LOG MASON CITY WELL NO. 12

0	4	Soil
4	10	Red clay, gravel and sand.
10	27	Limestone, brown.
27	36	Shale, blue.
36	39	Limestone, brown.
39	69	Shale, blue.
69	100	Limestone, gray.
100	145	Limestone, brown and gray.
145	240	Limestone, gray.
240	340	Limestone, shale breaks, brown.
340	455	Limestone, gray, brownish.
455	475	Limestone and flint gray.
475	550	Limestone, gray, brownish.
550	733	Limestone, gray (732 cloudy water in well No. 11).
733	735	Shale green.
735	740	Limestone, gray.
740	744	Limestone and shale, green and gray.
744	790	Shale, green.
790	799	Limestone, brown.
799	814	Shale, green. Water level 148 feet (caving).
814	887	Sand white, lower half firm, upper half rather soft. Water level 141 feet.
887	1080	Limestone, brown.
1080	1115	No cuttings, water level 164 feet.
1115	1130	Limestone, brown.
1130	1155	No cuttings.
1155	1217	Limestone, brown.
1217	1277	Sandy, water level 155 feet.
1277	1377	Limestone, brown.

September 11, 1946

Mr. Carl B. Patchen
Water Superintendent
Mason City, Iowa

Dear Mr. Patchen:

In response to your request of August 15, et seq., regarding another well near your south station, we have made some calculations with the following results.

First the coefficient of transmissibility and storage was determined, chiefly from Robinson's report containing his measurements and mine. Robinson's figure of 53,000 g.p.d. per foot, under a unit hydraulic gradient, as the average transmissibility appears to be within reason.

By using formulated calculations and a weighted average for the coefficient of storage we arrived at the following figures:

Pumping Rate at pumped well	1500	1500	1500	1500	1250	1250	1250	1250
Distance of adjacent well	100	200	500	1000	100	200	500	1000
Drawdown at end of one day in adjacent well	33.3	28.8	22.9	20	27.8	24.1	19.1	16.65
Drawdown at end of one year in adjacent well	52.6	48.1	42.1	37.6	43.8	40.0	35.1	31.4
Drawdown at end of ten years in adjacent well	60.0	55.6	49.6	45.1	50.2	46.3	41.3	37.6

If one well is pumped at the rate of 1500 g.p.m. at a pumping level of 300 feet from a static level of 200 feet, the water level in an adjacent well will be 200 feet plus the drawdown for that particular condition alone. When both wells are pumping the level will be lower but the amount of interference of one well on the other as given in the table above. Thus for the case of two wells 200 feet apart, each pumping at a rate of 1250 g.p.m. for a one day period, if we assume a non-pumping level of 200 feet and a drawdown of 62 feet, the pumping level in both wells should be the same and be equal to 200 + 62 + 24, or 286 feet total.

I would be glad to go over the formula and calculations if you are interested. Obviously in calculations of this type one should keep in mind the several variable and unpredictable factors. If after the new well is drilled we could run some tests on it and your No. 11 well, I believe that we could give you more precise figures in regard to forecasting future water levels.

If you have any questions or if I can add to the foregoing remarks please let me hear from you.

Very truly yours,

H. G. Hershey

HGH:BH

RESULTS OF PUMPING TEST MADE ON MASON CITY WELL NO. 12

AFTER DYNAMITING JORDAN SANDSTONE FROM 1235 TO 1265 FEET

Mason City, Iowa

April 23-27, 1948

NAME: Mason City Well No. 12.

LOCATION: NE¼ SE¼ NE¼ SE¼ Sec. 16, T. 96 N., R. 20 W.

OWNER: City of Mason City.

CONTRACTOR: Layne-Western Company, Inc., Ames, Iowa.

ELEVATION: Top of 20-inch pipe 1165.4 feet above sea level and about 1.5 feet above land-surface.

DRILLERS: Don Simpson and Jewell Black.

DRILLING DATES: Started 7/2/47.

TOTAL DEPTH: 1577 feet.

PRESENT DEPTH: 1538.5 feet.

CASING AND HOLE DATA: 10 feet of 30-inch curbing from 0 feet to 10 feet.
145 feet of 20-inch pipe from 0 feet to 145 feet, cemented in 26-inch hole.
22 feet of 18-inch pipe from 793 feet to 815 feet.
147.5 feet of 14-inch pipe from 732 feet to 879.5 feet.
Open 12¼-inch hole from 879 feet to bottom.

TEST PUMP: Turbine, setting 340 feet with 20 feet of suction pipe. Powered by 150 hp. electric motor.

TEMPERATURE MEASUREMENTS: Water temperature measurements made at end of 23.5 feet of 10-inch discharge pipe.

WATER LEVEL MEASUREMENTS: Depth to water measurements were referred to top of 20-inch casing.

REMARKS: Well No. 12 is located 263 feet south of Well No. 11. Well No. 11 has not been pumped since Sept. 3, 1947. No other wells are located within .5 mile of the city well field.

Results of Production Test Made on Mason City Well No. 12 After Dynamiting

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Apr. 23					
3:35 pm	175.7				
4:01	175.7				
4:02	318.6	31½	1167		Pump on
4:07	324.1	30½	1148		Water very dirty
4:08	330.0	28½	1109		Pumping much white sand
4:09	332.6				
4:11		24-3/4	1038		Water very dirty
4:12	335.4				
4:18	334.6				
4:20		23	1001		
4:22	328.5				
4:25	328.3	22½	985	50	Water very dirty, much sand
4:35	326.15				
4:38					Pump off to adjust impellers
4:41	231.6				Recovery measurements
4:43	227.1				
4:45	223.9				
4:47	221.6				
4:49	219.9				
4:51	218.3				
4:53	216.5				
4:55	215.3				
4:57	214.4				
5:01					Pump on
5:02	273.9				
5:03	290				
5:05	300				
5:06		41½	1334		
5:07	307.2				
5:08		41	1326		
5:11	311.2				
5:15				50	
5:20		39½	1304		Pumping much sand, dirty gray
5:21	312.5				
5:28	312.9	39-3/4	1308	51	
5:38	312.6	39-3/4	1308		
5:47		41	1326		
5:50	315.5				
5:55		41¼	1330		
5:58	315.3				
6:01	313.0	41½	1334	51	Water clearing, light gray
6:13		42	1341		
6:15	312.1				
6:27	313.25	41-3/4	1338		
6:38	311.9	41½	1334		
6:50	313.4	41-3/4	1338		
7:05	311.6	41-3/4	1338		Water clearing, light gray
7:20	310.4	40½	1319		
7:35	309.7	40½	1319		Water clearing, light gray
7:47	310.7	40-3/4	1323		
8:05	311.1	41	1326		

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Apr. 23					
8:22 pm	311.3	41	1326		Water clearing, some sand
8:28		41	1326		
8:30	312.0				
8:35					Pump off to surge well
8:37½					Pump on
8:38					Pump off
8:40					Pump on
8:40½					Pump off
8:43					Pump on
8:44					Pump off
8:44½					Pump on
8:45½					Pump off
8:47½					Pump on
8:55	301.8	44½	1379		
9:00	305.1	44	1371		Cloudy sand
9:06	306.0	42½	1349		
9:16	307.7	42¼	1345		
9:21		43½	1364		
9:22	307.9				
9:30		43½	1364		
9:33	309.1				
9:41				51	
9:43	310.6	43½	1364		Light cloudy, little sand
9:55	308.7	42¼	1345		Light cloudy, little sand
10:14	309.8	42½	1349		Light cloudy, little sand
10:30	310.0	42-3/4	1353		Light cloudy, little sand
10:45	309.8	42½	1349		Light cloudy, little sand
11:00	309.9	42¼	1345		Light cloudy, little sand
11:15	311.1	42¼	1345		Light cloudy, little sand
11:30	311.8	42-3/4	1353		Water clear, light sand
11:45	313.2	44½	1379		Water clear, light sand
12:00 am	314.0	44½	1379		Water clear, light sand
Apr. 24					
12:15 am	310.6	42¼	1345		Water clear, light sand
12:30	307.9	42	1341		Water clear, light sand
12:45	308.6	42½	1349		Water clear, light sand
1:00	309.4	42	1341		Water clear, light sand
1:15	309.5	42¼	1345		Water clear, light sand
1:30	310.5	43	1356		Water clear, light sand
1:40	310.8	43¼	1360		Water clear, light sand
1:47	308.8	43¼	1360		Water clear, light sand
1:56	307.7	43½	1364		Water clear, light sand
2:07	307.7	43	1356		Water clear, light sand
2:15	309.4	43	1356		Water clear, light sand
2:22	308.2	42¼	1345		Water clear, light sand
2:30	307.6	42½	1349		Water clear, light sand

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Apr. 24					
2:35 am	307.4	42-3/4	1353		Water clear, light sand
2:40	307.9	42½	1349		Water clear, light sand
2:55	308.5	42½	1349		Water clear, light sand
3:00	308.7	42-3/4	1353		Water clear, light sand
3:20	308.7	42½	1345		Water clear, light sand
3:30	308.8	42½	1349		Water clear, light sand
3:45	308.8	41-3/4	1338		Water clear, light sand
4:00	308.4	41-3/4	1338		Water clear, light sand
4:10	308.7	41½	1334		Water clear, light sand
4:22	308.8	42½	1349		Water clear, light sand
4:27	308.2	41-3/4	1338		Water clear, light sand
4:35	308.7	42	1341		Water clear, light sand
4:45	308.4	42	1341		Water clear, light sand
4:55	308.2	42½	1349		Water clear, light sand
5:06	308.2	42½	1349		Water clear, light sand
5:18	308.4	42½	1349		Water clear, light sand
5:25	308.6	43½	1364		Water clear, light sand
5:30	308.6	43½	1364		Water clear, light sand
5:45	307.7	43¼	1360		Water clear, light sand
5:54	308.6	43	1356		Water clear, light sand
6:00	308.6	42-3/4	1353		Water clear, light sand
6:10	308.6	42½	1349		Water clear, light sand
6:20	308.5	42½	1349		Water clear, light sand
6:30	308.7	42½	1349		Water clear, light sand
6:45	308.6	42-3/4	1353		Water clear, light sand
7:00	308.5	42¼	1345		Water clear, light sand
7:15	308.6	43½	1364		Water clear, light sand
7:20	307.8	43¼	1360		Water clear, light sand
7:30	307.7	43½	1364		Water clear, light sand
7:40	307.2	42½	1349		Water clear, light sand
7:55	308.7	42-3/4	1353		Water clear, light sand
8:00	308.5	42½	1349		Water clear, light sand
8:15	308.3	42-3/4	1353		Water clear, light sand
8:30	308.2	42¼	1345		Water clear, light sand
8:45	308.4	42	1341		Water clear, light sand
9:00	308.6	43½	1364		Water clear, light sand
9:15	308.7	43	1356		Water clear, light sand
9:27	312.7				
9:37	312.4	43	1356		Water clear, light sand
9:55	309.6	41¼	1330		Water clear, light sand
10:10	308.2	40½	1319		Water clear, light sand
10:30	307.8	42-3/4	1353		Water clear, light sand
10:45	308.7	43	1356		Water clear, light sand
11:05	311.8	42-3/4	1353		Water clear, light sand

