1) of the Missouri Public Drinking Water Regulations provides for the maximum inorganic chemical contaminant levels. These maximum levels are as follows:

<u>Contaminant</u>	<u>Level, Milligrams Per Liter</u>
Arsenic	0.05
Barium	1
Cadmium	0.010
Chromium	0.05
Fluoride	2.2
Lead	0.05
Mercury	0.002
Nitrate (as N)	10
Selenium	0.01
Silver	0.05

CAL

CANTON ANALYTICAL LABORATORY 153 Elder Street Ypsilanti, MI 48197 Phone 313/483-7430

To: Mr. Bill R. Crockett
WILLIMAS AND WORKS
Building 5, Suite 100
400 Vandiver Drive
Columbia, MO 65202

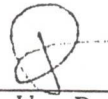
Date: April 19, 1982

Re: Water Samples rec'd 4-12-82

Results:

	Gross Alpha pCi/l	Gross Beta pCi/l
40-21-13-3	<1.0	6.5
Deer Creek	<1.0	<1.0
40-20-26-4	<1.0	4.0
40-21-22-4	<1.0	<1.0

CANTON ANALYTICAL LABORATORY

By: 
Peter W. Rekshan
Laboratory Director

Sections 10 CSR 60 - 4.060(1)(B) and (2)(B) of the above described regulations establish the maximum radionuclide contaminant levels and monitoring requirements for gross alpha and gross beta particle activity respectively. These maximum levels and requirements are as follows:

Gross alpha particle activity, including radium-226 but excluding radon and uranium, fifteen (15) pCi per liter. When the gross alpha particle activity exceeds five (5) pCi per liter, the same or an equivalent sample must be analyzed for radium-226. If the concentration of radium-226 exceeds three (3) pCi per liter, the same or an equivalent sample shall be analyzed for radium-228;

If the gross beta particle activity exceeds fifty (50) pCi per liter, an analysis of the sample must be performed to identify the major radioactive constituents present and the appropriate organ and total body doses must be calculated to determine compliance with this rule;

The concentration of all man-made radionuclides causing a four (4) millirem per year total body or organ dose equivalent must be calculated on the basis of a two (2) liter per day drinking water intake using the one hundred sixty-eight (168)-hour data listed in "Maximum Permissible Body Burdens and Maximum Permissible Concentration of Radionuclides in Air or Water for Occupational Exposure," NBS Handbook 69, as amended August 1963, U.S. Department of Commerce. If two (2) or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ must not exceed four (4) millirem per year;

Southeast Branch Laboratory
1812 South Broadway
Poplar Bluff, MO 63901

Section of Laboratory Services
307 West McCarty
Jefferson City, MO 65101

Southwest Branch Laboratory
1154 East Latoka
Springfield, MO 65807

REPORT OF BACTERIOLOGICAL EXAMINATION OF WATER SAMPLES
PRIVATE WATER SUPPLY

Samples collected by: Bill R. Crockett
Address: 409 Vandiver Drive, Bldg. 5, Suite 100
City or Town: Columbia, MO 65202

REPLY TO APPROPRIATE
DISTRICT OFFICE FOR
YOUR LOCATION
(SEE REVERSE SIDE)

Date of collection: 3-16-82 DATE ANALYZED: 3-18-82
Place: Forbes, 40-20-18-1
Date reported: 3-22-82

Laboratory Number	Source of Sample	Number of Coliform Organisms Per 100 ml. Portion
3051	Btl. No. 255I 40-20-18-1	<1
3052	Btl. No. 2639N 40-21-22-4	<1
3053	Btl. No. 496K 40-20-31-4	<1
3054	Btl. No. 4829N 40-20-31-1	<1
3055	Btl. No. 2642L 40-20-20-3	<1
3056	Btl. No. 1461I 40-20-26-4	<1

Based upon Division of Health bacteriological standards, the above results indicate that, at the time the sample was collected, this water was Safe for drinking purposes.

Water Samples reported as "Unsafe" have five or more coliform colonies. Those reported as "Questionable" are TNTC* without coliform or confluent** without coliform. Water supplies reported as "Unsafe" or "Questionable" warrant discontinued use for drinking and culinary purposes unless emergency disinfection of the water is performed by:

1. Boiling virorously for one full minute prior to use; or
2. Chemical disinfection: add ten drops of regular household chlorine bleach to each quart of water, mix and allow to stand for 30 minutes prior to use.

The safety of a water supply depends upon proper construction and protection against contamination. A favorable bacteriological analysis alone should not be accepted as conclusive evidence of the safety of a water supply unless a survey of the supply indicates no sanitation defects. It is recommended that a water supply used for drinking purposes be analyzed routinely.

The above examinations were made by the membrane filter technique in accordance with the latest edition of *Standard Methods for the Examination of Water and Wastewater*.

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* TNTC = Too numerous to count
** CONFLUENT = Bacterial colonies growing together over the surface of the filter
<1 = Less than one (no coliform colonies present)

WILLIAMS & WORKS
COLUMBIA, MO.