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Apr. 24					
11:10 am					Pump off to surge
11:13½					Pump on
11:14½					Pump off
11:16½					Pump on
11:18					Pump off
11:20					Pump on
11:21					Pump off
11:23					Pump on
11:24½					Pump off
11:26½					Pump on
11:30	294.3	43-3/4	1368		
11:37	301.8	43	1356		Water fairly clear, some sand
11:42	302.8	42½	1345		
11:46	303.6	42½	1345		
11:53	305.2	42½	1345		
12:05 pm	305.4	42	1341		Water fairly clear, some sand
12:20	305.9	42	1341		
12:35	306.6	43	1356		
12:50	307.1	42½	1349		
1:00	307.2	42-3/4	1353		
1:15	307.8	43	1356		
1:30	307.9	43	1356	52	
1:45	308.4	43	1356		
2:00	308.6	43¼	1360		Water clearing, sandy
2:15	308.6	43¼	1364		
2:30	307.2	42½	1345		
2:45	307.0	43	1356		
3:00	307.1	43	1356		
3:15	307.1	42½	1345		
3:30	306.9	42½	1345		
3:45	308.3	42½	1349		
4:00	307.5	42-3/4	1353		
4:20	307.3	42-3/4	1353		
4:33	307.3	42-3/4	1353		Water clear
4:45	307.0	42-3/4	1353		Trace sand
5:00	306.9	42½	1349		
5:16	307.5	43	1356		Trace sand
5:34	307.7	43¼	1360		
5:54	309.4	44	1371		Trace sand
6:10	308.9	43½	1364		
6:27	308.4	43	1356		
6:50	307.7	43	1356		
7:05	307.6	43	1356		Trace sand
7:18	307.1	42-3/4	1353		Trace sand
7:34	307.1	42-3/4	1353		
7:50	309.0	43-3/4	1368		Trace sand
8:05	309.5	44	1371		
8:20	307.5	42½	1349		
8:40	308.0	43	1356		Trace sand
8:55	307.9	43	1356		

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Apr. 24					
9:10	307.8	43	1356		
9:25	307.6	42⅝	1349		
9:42	307.6	42⅝	1349		
10:00	307.9	42⅝	1349		Trace sand
10:15	307.5	42⅝	1349		
10:30	307.6	42⅝	1349		
10:45	307.5	42⅝	1349		Trace sand
11:00	307.5	42-3/4	1353		Trace sand
11:15	309.2	43-3/4	1368		Trace sand
11:30	308.7	43½	1364		
11:45	308.1	42	1341		Trace sand
12:00 am	307.6	42½	1349		
Apr. 25					
12:15 am	306.5	42	1341		
12:25	307.8	42¼	1345		Water clear
12:40	307.8	42¼	1345		Water clear
1:00	307.4	42½	1349		Water clear
1:15	307.5	43	1356		Water clear
1:30	307.6	43	1356		Water clear
1:45	307.6	42-3/4	1353		Water clear
2:00	307.6	43	1356		Water clear
2:15	307.5	42-3/4	1353		Water clear
2:30	306.9	42-3/4	1353		Water clear
2:45	306.4	42-3/4	1353		Water clear
3:00	306.3	42	1341		
3:15	307.5	42½	1349		
3:30	306.8	42¼	1345		
3:45	307.4	42½	1349		
4:00	307.3	42½	1349		
4:15	307.3	42½	1349		
4:30	307.2	42½	1349		
4:45	307.6	42½	1349		
5:00	307.5	42-3/4	1353		
5:15	307.5	43	1356		
5:30	307.5	42½	1349		
5:45	307.5	42½	1349		
6:00	308.2	43⅜	1364		
6:15	308.1	43⅜	1360		
6:30	308.4	43⅜	1364		
6:45	308.6	43-3/4	1368		Slight trace of sand
7:00	307.9	42¼	1345		Slight trace of sand
7:15	307.6	42½	1349		Slight trace of sand
7:30	306.9	42½	1349		Slight trace of sand
7:40	307.0	42½	1349		Slight trace of sand
7:50	307.0	42-3/4	1353		Slight trace of sand
8:00	370.0	42¼	1345		Slight trace of sand
8:15	306.2	42	1341		
8:30	306.0	42¼	1345		
8:45	306.9	43⅜	1360		

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Apr. 25					
9:00 am	307.6	40-3/4	1322		
9:15	305.4	41	1326		
9:30	307.3	44	1371		
9:45	308.0	44¼	1375		
10:00	307.9	44	1371		
10:15	307.9	43½	1364		
10:30	307.8	43-3/4	1368		
10:45	308.1	43½	1364		
11:00	308.1	42½	1349		
11:15	307.0	42½	1349		
11:30	306.6	42¼	1345	52	Water clear, trace sand
11:45	306.7	42-3/4	1353		
12:00 pm	306.6	42½	1349		
12:15	306.7	42½	1349		
12:30	306.6	42½	1349		
12:45	306.5	42½	1349		
1:00	306.6	42½	1349		
1:15	306.5	42½	1349		
1:30	306.6	42-3/4	1353		
1:45	306.5	42¼	1349		
2:00	306.6	42½	1349		
2:15	306.5	42½	1349		
2:30	306.5	42½	1349		
2:45	306.4	42-3/4	1353		
3:00	306.5	42-3/4	1353		
3:15	306.5	43½	1364		
3:30	306.5	43½	1364		
3:45	306.5	42½	1349		
3:59		27¼	1089		Shut valve 45# press
4:02		27-3/4	1099		
4:05	271.0	27-3/4	1099		
4:14	268.6	27-3/4	1099		
4:25	261.9	27-3/4	1099		
4:26					Opened valve wide open
4:28	277.7	44	1371		
4:41	288.8				
4:47	308.7	43-3/4	1368		Trace sand, clear
5:30	307.0	43½	1360		Straighten out line
5:45	306.6	42½	1349		Trace sand, clear
6:00	306.3	43	1356		
6:15	306.6	42-3/4	1353		Trace sand, clear
6:30	306.6	42-3/4	1353		
6:45	306.5	42-3/4	1353		
7:00	306.5	42-3/4	1353		Trace sand, clear
7:15	307.0	43½	1360		Trace sand, clear
7:30	307.1	43½	1360		Trace sand, clear
7:45	307.1	43½	1364		Trace sand, clear
8:00	306.3	42½	1349		Trace sand, clear

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Apr. 25					
8:15 pm	306.3	42½	1349		Trace sand, clear
8:39	306.3	42½	1349		Trace sand, clear
8:53	306.6	42-3/4	1353		Trace sand, clear
9:10	306.6	42-3/4	1353		Trace sand, clear
9:25	306.7	43	1356		Trace sand, clear
9:40	306.9	43	1356		Trace sand, clear
9:55	307.0	43¼	1360		Trace sand, clear
10:17	307.1	43¼	1364		Trace sand, clear
10:35	306.8	42½	1349		Trace sand, clear
10:52	306.5	42-3/4	1353		Trace sand, clear
11:10	306.7	43-3/4	1368		Trace sand, clear
11:28	306.9	43	1356		Trace sand, clear
11:46	305.9	42¼	1345		Trace sand, clear
12:00 am	306.1	43	1356		
Apr. 26					
12:15 am	307.1	43¼	1360		Trace sand, clear
12:21	307.8	43¼	1360		Trace sand, clear
12:33	307.8	43	1356		Trace sand, clear
12:42	307.6	43	1356		Trace sand, clear
12:52	307.7	43¼	1360		Trace sand, clear
1:00	307.7	43	1356		Trace sand, clear
1:15	307.9	43¼	1360		Trace sand, clear
1:30	307.9	43	1356		Trace sand, clear
1:45	307.9	43	1356		Trace sand, clear
2:00	307.3	43	1356		
2:15	307.4	43	1356		Trace sand, clear
2:30	307.4	43	1356		Trace sand, clear
2:45	307.4	43	1356		Trace sand, clear
3:00	307.4	43	1356		
3:15	307.4	43	1356		
3:30	307.4	43	1356		
3:45	306.7	43	1356		Trace sand, clear
4:00	307.8	43	1356		
4:15	307.4	43	1356		
4:30	307.8	43	1356		
4:45	307.7	43	1356		Trace sand, clear
5:00	307.7	43	1356		Trace sand, clear
5:15	307.7	43	1356		
5:30	307.7	43	1356		
5:45	307.6	43	1356		Trace sand, clear
6:00	307.7	43	1356		
6:15	307.2	43	1356		Water clear
6:30	307.4	43	1356		Water clear
6:45	307.6	43	1356		Water clear
7:00	307.6	43	1356		
7:15	307.4	43	1356		Water clear

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Apr. 26					
7:30 am	307.2	43	1356		
7:45	307.3	43	1356		
8:00	307.8	43	1356		
8:15	307.4	43½	1364		
8:30	307.6	43-3/4	1371		
8:45	307.5	43½	1364		
9:00	307.0	43	1356		
9:15	306.6	42-3/4	1353		
9:30	305.7	41½	1334		
9:45	306.1	41¼	1330		
9:50					Closed valve to 45#/in^2 pressure equal to about 100 foot head
9:51	291.6	26¼	1069		
9:53	291.1	27	1084		
10:00	289.1	27	1084		
10:05	287.9	27	1084	52	
10:16	287.3	27	1084		
10:30	287.3	27½	1094		
10:45	287.0	27½	1094		
10:57	286.9	27½	1094	52	H_2O sample for analysis Water clear, trace fine sand
10:59					Pump off
10:59½	240				Recovery measurements
11:01	238.9				
11:02	237.9				
11:03	236.3				
11:04	234.7				
11:05	234.0				
11:07	232.6				
11:08	232.0				
11:09	231.3				
11:10	230.9				
11:12	230.0				
11:15	228.9				
11:20	227.6				
11:25	226.0				
11:30	225.6				
11:35	225.0				
11:40	224.3				
11:45	223.8				
11:50	222.3				
11:55	223.0				
12:00 pm	222.6				
12:15	221.8				
12:30	220.8				
12:45	220.4				
1:15	219.2				
1:30	218.7				
1:45	218.1				

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Apr. 26					
2:00 pm	218.0				
2:15	217.7				
2:30	217.7				
2:45	217.5				
3:00	217.0				
3:15	216.9				
3:30	216.9				
3:45	216.4				
4:00	216.2				
Apr. 27					
7:50 am	212.8				
8:15	212.7				
8:30	212.7				

RESULTS OF PRODUCTION TEST MADE ON MASON CITY WELL NO. 12

Mason City, Iowa

November 7-20, 1947

NAME: Mason City Well No. 12.

LOCATION: NE¼ SE¼ NE¼ SE¼ Sec. 16, T. 96 N., R. 20 W.

OWNER: City of Mason City.

CONTRACTOR: Layne-Western Company, Inc., Ames, Iowa.

ELEVATION: Drilling curb, top of 20-inch pipe 1165.4 feet above sea level and about 1.5 feet above land surface.

DRILLERS: Don Simpson and Jewell Black.

DRILLING DATES: Started 7/2/47

PRESENT DEPTH: 1377 feet.

CASING AND HOLE DATA: 10 feet of 30-inch curbing from 0 feet to 10 feet.
145 feet of 20-inch pipe from 0 feet to 145 feet, cemented in 26-inch hole.
22 feet of 18-inch pipe from 793 feet to 815 feet.
147.5 feet of 14-inch pipe from 732 feet to 879.5 feet.
Open 12¼-inch hole from 879 feet to 1377 feet.

PRINCIPAL AQUIFER: Not known.

TEST PUMP: Turbine, setting 301 feet with 20 feet of suction pipe. Powered by 150 hp. electric motor.

DISCHARGE MEASUREMENTS: Discharge rate obtained with 7-inch orifice in 10-inch casing.

TEMPERATURE MEASUREMENTS: Water temperature measurements made at end of 23.5 feet of 10-inch discharge pipe.

WATER LEVEL MEASUREMENTS: Depth to water measurements were referred to hole in pump base 1.1 feet above top of 20-inch pipe.

REMARKS: Well No. 12 is located 263 feet south of well No. 11. Well No. 11 has not been pumped since Sept. 3, 1947. No other wells are located within .5 miles of the city well field.

cc: Hamblin and Brooks

Results of Production Test Made on Mason City Well No. 12 Nov. 7-20, 1947

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Chloride P.P.M.	Remarks
Nov. 7						
1:03 pm	197.6					
3:10						Start introducing 1000 gallons HCl in 1168 feet of 2-inch pipe.
3:55						All acid in. Flushed out partially with water.
5:35	201.15					
5:55	200.97					
6:05	200.85					
6:25	200.75					
7:24	200.15					
7:48	200.6					
8:05	200.7					
8:12	200.74					
8:17						Pumping started.
8:21	286.0		700 to 800			Water level in orifice tube fluctuating
8:34				50	10±	
8:44	294.55				700 to 800	
8:50	295.32					Much gas in water. Discharge rate fluctuating.
8:55					350	
9:00	297.20					
9:01						Pump broke (?) Pumping stopped.
9:06	205.0					Suspect air lock.
9:12	210.0					Pump started. No water pumped.
9:13						Pump stopped.
9:16	208.8					Recovery measurements.
9:27	204.8					
9:50	201.1					
10:15	198.35					
10:21	197.98					

Mason City Well No. 12 -6- Nov. 7-20, 1947

Date	Depth to Water (feet)	Depth to Water 2" Tube	Remarks
Nov. 7			
10:36 pm	197.30		
11:04	197.39		
Nov. 8			
7:39 am	195.40		
7:46	195.38		Spent day attempting to pump water, assuming pump was air locked. Finally decided pump had broken.
1:20 pm	192.14		
1:23	192.23		
5:24	192.00		
5:30	191.95		
5:57	191.90		Flushed out 2-inch acid line with fresh water. Referred point for acid line is top of coupling, .19-foot above pump base.
Nov. 9			
9:05 am	191.80		
9:07	191.80		
9:10	191.78		
9:17		192.02	
9:23		192.02	Water level in 2-inch tube apparently .03-foot lower than water level in 20-inch pipe.

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Chloride P.P.M.	Remarks
Nov. 17						
5:11 pm	183.85					
5:18	183.85					
6:27	183.82					
6:32	183.82					
6:33						Pumping started.
6:36		21	960±			Pumping stopped, motor heating.
7:01	192.0					
Nov. 19						
9:15 am	189.0					
2:02 pm	188.66					
2:21	188.64					
2:23						Pumping started.
2:27	293.0	17½	890±			
2:30	297.5	11½	710	50		
2:32	300					
2:35	299.5	11½	710		10±	Water cloudy.
2:40	300.6	9½	660±			
2:49	302.25	9½	660±		7±	Water pinkish, rusty.
2:54	302.7	9½		50		Water rusty color.
2:57	303.1	9½			7±	Water rusty color.
3:00	303.1	9½	660	50	7±	Water slightly milky.
3:10	304.0	9½	660	50	7±	Water slightly milky, contains some silt.
3:20	304.65	9½+	650	50	7±	Water slightly milky, contains some silt.
3:30	305.3	9	640	50	5±	Water almost clear.
3:45	305.6	9	640	50		Water clear, trace sand.
3:50	305.82	9	640	50	6±	Water clear, trace sand.
4:00	306.2	9	640			
4:05						Pumping stopped to surge.
4:15		12	730±			Pumping started.
4:18	287	11½	710			
4:20	289.5	11				
4:25	290	10-3/4	700±			
4:30	290.6	10-3/4				
4:35	291.3					
4:37						Pumping rate increased.
4:40	305.3	17½	870+			
4:45	307.1	17½	870			
4:50	307.7					
4:55	314.4	18½			6±	
4:58						Shut down to surge 5 times.
5:09						Pumping resumed.
5:15	309	24½	1033	50		
5:20	312.8	24	1022			
5:25	314.7	24	1022	50	6±	Water milky, contains sand and shale particles.

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Chloride P.P.M.	Remarks
Nov. 19						
5:33 pm	315.5	24	1022			
5:42	316.6	23½	1012	50+	6±	
5:49	316.9					
6:00	317.4	23½	1012	50+	6±	Water slightly cloudy, some sand.
6:10	318.0	23¼	1006			
6:20	317.8	23	1001			
6:25						Shut down to surge.
6:40						Pumping resumed.
6:45	297.7	22	990			
6:50	305	23-3/4	1017			
7:00	307.6	23½	1012	50+	6+	Water slightly cloudy, trace sand.
7:10	308.5	23¼	1006			
7:20	308.9	23¼	1006	50+		Water slightly cloudy, trace sand.
7:30	308.9	23	1001			
7:41	309.05	23	1001			Water slightly milky.
7:50	309.25	23	1000±	50		Water slightly milky, some sand and shale.
8:05		22-3/4	995±			
8:10	308.9	22½	990	50	6+	Water slightly milky.
9:08	308.35	21-3/4	975			
9:12		24	1022			Increase discharge rate.
9:14	313.9	23-3/4	1017	50	10±	
9:24	316.0					
9:27	316.65	24	1022		10±	Water almost clear.
9:31						Pumping stopped to surge well.
9:40		25½	1059			Pumping resumed.
9:45	308.7	24	1022			
9:50	313.6	23½	1012			
10:00	316.5	23¼	1006	50		Water milky.
10:15	317.9	23	1001			
10:30	317.9	23	1001			
10:45		24½	1033			
10:50	317.4		1033			
11:00	317.9	25	1043	50	12±	Air temperature 32±. Water clear, trace sand.
11:10	317.3	24½	1033			
11:20	317.2	24½	1033			
11:30	317.5	24½	1033	50+	12±	Water clear, trace of sand.
11:42	317.6	24½	1033			
Nov. 20						
12:00 am	317.8	24½	1033		12±	Water clear, trace of sand.
12:30	317.7	24½	1033	50	11±	Water slightly cloudy, trace of sand.
12:40	317.9	24½	1033			
1:00	318.0	24½	1033			
1:30	318.6	24½	1033	50	11	Water clear, trace sand.

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Chloride P.P.M.	Remarks
Nov. 20						
2:00 am	317.8	24½	1027			Water clear, trace sand.
2:30	317.85	24½	1027			
2:45	318.0	24	1022			
2:50	315.0	22-3/4	995			Discharge rate decreased slightly.
2:55	315.0	23	1001			
3:00	314.5	23	1000±			Water clear, trace of sand.
8:47	314.4	22½	990			
8:48						Shut down for surging.
8:57						Pumping resumed.
9:05	306.55	24	1022			
9:10	308.6					
9:14	311.70	25	1043			
9:16	312.70	24-3/4	1038			
9:22	314.0					
9:26	315.2	25¼	1051			Discharge rate increased.
9:30	315.8	25	1043			
9:34	318.0	26¼	1069			Discharge rate increased.
9:35	318.1					
9:43	319.0	25-3/4	1062±	50	10±	
9:50	319.2	26	1064			
9:56	320.4	26½	1074			
10:00	320.5	26	1064			
10:10	320.55	26	1064			
10:15	320.2	26	1064			
10:25	320.6	26	1064			
10:55	320.6	25½	1059			
11:30	320.2	25½	1059			
11:45	320.55	25½	1059			
12:00 pm	320.57	25½	1059		9±	Water clear.
12:15	320.57	25½	1059			
12:30	320.55	25½	1059			
12:45	320.6	25½	1059	50+	9±	Water clear, mere trace of sand.
1:00	320.6	25½	1059			Water sample collected.
1:12						Pumping stopped.
1:13	225.					Recovery measurements.
1:14	224.					
1:15	226.					
1:16	225.5					
1:17	224.7					
1:18	223.9					
1:19	223.18					
1:20	222.45					
1:21	221.82					
1:22	221.31					
1:23	220.8					
1:24	220.2					

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Chloride P.P.M.	Remarks
Nov. 20						
1:25 pm	219.82					
1:30	218.1					
1:35	216.62					
1:40	215.45					
1:45	214.60					
1:50	213.70					
1:55	213.02					
2:00	212.42					
2:05	211.82					
2:10	211.37					
2:15	210.90					
2:20	210.47					
2:25	210.05					
2:30	209.73					

RESULTS OF PUMPING TEST MADE ON MASON CITY WELL NO. 12

Mason City, Iowa

November 4-5, 1947

NAME: Mason City Well No. 12.

LOCATION: NE¼ SE¼ NE¼ SE¼ Sec. 16, T. 96 N., R. 20 W.

OWNER: City of Mason City.

CONTRACTOR: Layne-Western Company, Inc., Ames, Iowa

ELEVATION: Drilling curb, top of 20-inch pipe 1165.4 feet above sea level and about 1.5 feet above land-surface.

DRILLERS: Don Simpson and Jewell Black.

DRILLING DATES: Started 7/2/47.

PRESENT DEPTH: 1377 feet.

CASING AND HOLE DATA: 10 feet of 30-inch curbing from 0 feet to 10 feet.
145 feet of 20-inch pipe from 0 feet to 145 feet cemented in 26-inch hole.
22 feet of 18-inch pipe from 793 feet to 815 feet.
147.5 feet of 14-inch pipe from 732 feet to 879.5 feet.
Open 12¼-inch hole from 879 feet to 1377 feet.

PRINCIPAL AQUIFER: Not known.

TEST PUMP: Turbine, setting 301 feet with 20 feet of suction pipe. Powered by 150 hp. electric motor.

DISCHARGE MEASUREMENTS: Discharge rate obtained with a 7-inch orifice in 10-inch casing.

TEMPERATURE MEASUREMENTS: Water temperature measurements made at end of 23.5 feet of 10-inch discharge pipe.

WATER LEVEL MEASUREMENTS: Depth to water measurements were referred to hole in pump base 1.0 foot above top of 20-inch pipe.

REMARKS: Well No. 12 is located 263 feet south of well No. 11. Well No. 11 has not been pumped since Sept. 3, 1947. No other wells are located within .5 miles of the city well field.

cd: Hamblin and Brooks

Results of Pumping Test Made on Mason City Well No. 12 November 4-5, 1947.