Southeast Branch Laboratory
1812 South Broadway
Poplar Bluff, MO 63901

Section of Laboratory Services
307 West McCarty
Jefferson City, MO 65101

Southwest Branch Laboratory
1154 East Latoka
Springfield, MO 65807

REPORT OF BACTERIOLOGICAL EXAMINATION OF WATER SAMPLES
PRIVATE WATER SUPPLY

Samples collected by: Bill R. Crockett
Address: 409 Vandiver
City or Town: Columbia, MO 65201

REPLY TO APPROPRIATE
DISTRICT OFFICE FOR
YOUR LOCATION
(SEE REVERSE SIDE)

Date of collection: 3-16-82
Place: Forbes, 40-21-13-3
Date reported: 3-22-82

DATE ANALYZED: 3-18-82

Laboratory Number	Source of Sample	Number of Coliform Organisms Per 100 ml. Portion
3057	Btl. No. 1274J	TNTC Without Coliforms

Based upon Division of Health bacteriological standards, the above results indicate that, at the time the sample was collected, this water was ~~QUESTIONABLE~~ for drinking purposes.

Water Samples reported as "Unsafe" have five or more coliform colonies. Those reported as "Questionable" are TNTC* without coliform or confluent** without coliform. Water supplies reported as "Unsafe" or "Questionable" warrant discontinued use for drinking and culinary purposes unless emergency disinfection of the water is performed by:

1. Boiling virorously for one full minute prior to use; or
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The safety of a water supply depends upon proper construction and protection against contamination. A favorable bacteriological analysis alone should not be accepted as conclusive evidence of the safety of a water supply unless a survey of the supply indicates no sanitation defects. It is recommended that a water supply used for drinking purposes be analyzed routinely.

The above examinations were made by the membrane filter technique in accordance with the latest edition of *Standard Methods for the Examination of Water and Wastewater*.

(OVER)

* TNTC = Too numerous to count

** CONFLUENT = Bacterial colonies growing together over the surface of the filter

< 1 = Less than one (no coliform colonies present)

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COLUMBIA, MO.

missouri department of natural resources

NOV 23 1982

DIVISION OF ENVIRONMENTAL QUALITY

P. O. Box 1368 Jefferson City, Missouri 65102 314-751-3241

REPORT OF BACTERIOLOGICAL ANALYSIS OF WATER SAMPLES
Public Water Supply

SUPPLY Bill Creckett Miller/Williams & Works

PWS ID _____ COUNTY Boone

Sample Type Routine Special Check

Collected By no information Date Collected 11/16/82

Date Reported 11/22/82 Date Analyzed 11/18/82

<u>Laboratory Number</u>	<u>Time of Collection</u>	<u>Point of Collection</u>	<u>Number of Coliform Colonies/100 ml</u>
16767	10:16	40-21-15-3	<1
16768	10:30	40-20-18-1	<1
16769	00:00	40-20-31-4	<1
16770	12:20	40-21-22-4	<1
16771	11:15	40-20-20-3	<1
16772	12:00	40-20-26-4	<1
16766	12:07	40-20-31-1	<1

Coliform bacteria are used as an indicator of water supply contamination. The analysis determines if coliform are present. The following is an explanation of the result (s) given above:

<1 - no coliform detected.

a number - refers to the number of coliform detected.

Non-coliform TNTC - bacteria other than coliform are present in a quantity too numerous to count.

Non-coliform confluent - bacteria other than coliform are present but extensive bacteria growth is such that discrete colonies are not distinguishable for counting purposes.

TNTC with coliform* - coliform are present in a quantity too numerous to count.

Confluent with coliform* - coliform are present but extensive bacterial growth is such that discrete colonies are not distinguishable for counting purposes.

The above analyses were performed by the Missouri Division of Health, Section of Laboratory Services using the membrane filter technique in accordance with the latest edition of Standard Methods for the Examination of Water and Waste Water (10 CSR 60-5.010).

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Section 10 CSR 60 - 4.070(1) of the above described regulations establish the maximum contaminant levels for secondary contaminants. These levels are as follows:

<u>Constituent</u>	<u>Recommended Maximum Concentration</u>
Alkalinity	--
Calcium	--
Chloride	250 mg/l
Color	15 color units
Copper	1 mg/l
Hardness	--
Foaming Agents (MBAS)	0.5 mg/l
Iron	0.3 mg/l
Magnesium	--
Manganese	0.05 mg/l
Odor	3 T.O.N.*
Potassium	--
pH	--
Sodium	--
Sulfate	250 mg/l
Total Filterable Residue Dried	500 mg/l
Residue Dried	
Zinc	5 mg/l

* Threshold Odor Number

RADIOACTIVITY

There is no known background radioactivity on the Forbes properties in Benton and Camden Counties.

EXPANSIVE SOILS

The surface soils on the subject properties are generally not expansive. The parent formations from which the surface soils are formed just do not naturally produce soils of an expansive nature. However, small quantities of moderately expansive soils in isolated locations may be found on the site. These soils are an exception rather than the rule.