Time	Depth To Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Nov. 4					
9:10 am	157.50				
9:20	157.44				
10:55		38	1280		Pumping started.
10:57					Pumping stopped.
11:01					Pumping resumed.
11:07				50	
11:10		21	960		Water dirty gray.
11:15	314.6	18	890		
11:20	313.8	18	890		
11:22				51	Water dirty gray.
11:25	312.5	18	890	51	Water dirty gray.
11:30	310.9	18	890		Water dirty gray, dolomite and sand grains, silt.
11:35	310.0	18			Water dirty gray, dolomite and sand grains, silt.
11:40	310.5				
11:45	310.2	18	890	51	Water clearing, dolomite cuttings and fine sand.
11:55	310.7				
12:05 pm	311.2	18	890	51.5	Water clearing, dolomite chips and trace fine sand.
12:15	310.0				
12:27	309.05	17	865	51.5	
12:40	308.35	16-3/4	860±	51.5	Water milky, some silt.
12:50	308.65	16-3/4	860±		
1:00	308.50	16-3/4	860±	51.5	Water dark gray dirty, shale chips gray.
1:10	306.20	16-3/4	860±		Water dark gray dirty, shale chips gray.
1:20	305.10	16-3/4	860±		Water dark gray dirty, shale chips gray.
1:30	303.70	17	865±		Water dark gray dirty, shale gray and limestone.
1:40	303.50	17	865±		Water clearing, little sediment.
1:50	303.40	17	865±	51.5	Water milky.
2:00	303.60	17	865±		Water milky.
2:10	303.70	17	865±	51.5	Water milky, clearing.
2:20	303.60	17	865±		Water milky, clearing.
2:27	303.50	17	865±		Water milky, clearing.
2:31					Pump off.
2:33					Pump on.
2:34					Pump off.
2:36					Pump on.
2:37					Pump off.
2:39					Pump on.
2:42	292.0	16½	850		Water dirty.
2:45	297.20	16½	850		Water dirty.
2:50	298.3	16	840		Water cloudy.

Results of Pumping Test Made on Mason City Well No. 12 November 4-5, 1947.

Time	Depth To Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
3:00 pm	299.2	16	840		Water clearing.
3:10	299.4	16	840		
3:22	299.8	16	840		
3:31	299.9	16	840		Water milky.
3:40	299.9	16	840		
3:50	299.6	16	840		
4:00	299.7	16	840		
4:07					Pumping stopped to surge 3 times.
4:13					Pumping resumed.
4:20		20	940		Pumping rate increased.
4:25	305				
4:28	307	19	910±		
4:40	308.2	19	910±		Stopped pump for surging.
4:50					Pumping resumed.
4:54	300.9	18	890±		
5:03	307.6	17	865±		
5:10	308.8	17	865±		
5:20	309.5	17	865±		
5:30	309.5	17	865±		Water milky.
5:40	309.5	17	865±		Water milky, some shale chips.
5:52	309.6	17+	870±		
6:00	309.5				
6:15	309.3	17+	870±		
6:30	309.2	17+	870±		
6:45	309.2	17+	870±	51.5	Slight H_2S odor.
7:00	309.2	17+	870±		
7:15	309.3	17+	870+		
7:30	309.3	17+	870		Water fairly clear.
7:45	309.2	17+	870		
8:00	309.2	17+	870		
8:15	309.2	17±	870		
8:45	309.2	17+	870		
9:15	309.1	16½	850		
9:45	310.2	16½	850		
10:15	309.1	16½	850		Water fairly clear, few dark grains 15± per qt.
10:45	307.85	16½	850	51.5	
11:20	308.25	16½			
11:40	309.2				
11:46					Shut down to surge.
11:49	216.0				Start, high point lowered somewhat.
11:50					Stop pumping.
11:52	210				Start pumping. High point lowered somewhat.
11:52:30					Stop pumping.
11:54					Start pumping.
11:54:30					Stop pumping.

Results of Pumping Test Made on Mason City Well No. 12 November 4-5, 1947.

Time	Depth To Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
11:56 pm					Start pumping.
11:56:30					Stop pumping.
12:00 am Nov. 5	214.8				
12:01	216.7				
12:02	217.18				
12:03	217.18				
12:04	216.98				
12:05	216.68				
12:06	216.40				
12:07	216.15				
12:08	215.9				
12:09	215.6				
12:10	215.25				
12:11	215.1				
12:20	213.6				
12:21	213.3				
12:22					Pumping started.
12:24	288				
12:26	298	18.25			
12:28	301.8	18.0	890		Water more cloudy than before surging.
12:31	304.				
12:37	306.0	17.+	875		Water clearer. Slight H_2S odor.
12:43	307.1				
12:47	307.55	17	865	51.5	
12:55					Increasing production by opening
12:58	316.8	20.5	945		valve on discharge side.
1:00	315.75	20.5	945		
1:05	316.0	20.75	950		
1:07	316.35				
1:11	316.72	20.5	945		
1:15	316.75				Water fairly clear.
1:20	317.15	20.75	950		
1:27	317.53				
1:32	312.88	19.5	925		
1:45	313.55				
2:01	313.55	19.25			Water clear and some fine sand.
2:15	313.80				
2:30	313.60				
3:00	314.0	19.0			
3:22	314.3				
7:07	313.2	18½	900	51.5	
7:15	313.05	18½	900		Water clear, trace of fine sand.
7:52	312.87	18½	900		
8:25	312.6	18¼			
8:45	312.7				
9:15	312.6	18¼	893	53	Water clear.

Results of Pumping Test Made on Mason City Well No. 12 November 4-5, 1947

Time	Depth To Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
9:30 am				51.3	
9:52	312.5	18½	898		
10:05					Water sample, trace fine sand and shale.
10:12	312.5	18		46	Temp. air in bldg. near discharge pipe.
10:21	312.30				
10:36	312.30	18	887		
10:55	312.60	18¼			
11:10	312.65	18¼	887	51.5	Water sample taken.
11:11					Pump shut off.
11:12	218				
11:13	221.85				
11:14	224.63				
11:15	224.75				Recovery measurements.
11:16	224.25				
11:17	223.60				
11:18	222.90				
11:19	222.25				
11:20	221.66				
11:21	221.11				
11:22	220.62				
11:23	220.12				
11:24	219.70				
11:25	219.33				
11:26	218.95				
11:27	218.59				
11:28	218.16				
11:29	217.95				
11:30	217.62				
11:31	217.32				
11:36	216.05				
11:41	214.94				
11:46	214.10				
11:51	213.33				
11:56	212.65				
12:01 pm	212.12				
12:06	211.63				
12:11	211.20				
12:16	210.80				
12:21	210.45				
12:26	210.11				
12:31	209.83				
12:36	209.55				
12:41	209.28				
12:46	209.04				
12:51	208.88				
1:01½	208.40				

Results of Pumping Test Made on Mason City Well No. 12 November 4-5, 1947

Time	Depth To Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
1:16 pm	207.90				
1:31	207.48				
1:46	207.15				
2:01	206.84				
2:11	206.64				
2:26	206.38				
2:49	206.11				
3:05	205.79				
Nov. 6					
10:00 am	200.97				
4:00 pm	199.37				
Nov. 7					
10:30 am	197.97				

Water level and depth of City Well No. 12, Mason City, Iowa during dynamiting operations of April 16-20, 1948

All measurements top of 20" casing
Depth to water measurement by electric line
Depth of hole measurement by weighted steel tape

April 16, 1948

Depth to water - 181.2' at 10:30 A.M.
Depth of hole - 1559'9"
Size of shot - 10 lbs.
Interval shot - 1255'-1265'
Time of shot - 6:16 P.M.

April 17, 1948

Depth to water - 187.00' at 8:15 A.M.
Depth of hole - 1557'6" in A.M.
Size of shot - 16 lbs.
Interval of shot-1245'-1255'
Time of shot - 3:00 P.M.
Depth of hole -1555'8" in P.M.
Depth of water - 182.97' at 3:50 P.M.

April 18, 1948

Depth to water - 181.00' at 9:30 A.M.

April 19, 1948

Depth to water - 179.90' at 8:15 A.M.
Depth of hole - 1552'8"
No shot - dynamite broke loose and dropped to bottom of well

April 20, 1948

Depth to water - 180.10' at 10:15 A.M.
Size of shot - 21 lbs.
Interval of shot-1235'-1241'
Time of shot - 12:05 P.M.
Depth to water - 177.80' at 2:10 P.M.
Depth of hole - 1538.5'

April 21, 1948

Depth to water - 177.3' at 9:20 A.M.

April 22, 1948

Depth to water - 176.80' at 8:40

DETAILS OF DYNAMITING THE JORDAN SANDSTONE INTERVAL IN CITY WELL NO. 12, MASON CITY, IOWA

April 16 to 20, 1948

Dynamiting under direct supervision of M. S. Munson of Layne-Western Inc. of Ames, Iowa.

One-half pound sticks of 60 percent gelatine dynamite were used for the shots.

Three shots were fired. The container for the first two shots was 10 feet in length carrying 32 sticks or 16 pounds of dynamite. The last shot was placed in a 6 foot container carrying 42 sticks or 21 pounds of dynamite. The first shot was placed at a depth of 1255 to 1265 feet. The top six pounds of dynamite did not fire on this shot, probably due to a defect in loading the tube. The second shot was placed at a depth of 1245 to 1255 feet and the entire load of dynamite exploded. The third shot was placed at a depth of 1235 to 1241 feet and 21 pounds were exploded. A first attempt to shoot the 1235 to 1241 interval was a failure as the shooting wire broke at the pulley as the charge was being lowered into the hole and the dynamite was lost.

The tubes used to hold the dynamite were made of galvanized sheet tin with the bottom end and side seam tightly closed with solder. The tubes for the first two shots were 10 feet in length and 2 3/4 inches in diameter. The last shot was placed in a tube 6 feet long and 4 inches in diameter. A metal bail was bolted to the upper ends of the tube after loading. The shooting wire was tightly wrapped around the bail before the tube was lowered on the wire into position in the well.

Fifteen hundred feet of shooting wire ~~was~~ prepared. Three 500 feet spools were connected together and placed upon a large reel. The wire was measured and marked in 100 feet intervals with white adhesive tape. Before each shot careful measurements were made ~~before each shot~~ of the length of wire from the top of the dynamite tube to the first footage mark on the wire. The reel of wire was placed about 100 feet from the mouth of the well and was attended by two men. The wire was hung over the center of the well on a large pulley.

Four helpers from the water department of Mason City aided in making preparations and lowering the shots into the well.

~~The tubes used to hold the dynamite were made~~

Every safety precaution was observed by Mr. Munson during loading and tamping of the sticks of dynamite into the tubes. Blasting caps were kept separate fom the dynamite sticks until ready for use. Red flags were placed upon the dynamite and blasting cap boxes, and observers were cautioned as to movements.

When the dynamite was placed into the tubes ~~loaded~~, the tubes were tied in an upright position to the side of a nearby tool-house and the loader climbed on the tool-house roof. A 12 ~~feet~~ foot 2 inch by 1 inch wooden stick was used to tamp the load. All charges were loaded in the same manner, except for experiments with various kinds of waterproofing material in an effort to speed up the time consumed by the hardening of these materials. A waterproof plugs ~~was~~ were placed near the bottom and top of the tube, ~~and at the top~~.

Paraffine was used in the first tube. A caulking compound called Mineralead (composed in large of sulfur) was tried in the bottom of the

second tube. This preparation became too hot and burned thus proving unsatisfactory. Sealing wax was used in the third shot.

Ungraded sand was used as tamping for the first shot. The sand was graded through a window screen for the following shots.

The dynamite was loaded into the tubes in bundles of four, after being wrapped tightly with black tape, for the first two shots. In bundles of seven for the last shot. A blasting cap attached to a long electric wire was inserted into every other bundle of dynamite sticks.

The tubes were loaded in the following manner:

Approximately one foot of sand was poured into the bottom of the tube and thoroughly tamped, about one foot of melted paraffine was poured over the sand and allowed to harden. The bundles of dynamite sticks were then pushed down the tube and sand was poured over each bundle and gently tamped with the stick.

The ends of the wires attached to the blasting cap in one -half of the bundles were brought to the upper open end of the tube. When the dynamite was in the tube and the sand tamped about it, another layer of sand, approximately 1½ foot in thickness was placed over the dynamite. About one foot of paraffine was then poured over this sand layer and around the blasting cap wires which extended through the sand and paraffine to the top of the tube.

After the paraffine or sealing wax hardened the bail was bolted to the top of the tube and the tube was hung in a temporary position into the top of the well.

The ends of the 1500 feet length of shooting wire were then attached to the ends of the blasting cap wires and securely taped. These connections were

then placed in the upper one foot portion of the tube which was unfilled and melted paraffin or sealing wax was poured over the wires and connections thus assuring a waterproof seal.

The tube was then lowered into the well and placed at the desired depth by observing the 100-foot markings on the wire.

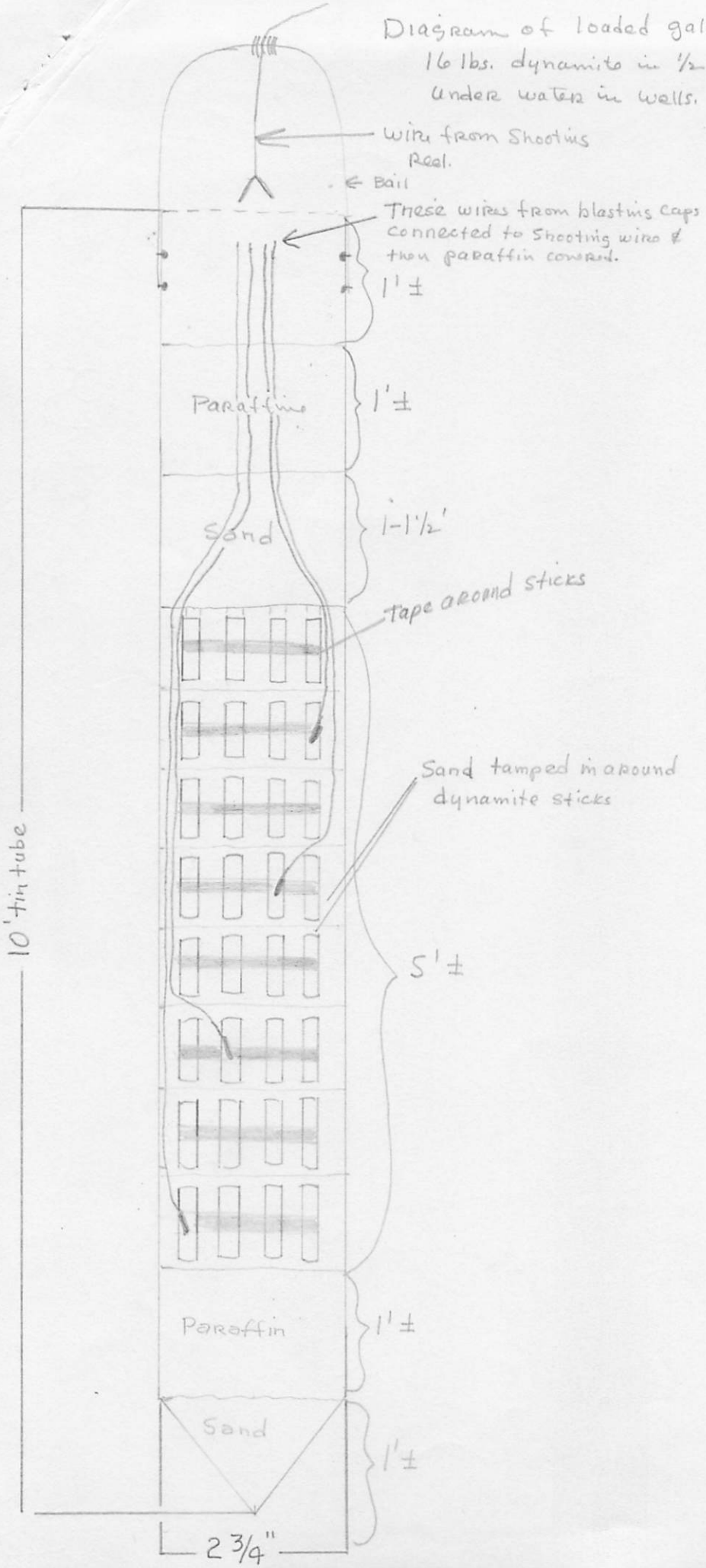
When the proper depth was reached the wire was tied to an anchor on the surface and the upper end of the wire was plugged into a 110 volt electric socket. This completed the circuit and fired the shot.

Under the great thickness of water in the well only a very slight jerk was noticeable on the shooting wire when the shot was fired. No sound was heard.

The wire was then reeled up and the bail and approximately 1½ feet of the upper end of the tube were recovered.

The depth of the hole was measured before and after each shot was fired. Two sash weights weighing 10 pounds each were attached to the end of a calibrated hand-operated steel tape. A large pulley was hung over the center of the open hole and the weights were lowered into the hole with the steel tape running over the pulley.

Diagram of loaded galvanized tin tube containing 16 lbs. dynamite in ½ lb. sticks for shooting. Under water in wells.



2971

MASTER CARD - A

9-26-69
RP 11-11-70

STATE	COUNTY	LATITUDE DEG	LATITUDE MIN	LATITUDE SEC	N or S	LONGITUDE DEG	LONGITUDE MIN	LONGITUDE SEC	SEQ. NO.
1 2	3 4	5 6	7 8	9 10	11	12 13 14	15 16	17 18	19
19	74	43	07	43	N	093	12	03	1

WELL SCHEDULE

US GEOLOGICAL SURVEY

IOWA DISTRICT WRD

WELL NO 096-20W-16-DADA CO CERRO GORDO

OWNER MASON CITY WELL #12 ADDRESS MASON CITY

DRILLER LAYNE-WESTERN DATE DRLD 7-2-47

MAP

SOURCE OF DATA FILE

DESCRIPTION M.P. LSD FEET (ABOVE) (BELOW) LSD

CONTINUED FROM ABOVE	ACCURACY	LOCAL WELL NUMBER T	R	E/W	SEC.	QUARTERS	LOCAL USE W-NUMBER	OPTIONAL	OWNER OR NAME	OWNERSHIP	WATER USE	WELL USE	WELL DATA	FREQ. W/L	FIELD CHAR	HYD LAB	QW-DATA	QW-FREQ.	PUMPAGE	APERTURE	LOG DATA	CARD DESIG.
	20	21 22 23	24 25	26	27 28	29 30 31 32 33 34	35 36 37 38 39	40 41 42 43 44 45 46 47 48 49 50 51	52 53 54 55 56 57 58 59 60 61 62 63 64 65 66	67	68	69	70	71	72	73	74	75	76	77	78 79	80
	2	096	20	W	16	DADA	02971	1 47 CITY 12	MASON CITY	MP	W	5					CI				G	A

WELL-DESCRIPTION CARD - B

DUPLICATE CARD A CC 1-19	DEPTH OF WELL	ACCURACY	DEPTH CASED OR FIRST PERF.	DIAM. INCHES	WELL FINISH	METH DRILLED	YEAR DRILLED	PUMP SETTING	METH. LIFT	DEEP SHALLOW	POWER	ALTITUDE OF LSD (FEET)	ACCURACY	WATER LEVEL (FEET)	ACCURACY	DATE MONTH	DATE YEAR	YIELD OF WELL (GPM)	METH DET	DRAW-DOWN (FEET)	ACCURACY	PUMPING PERIOD (HOURS)	QUALITY OF WATER IRON	SULF	CHLOR	HARD	SP COND.	TEMP	DATE SAMPLED	CARD DESIG.
	20 21 22 23	24	25 26 27 28	29 30	31	32	33 34 35	36 37 38	39	40	41	42 43 44 45 46	47	48 49 50 51	52	53 54	55	56 57 58 59 60	61	62 63 64	65	66 67 68	69	70	71	72	73	74 75 76	77 78 79	80
	1585	3	145	20	X	C	47					1 1 6	W																	B

HYDROGEOLOGIC CARD - C

DUPLICATE CARD A CC 1-19	PHYS-IOG-RAPHY PROV.	SEC.	DRAINAGE BASIN	SUBBASIN	TOPO SETTING	MAJOR AQUIFER SYSTEM	SERIES USGS	SERIES ISG	UNIT	LITH-OLOGY	ORIG.	THICK-NESS	LENGTH WELL OPEN TO	DEPTH TO TOP OF	MINOR AQUIFER SYSTEM	SERIES USGS	SERIES ISG	UNIT	LITH-OLOGY	ORIG	THICK-NESS	LENGTH WELL OPEN TO	DEPTH TO TOP OF	DEPTH TO CONSOL-DATED ROCK	SOURCE	DEPTH TO BASEMENT	SOURCE	SURF MAT. LITH-OLOGY	SURF MAT. INFIL	COEF TRAN SIG FIG	COEF TRAN XIO	COEF STOR SIG FIG	COEF STOR XIO-	GEOL. CARD CARD DESIG.
	20 21	22	23 24 25	26	27	28	29	30	31	32 33	34	35 36 37	38 39 40	41 42 43	44	45	46	47	48 49	50	51 52 53	54 55 56	57 58 59	60 61 62 63	64	65 66 67 68	69	70 71	72	73 74	75	76 77	78	79 80
	1	2E	25	E	F	C3	S	J	N	16	6H	6H	6H	A 21 (1213)	C3	S	R	V	6	78	78	A 49 (1490)		5D				D	1					C

CASING AND SCREEN (SIZE, TYPE, INTERVALS):

10' ΦF 30" CURBING 0'-10';

145' ΦF 20" PIPE 0'-145' CEM. IN 26" HOLE

22' ΦF 18" PIPE 793'-815';

147.5' ΦF 14" PIPE 732'-879.5'

131½ ΦF 10" PIPE FROM 1374 TO 1505'

CODED BY Davis gm DATE 12-20-72

PUNCHED BY KH-Davis DATE 1-2-73

VERIFIED BY DATE

SKETCH ON REVERSE: YES NO

16

WELL NO 096-20W-16 DADA

Water level and depth of City Well No. 12, Mason City, Iowa during dynamiting operations of April 16-20, 1948

All measurements top of 20" casing
Depth to water measurement by electric line
Depth of hole measurement by weighted steel tape

April 16, 1948

Depth to water - 181.2' at 10:30 A.M.
Depth of hole - 1559'9"
Size of shot - 10 lbs.
Interval shot - 1255'-1265'
Time of shot - 6:16 P.M.

April 17, 1948

Depth to water - 187.00' at 8:15 A.M.
Depth of hole - 1557'6" in A.M.
Size of shot - 16 lbs.
Interval of shot-1245'-1255'
Time of shot - 3:00 P.M.
Depth of hole -1555'8" in P.M.
Depth of water - 182.97' at 3:50 P.M.

April 18, 1948

Depth to water - 181.00' at 9:30 A.M.

April 19, 1948

Depth to water - 179.90' at 8:15 A.M.
Depth of hole - 1552'8"
No shot - dynamite broke loose and dropped to bottom of well

April 20, 1948

Depth to water - 180.10' at 10:15 A.M.
Size of shot - 21 lbs.
Interval of shot-1235'-1241'
Time of shot - 12:05 P.M.
Depth to water - 177.80' at 2:10 P.M.
Depth of hole - 1538.5'

April 21, 1948

Depth to water - 177.3' at 9:20 A.M.

April 22, 1948

Depth to water - 176.80' at 8:40

RESULTS OF PUMPING TEST MADE ON MASON CITY WELL NO. 12

Mason City, Iowa

November 4-5, 1947

NAME: Mason City Well No. 12.

LOCATION: NE¼ SE¼ NE¼ SE¼ Sec. 16, T. 96 N., R. 20 W.

OWNER: City of Mason City.

CONTRACTOR: Layne-Western Company, Inc., Ames, Iowa

ELEVATION: Drilling curb, top of 20-inch pipe 1165.4 feet above sea level and about 1.5 feet above land-surface.

DRILLERS: Don Simpson and Jewell Black.

DRILLING DATES: Started 7/2/47.

PRESENT DEPTH: 1377 feet.

CASING AND HOLE DATA: 10 feet of 30-inch curbing from 0 feet to 10 feet.
145 feet of 20-inch pipe from 0 feet to 145 feet cemented in 26-inch hole.
22 feet of 18-inch pipe from 793 feet to 815 feet.
147.5 feet of 14-inch pipe from 732 feet to 879.5 feet.
Open 12¼-inch hole from 879 feet to 1377 feet.

PRINCIPAL AQUIFER: Not known.

TEST PUMP: Turbine, setting 301 feet with 20 feet of suction pipe. Powered by 150 hp. electric motor.

DISCHARGE MEASUREMENTS: Discharge rate obtained with a 7-inch orifice in 10-inch casing.

TEMPERATURE MEASUREMENTS: Water temperature measurements made at end of 23.5 feet of 10-inch discharge pipe.

WATER LEVEL MEASUREMENTS: Depth to water measurements were referred to hole in pump base 1.0 foot above top of 20-inch pipe.

REMARKS: Well No. 12 is located 263 feet south of well No. 11. Well No. 11 has not been pumped since Sept. 3, 1947. No other wells are located within .5 mile of the city well field.

cc: Hamblin and Brooks

2

Results of Pumping Test Made on Mason City Well No. 12 November 4-5, 1947.

Time	Depth To Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Nov. 4					
9:10 am	157.50				
9:20	157.44				
10:55		38	1280		Pumping started.
10:57					Pumping stopped.
11:01					Pumping resumed.
11:07				50	
11:10		21	960		Water dirty gray.
11:15	314.6	18	890		
11:20	313.8	18	890		
11:22				51	Water dirty gray.
11:25	312.5	18	890	51	Water dirty gray.
11:30	310.9	18	890		Water dirty gray, dolomite and sand grains, silt.
11:35	310.0	18			Water dirty gray, dolomite and sand grains, silt.
11:40	310.5				
11:45	310.2	18	890	51	Water clearing, dolomite cuttings and fine sand.
11:55	310.7				
12:05 pm	311.2	18	890	51.5	Water clearing, dolomite chips and trace fine sand.
12:15	310.0				
12:27	309.05	17	865	51.5	
12:40	308.35	16-3/4	860±	51.5	Water milky, some silt.
12:50	308.65	16-3/4	860±		
1:00	308.50	16-3/4	860±	51.5	Water dark gray dirty, shale chips gray.
1:10	306.20	16-3/4	860±		Water dark gray dirty, shale chips gray.
1:20	305.10	16-3/4	860±		Water dark gray dirty, shale chips gray.
1:30	303.70	17	865±		Water dark gray dirty, shale gray and limestone.
1:40	303.50	17	865±		Water clearing, little sediment.
1:50	303.40	17	865±	51.5	Water milky.
2:00	303.60	17	865±		Water milky.
2:10	303.70	17	865±	51.5	Water milky, clearing.
2:20	303.60	17	865±		Water milky, clearing.
2:27	303.50	17	865±		Water milky, clearing.
2:31					Pump off.
2:33					Pump on.
2:34					Pump off.
2:36					Pump on.
2:37					Pump off.
2:39					Pump on.
2:42	292.0	16½	850		Water dirty.
2:45	297.20	16½	850		Water dirty.
2:50	298.3	16	840		Water cloudy.

Results of Pumping Test Made on Mason City Well No. 12 November 4-5, 1947.

Time	Depth To Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
3:00 pm	299.2	16	840		Water clearing.
3:10	299.4	16	840		
3:22	299.8	16	840		
3:31	299.9	16	840		Water milky.
3:40	299.9	16	840		
3:50	299.6	16	840		
4:00	299.7	16	840		
4:07					Pumping stopped to surge 3 times.
4:13					Pumping resumed.
4:20		20	940		Pumping rate increased.
4:25	305				
4:28	307	19	910±		
4:40	308.2	19	910±		Stopped pump for surging.
4:50					Pumping resumed.
4:54	300.9	18	890±		
5:03	307.6	17	865±		
5:10	308.8	17	865±		
5:20	309.5	17	865±		
5:30	309.5	17	865±		Water milky.
5:40	309.5	17	865±		Water milky, some shale chips.
5:52	309.6	17+	870±		
6:00	309.5				
6:15	309.3	17+	870±		
6:30	309.2	17+	870±		
6:45	309.2	17+	870±	51.5	Slight H_2S odor.
7:00	309.2	17+	870±		
7:15	309.3	17+	870+		
7:30	309.3	17+	870		Water fairly clear.
7:45	309.2	17+	870		
8:00	309.2	17+	870		
8:15	309.2	17±	870		
8:45	309.2	17+	870		
9:15	309.1	16½	850		
9:45	310.2	16½	850		
10:15	309.1	16½	850		Water fairly clear, few dark grains 15± per qt.
10:45	307.85	16½	850	51.5	
11:20	308.25	16¼			
11:40	309.2				
11:46					Shut down to surge.
11:49	216.0				Start, high point lowered somewhat.
11:50					Stop pumping.
11:52	210				Start pumping. High point lowered somewhat.
11:52:30					Stop pumping.
11:54					Start pumping.
11:54:30					Stop pumping.

Results of Pumping Test Made on Mason City Well No. 12 November 4-5, 1947.

Time	Depth To Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
11:56 pm					Start pumping.
11:56:30					Stop pumping.
12:00 am	214.8				
Nov. 5					
12:01	216.7				
12:02	217.18				
12:03	217.18				
12:04	216.98				
12:05	216.68				
12:06	216.40				
12:07	216.15				
12:08	215.9				
12:09	215.6				
12:10	215.25				
12:11	215.1				
12:20	213.6				
12:21	213.3				
12:22					Pumping started.
12:24	288				
12:26	298	18.25			
12:28	301.8	18.0	890		Water more cloudy than before surging.
12:31	304.				
12:37	306.0	17.+	875		Water clearer. Slight H_2S odor.
12:43	307.1				
12:47	307.55	17	865	51.5	
12:55					Increasing production by opening
12:58	316.8	20.5	945		valve on discharge side.
1:00	315.75	20.5	945		
1:05	316.0	20.75	950		
1:07	316.35				
1:11	316.72	20.5	945		
1:15	316.75				Water fairly clear.
1:20	317.15	20.75	950		
1:27	317.53				
1:32	312.88	19.5	925		
1:45	313.55				
2:01	313.55	19.25			Water clear and some fine sand.
2:15	313.80				
2:30	313.60				
3:00	314.0	19.0			
3:22	314.3				
7:07	313.2	18⅛	900	51.5	
7:15	313.05	18⅛	900		Water clear, trace of fine sand.
7:52	312.87	18⅛	900		
8:25	312.6	18¼			
8:45	312.7				
9:15	312.6	18½	893	53	Water clear.

Results of Pumping Test Made on Mason City Well No. 12 November 4-5, 1947

Time	Depth To Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
9:30 am				51.3	
9:52	312.5	18½	898		
10:05					Water sample, trace fine sand and shale.
10:12	312.5	18		46	Temp. air in bldg. near discharge pipe.
10:21	312.30				
10:36	312.30	18	887		
10:55	312.60	18½			
11:10	312.65	18½	887	51.5	Water sample taken.
11:11					Pump shut off.
11:12	218				
11:13	221.85				
11:14	224.63				
11:15	224.75				Recovery measurements.
11:16	224.25				
11:17	223.60				
11:18	222.90				
11:19	222.25				
11:20	221.66				
11:21	221.11				
11:22	220.62				
11:23	220.12				
11:24	219.70				
11:25	219.33				
11:26	218.95				
11:27	218.59				
11:28	218.16				
11:29	217.95				
11:30	217.62				
11:31	217.32				
11:36	216.05				
11:41	214.94				
11:46	214.10				
11:51	213.33				
11:56	212.65				
12:01 pm	212.12				
12:06	211.63				
12:11	211.20				
12:16	210.80				
12:21	210.45				
12:26	210.11				
12:31	209.83				
12:36	209.55				
12:41	209.28				
12:46	209.04				
12:51	208.88				
1:01½	208.40				

Results of Pumping Test Made on Mason City Well No. 12 November 4-5, 1947

Time	Depth To Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
1:16 pm	207.90				
1:31	207.48				
1:46	207.15				
2:01	206.84				
2:11	206.64				
2:26	206.38				
2:49	206.11				
3:05	205.79				
Nov. 6					
10:00 am	200.97				
4:00 pm	199.37				
Nov. 7					
10:30 am	197.97				

RESULTS OF PRODUCTION TEST MADE ON MASON CITY WELL NO. 12

Mason City, Iowa

November 7-20, 1947

NAME: Mason City Well No. 12.

LOCATION: NE¼ SE¼ NE¼ SE¼ Sec. 16, T. 96 N., R. 20 W.

OWNER: City of Mason City.

CONTRACTOR: Layne-Western Company, Inc., Ames, Iowa.

ELEVATION: Drilling curb, top of 20-inch pipe 1165.4 feet above sea level and about 1.5 feet above land surface.

DRILLERS: Don Simpson and Jewell Black.

DRILLING DATES: Started 7/2/47

PRESENT DEPTH: 1377 feet.

CASING AND HOLE DATA: 10 feet of 30-inch curbing from 0 feet to 10 feet.
145 feet of 20-inch pipe from 0 feet to 145 feet, cemented in 26-inch hole.
22 feet of 18-inch pipe from 793 feet to 815 feet.
147.5 feet of 14-inch pipe from 732 feet to 879.5 feet.
Open 12¼-inch hole from 879 feet to 1377 feet.

PRINCIPAL AQUIFER: Not known.

TEST PUMP: Turbine, setting 301 feet with 20 feet of suction pipe. Powered by 150 hp. electric motor.

DISCHARGE MEASUREMENTS: Discharge rate obtained with 7-inch orifice in 10-inch casing.

TEMPERATURE MEASUREMENTS: Water temperature measurements made at end of 23.5 feet of 10-inch discharge pipe.

WATER LEVEL MEASUREMENTS: Depth to water measurements were referred to hole in pump base 1.1 feet above top of 20-inch pipe.

REMARKS: Well No. 12 is located 263 feet south of well No. 11. Well No. 11 has not been pumped since Sept. 3, 1947. No other wells are located within .5 mile of the city well field.

cc: Hamblin and Brooks

Results of Production Test Made on Mason City Well No. 12 Nov. 7-20, 1947

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Chloride P.P.M.	Remarks
Nov. 7						
1:03 pm	197.6					
3:10						Start introducing 1000 gallons HCl in 1168 feet of 2-inch pipe.
3:55						All acid in. Flushed out partially with water.
5:35	201.15					
5:55	200.97					
6:05	200.85					
6:25	200.75					
7:24	200.15					
7:48	200.6					
8:05	200.7					
8:12	200.74					
8:17						Pumping started.
8:21	286.0		700 to 800			Water level in orifice tube fluctuating
8:34				50	10+	
8:44	294.55				700 to 800	
8:50	295.32					Much gas in water. Discharge rate fluctuating.
8:55					350	
9:00	297.20					
9:01						Pump broke (?) Pumping stopped.
9:06	205.0					Suspect air lock.
9:12	210.0					Pump started. No water pumped.
9:13						Pump stopped.
9:16	208.8					Recovery measurements.
9:27	204.3					
9:50	201.1					
10:15	198.35					
10:21	197.98					

Mason City Well No. 12 — Nov. 7-20, 1947

Date	Depth to Water (feet)	Depth to Water 2" Tube	Remarks
Nov. 7			
10:36 pm	197.30		
11:04	197.39		
Nov. 8			
7:39 am	195.40		
7:46	195.38		Spent day attempting to pump water, assuming pump was air locked. Finally decided pump had broken.
1:20 pm	192.14		
1:23	192.23		
5:24	192.00		
5:30	191.95		
5:57	191.90		Flushed out 2-inch acid line with fresh water. Referred point for acid line is top of coupling, .19-foot above pump base.
Nov. 9			
9:05 am	191.80		
9:07	191.80		
9:10	191.78		
9:17		192.02	
9:23		192.02	Water level in 2-inch tube apparently .03-foot lower than water level in 20-inch pipe.

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Chloride P.P.M.	Remarks
Nov. 17						
5:11 pm	183.85					
5:18	183.85					
6:27	183.82					
6:32	183.82					
6:33						Pumping started.
6:36		21	960±			Pumping stopped, motor heating.
7:01	192.0					
Nov. 19						
9:15 am	189.0					
2:02 pm	188.66					
2:21	188.64					
2:23						Pumping started.
2:27	293.0	17⅛	890±			
2:30	297.5	11½	710	50		
2:32	300					
2:35	299.5	11½	710		10±	Water cloudy.
2:40	300.6	9⅞	660±			
2:49	302.25	9⅞	660±		7±	Water pinkish, rusty.
2:54	302.7	9⅞		50		Water rusty color.
2:57	303.1	9⅞			7±	Water rusty color.
3:00	303.1	9⅞	660	50	7±	Water slightly milky.
3:10	304.0	9⅞	660	50	7±	Water slightly milky, contains some silt.
3:20	304.65	9⅞+	650	50	7±	Water slightly milky, contains some silt.
3:30	305.3	9	640	50	5±	Water almost clear.
3:45	305.6	9	640	50		Water clear, trace sand.
3:50	305.82	9	640	50	6±	Water clear, trace sand.
4:00	306.2	9	640			
4:05						Pumping stopped to surge.
4:15		12	730±			Pumping started.
4:18	287	11½	710			
4:20	289.5	11				
4:25	290	10-3/4	700±			
4:30	290.6	10-3/4				
4:35	291.3					
4:37						Pumping rate increased.
4:40	305.3	17⅜	870+			
4:45	307.1	17⅜	870			
4:50	307.7					
4:55	314.4	18⅛			6±	
4:58						Shut down to surge 5 times.
5:09						Pumping resumed.
5:15	309	24	1033	50		
5:20	312.8	24	1022			
5:25	314.7	24	1022	50	6±	Water milky, contains sand and shale particles.

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Chloride P.P.M.	Remarks
Nov. 19						
5:33 pm	315.5	24	1022			
5:42	316.6	23½	1012	50+	6±	
5:49	316.9					
6:00	317.4	23½	1012	50+	6±	Water slightly cloudy, some sand.
6:10	318.0	23¼	1006			
6:20	317.8	23	1001			
6:25						Shut down to surge.
6:40						Pumping resumed.
6:45	297.7	22	990			
6:50	305	23-3/4	1017			
7:00	307.6	23½	1012	50+	6+	Water slightly cloudy, trace sand.
7:10	308.5	23¼	1006			
7:20	308.9	23¼	1006	50+		Water slightly cloudy, trace sand.
7:30	308.9	23	1001			
7:41	309.05	23	1001			Water slightly milky.
7:50	309.25	23	1000±	50		Water slightly milky, some sand and shale.
8:05		22-3/4	995±			
8:10	308.9	22½	990	50	6+	Water slightly milky.
9:08	308.35	21-3/4	975			
9:12		24	1022			Increase discharge rate.
9:14	313.9	23-3/4	1017	50	10±	
9:24	316.0					
9:27	316.65	24	1022		10±	Water almost clear.
9:31						Pumping stopped to surge well.
9:40		25½	1059			Pumping resumed.
9:45	308.7	24	1022			
9:50	313.6	23½	1012			
10:00	316.5	23¼	1006	50		Water milky.
10:15	317.9	23	1001			
10:30	317.9	23	1001			
10:45		24½	1033			
10:50	317.4		1033			
11:00	317.9	25	1043	50	12±	Air temperature 32±. Water clear, trace sand.
11:10	317.3	24½	1033			
11:20	317.2	24½	1033			
11:30	317.5	24½	1033	50+	12±	Water clear, trace of sand.
11:42	317.6	24½	1033			
Nov. 20						
12:00 am	317.8	24½	1033		12±	Water clear, trace of sand.
12:30	317.7	24½	1033	50	11±	Water slightly cloudy, trace of sand.
12:40	317.9	24½	1033			
1:00	318.0	24½	1033			
1:30	318.6	24½	1033	50	11	Water clear, trace sand.

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Chloride P.P.M.	Remarks
Nov. 20						
2:00 am	317.8	24½	1027			Water clear, trace sand.
2:30	317.85	24½	1027			
2:45	318.0	24	1022			
2:50	315.0	22-3/4	995			Discharge rate decreased slightly.
2:55	315.0	23	1001			
3:00	314.5	23	1000±			Water clear, trace of sand.
8:47	314.4	22½	990			
8:48						Shut down for surging.
8:57						Pumping resumed.
9:05	306.55	24	1022			
9:10	308.6					
9:14	311.70	25	1043			
9:16	312.70	24-3/4	1038			
9:22	314.0					
9:26	315.2	25¼	1051			Discharge rate increased.
9:30	315.8	25	1043			
9:34	318.0	26¼	1069			Discharge rate increased.
9:35	318.1					
9:43	319.0	25-3/4	1062±	50	10±	
9:50	319.2	26	1064			
9:56	320.4	26½	1074			
10:00	320.5	26	1064			
10:10	320.55	26	1064			
10:15	320.2	26	1064			
10:25	320.6	26	1064			
10:55	320.6	25½	1059			
11:30	320.2	25½	1059			
11:45	320.55	25½	1059			
12:00 pm	320.57	25½	1059		9±	Water clear.
12:15	320.57	25½	1059			
12:30	320.55	25½	1059			
12:45	320.6	25½	1059	50+	9±	Water clear, mere trace of sand.
1:00	320.6	25½	1059			Water sample collected.
1:12						Pumping stopped.
1:13	225.					Recovery measurements.
1:14	224.					
1:15	226.					
1:16	225.5					
1:17	224.7					
1:18	223.9					
1:19	223.18					
1:20	222.45					
1:21	221.82					
1:22	221.31					
1:23	220.8					
1:24	220.2					

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Chloride P.P.M.	Remarks
Nov. 20						
1:25 pm	219.82					
1:30	218.1					
1:35	216.62					
1:40	215.45					
1:45	214.60					
1:50	213.70					
1:55	213.02					
2:00	212.42					
2:05	211.82					
2:10	211.37					
2:15	210.90					
2:20	210.47					
2:25	210.05					
2:30	209.73					

RESULTS OF PUMPING TEST MADE ON MASON CITY WELL NO. 12

AFTER DYNAMITING JORDAN SANDSTONE FROM 1235 TO 1265 FEET

Mason City, Iowa

April 23-27, 1948

NAME: Mason City Well No. 12.

LOCATION: NE¼ SE¼ NE¼ SE¼ Sec. 16, T. 96 N., R. 20 W.

OWNER: City of Mason City.

CONTRACTOR: Layne-Western Company, Inc., Ames, Iowa.

ELEVATION: Top of 20-inch pipe 1165.4 feet above sea level and about 1.5 feet above land-surface.

DRILLERS: Don Simpson and Jewell Black.

DRILLING DATES: Started 7/2/47.

TOTAL DEPTH: 1577 feet.

PRESENT DEPTH: 1538.5 feet.

CASING AND HOLE DATA: 10 feet of 30-inch curbing from 0 feet to 10 feet.
145 feet of 20-inch pipe from 0 feet to 145 feet, cemented in 26-inch hole.
22 feet of 18-inch pipe from 793 feet to 815 feet.
147.5 feet of 14-inch pipe from 732 feet to 879.5 feet.
Open 12¼-inch hole from 879 feet to bottom.

TEST PUMP: Turbine, setting 340 feet with 20 feet of suction pipe. Powered by 150 hp. electric motor.

TEMPERATURE MEASUREMENTS: Water temperature measurements made at end of 23.5 feet of 10-inch discharge pipe.

WATER LEVEL MEASUREMENTS: Depth to water measurements were referred to top of 20-inch casing.

REMARKS: Well No. 12 is located 263 feet south of Well No. 11. Well No. 11 has not been pumped since Sept. 3, 1947. No other wells are located within .5 mile of the city well field.

Results of Production Test Made on Mason City Well No. 12 After Dynamiting

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Apr. 23					
3:35 pm	175.7				
4:01	175.7				
4:02	318.6	31½	1167		Pump on
4:07	324.1	30½	1148		Water very dirty
4:08	330.0	28½	1109		Pumping much white sand
4:09	332.6				
4:11		24-3/4	1038		Water very dirty
4:12	335.4				
4:18	334.6				
4:20		23	1001		
4:22	328.5				
4:25	328.3	22½	985	50	Water very dirty, much sand
4:35	326.15				
4:38					Pump off to adjust impellers
4:41	231.6				Recovery measurements
4:43	227.1				
4:45	223.9				
4:47	221.6				
4:49	219.9				
4:51	218.3				
4:53	216.5				
4:55	215.3				
4:57	214.4				
5:01					Pump on
5:02	273.9				
5:03	290				
5:05	300				
5:06		41½	1334		
5:07	307.2				
5:08		41	1326		
5:11	311.2				
5:15				50	
5:20		39½	1304		Pumping much sand, dirty gray
5:21	312.5				
5:28	312.9	39-3/4	1308	51	
5:38	312.6	39-3/4	1308		
5:47		41	1326		
5:50	315.5				
5:55		41½	1330		
5:58	315.3				
6:01	313.0	41½	1334	51	Water clearing, light gray
6:13		42	1341		
6:15	312.1				
6:27	313.25	41-3/4	1338		
6:38	311.9	41½	1334		
6:50	313.4	41-3/4	1338		
7:05	311.6	41-3/4	1338		Water clearing, light gray
7:20	310.4	40½	1319		
7:35	309.7	40½	1319		Water clearing, light gray
7:47	310.7	40-3/4	1323		
8:05	311.1	41	1326		

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Apr. 23					
8:22 pm	311.3	41	1326		Water clearing, some sand
8:28		41	1326		
8:30	312.0				
8:35					Pump off to surge well
8:37½					Pump on
8:38					Pump off
8:40					Pump on
8:40½					Pump off
8:43					Pump on
8:44					Pump off
8:44½					Pump on
8:45½					Pump off
8:47½					Pump on
8:55	301.8	44½	1379		
9:00	305.1	44	1371		Cloudy sand
9:06	306.0	42½	1349		
9:16	307.7	42½	1345		
9:21		43½	1364		
9:22	307.9				
9:30		43½	1364		
9:33	309.1				
9:41				51	
9:43	310.6	43½	1364		Light cloudy, little sand
9:55	308.7	42½	1345		Light cloudy, little sand
10:14	309.8	42½	1349		Light cloudy, little sand
10:30	310.0	42-3/4	1353		Light cloudy, little sand
10:45	309.8	42½	1349		Light cloudy, little sand
11:00	309.9	42½	1345		Light cloudy, little sand
11:15	311.1	42½	1345		Light cloudy, little sand
11:30	311.8	42-3/4	1353		Water clear, light sand
11:45	313.2	44½	1379		Water clear, light sand
12:00 am	314.0	44½	1379		Water clear, light sand
Apr. 24					
12:15 am	310.6	42½	1345		Water clear, light sand
12:30	307.9	42	1341		Water clear, light sand
12:45	308.6	42½	1349		Water clear, light sand
1:00	309.4	42	1341		Water clear, light sand
1:15	309.5	42½	1345		Water clear, light sand
1:30	310.5	43	1356		Water clear, light sand
1:40	310.8	43¼	1360		Water clear, light sand
1:47	308.8	43¼	1360		Water clear, light sand
1:56	307.7	43½	1364		Water clear, light sand
2:07	307.7	43	1356		Water clear, light sand
2:15	309.4	43	1356		Water clear, light sand
2:22	308.2	42½	1345		Water clear, light sand
2:30	307.6	42½	1349		Water clear, light sand

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Apr. 24					
2:35 am	307.4	42-3/4	1353		Water clear, light sand
2:40	307.9	42½	1349		Water clear, light sand
2:55	308.5	42½	1349		Water clear, light sand
3:00	308.7	42-3/4	1353		Water clear, light sand
3:20	308.7	42½	1345		Water clear, light sand
3:30	308.8	42½	1349		Water clear, light sand
3:45	308.8	41-3/4	1338		Water clear, light sand
4:00	308.4	41-3/4	1338		Water clear, light sand
4:10	308.7	41½	1334		Water clear, light sand
4:22	308.8	42½	1349		Water clear, light sand
4:27	308.2	41-3/4	1338		Water clear, light sand
4:35	308.7	42	1341		Water clear, light sand
4:45	308.4	42	1341		Water clear, light sand
4:55	308.2	42½	1349		Water clear, light sand
5:06	308.2	42½	1349		Water clear, light sand
5:18	308.4	42½	1349		Water clear, light sand
5:25	308.6	43½	1364		Water clear, light sand
5:30	308.6	43½	1364		Water clear, light sand
5:45	307.7	43¼	1360		Water clear, light sand
5:54	308.6	43	1356		Water clear, light sand
6:00	308.6	42-3/4	1353		Water clear, light sand
6:10	308.6	42½	1349		Water clear, light sand
6:20	308.5	42½	1349		Water clear, light sand
6:30	308.7	42½	1349		Water clear, light sand
6:45	308.6	42-3/4	1353		Water clear, light sand
7:00	308.5	42½	1345		Water clear, light sand
7:15	308.6	43½	1364		Water clear, light sand
7:20	307.8	43¼	1360		Water clear, light sand
7:30	307.7	43½	1364		Water clear, light sand
7:40	307.2	42½	1349		Water clear, light sand
7:55	308.7	42-3/4	1353		Water clear, light sand
8:00	308.5	42½	1349		Water clear, light sand
8:15	308.3	42-3/4	1353		Water clear, light sand
8:30	308.2	42½	1345		Water clear, light sand
8:45	308.4	42	1341		Water clear, light sand
9:00	308.6	43½	1364		Water clear, light sand
9:15	308.7	43	1356		Water clear, light sand
9:27	312.7				
9:37	312.4	43	1356		Water clear, light sand
9:55	309.6	41½	1330		Water clear, light sand
10:10	308.2	40½	1319		Water clear, light sand
10:30	307.8	42-3/4	1353		Water clear, light sand
10:45	308.7	43	1356		Water clear, light sand
11:05	311.8	42-3/4	1353		Water clear, light sand

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Apr. 24					
11:10 am					Pump off to surge
11:13½					Pump on
11:14¾					Pump off
11:16½					Pump on
11:18					Pump off
11:20					Pump on
11:21					Pump off
11:23					Pump on
11:24½					Pump off
11:26½					Pump on
11:30	294.3	43-3/4	1368		
11:37	301.8	43	1356		Water fairly clear, some sand
11:42	302.8	42½	1345		
11:46	303.6	42¾	1345		
11:53	305.2	42¾	1345		
12:05 pm	305.4	42	1341		Water fairly clear, some sand
12:20	305.9	42	1341		
12:35	306.6	43	1356		
12:50	307.1	42½	1349		
1:00	307.2	42-3/4	1353		
1:15	307.8	43	1356		
1:30	307.9	43	1356	52	
1:45	308.4	43	1356		
2:00	308.6	43½	1360		Water clearing, sandy
2:15	308.6	43½	1364		
2:30	307.2	42¾	1345		
2:45	307.0	43	1356		
3:00	307.1	43	1356		
3:15	307.1	42¼	1345		
3:30	306.9	42¼	1345		
3:45	308.3	42½	1349		
4:00	307.5	42-3/4	1353		
4:20	307.3	42-3/4	1353		
4:33	307.3	42-3/4	1353		Water clear
4:45	307.0	42-3/4	1353		Trace sand
5:00	306.9	42½	1349		
5:16	307.5	43	1356		Trace sand
5:34	307.7	43¼	1360		
5:54	309.4	44	1371		Trace sand
6:10	308.9	43½	1364		
6:27	308.4	43	1356		
6:50	307.7	43	1356		
7:05	307.6	43	1356		Trace sand
7:18	307.1	42-3/4	1353		Trace sand
7:34	307.1	42-3/4	1353		
7:50	309.0	43-3/4	1368		Trace sand
8:05	309.5	44	1371		
8:20	307.5	42½	1349		
8:40	308.0	43	1356		Trace sand
8:55	307.9	43	1356		

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Apr. 24					
9:10	307.8	43	1356		
9:25	307.6	42½	1349		
9:42	307.6	42½	1349		
10:00	307.9	42½	1349		Trace sand
10:15	307.5	42½	1349		
10:30	307.6	42½	1349		
10:45	307.5	42½	1349		Trace sand
11:00	307.5	42-3/4	1353		Trace sand
11:15	309.2	43-3/4	1368		Trace sand
11:30	308.7	43½	1364		
11:45	308.1	42	1341		Trace sand
12:00 am	307.6	42½	1349		
Apr. 25					
12:15 am	306.5	42	1341		
12:25	307.8	42¼	1345		Water clear
12:40	307.8	42¼	1345		Water clear
1:00	307.4	42½	1349		Water clear
1:15	307.5	43	1356		Water clear
1:30	307.6	43	1356		Water clear
1:45	307.6	42-3/4	1353		Water clear
2:00	307.6	43	1356		Water clear
2:15	307.5	42-3/4	1353		Water clear
2:30	306.9	42-3/4	1353		Water clear
2:45	306.4	42-3/4	1353		Water clear
3:00	306.3	42	1341		
3:15	307.5	42½	1349		
3:30	306.8	42¼	1345		
3:45	307.4	42½	1349		
4:00	307.3	42½	1349		
4:15	307.3	42½	1349		
4:30	307.2	42½	1349		
4:45	307.6	42½	1349		
5:00	307.5	42-3/4	1353		
5:15	307.5	43	1356		
5:30	307.5	42½	1349		
5:45	307.5	42½	1349		
6:00	308.2	43½	1364		
6:15	308.1	43¼	1360		
6:30	308.4	43½	1364		
6:45	308.6	43-3/4	1368		Slight trace of sand
7:00	307.9	42¼	1345		Slight trace of sand
7:15	307.6	42½	1349		Slight trace of sand
7:30	306.9	42½	1349		Slight trace of sand
7:40	307.0	42½	1349		Slight trace of sand
7:50	307.0	42-3/4	1353		Slight trace of sand
8:00	370.0	42¼	1345		Slight trace of sand
8:15	306.2	42	1341		
8:30	306.0	42¼	1345		
8:45	306.9	43¼	1360		

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Apr. 25					
9:00 am	307.6	40-3/4	1322		
9:15	305.4	41	1326		
9:30	307.3	44	1371		
9:45	308.0	44¼	1375		
10:00	307.9	44	1371		
10:15	307.9	43½	1364		
10:30	307.8	43-3/4	1368		
10:45	308.1	43½	1364		
11:00	308.1	42½	1349		
11:15	307.0	42½	1349		
11:30	306.6	42¼	1345	52	Water clear, trace sand
11:45	306.7	42-3/4	1353		
12:00 pm	306.6	42½	1349		
12:15	306.7	42½	1349		
12:30	306.6	42½	1349		
12:45	306.5	42½	1349		
1:00	306.6	42½	1349		
1:15	306.5	42½	1349		
1:30	306.6	42-3/4	1353		
1:45	306.5	42½	1349		
2:00	306.6	42½	1349		
2:15	306.5	42½	1349		
2:30	306.5	42½	1349		
2:45	306.4	42-3/4	1353		
3:00	306.5	42-3/4	1353		
3:15	306.5	43½	1364		
3:30	306.5	43½	1364		
3:45	306.5	42½	1349		
3:59		27¼	1089		Shut valve 45# press
4:02		27-3/4	1099		
4:05	271.0	27-3/4	1099		
4:14	268.6	27-3/4	1099		
4:25	261.9	27-3/4	1099		
4:26					Opened valve wide open
4:28	277.7	44	1371		
4:41	288.8				
4:47	308.7	43-3/4	1368		Trace sand, clear
5:30	307.0	43¼	1360		Straighten out line
5:45	306.6	42½	1349		Trace sand, clear
6:00	306.3	43	1356		
6:15	306.6	42-3/4	1353		Trace sand, clear
6:30	306.6	42-3/4	1353		
6:45	306.5	42-3/4	1353		
7:00	306.5	42-3/4	1353		Trace sand, clear
7:15	307.0	43¼	1360		Trace sand, clear
7:30	307.1	43¼	1360		Trace sand, clear
7:45	307.1	43½	1364		Trace sand, clear
8:00	306.3	42½	1349		Trace sand, clear

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Apr. 25					
8:15 pm	306.3	42½	1349		Trace sand, clear
8:39	306.3	42½	1349		Trace sand, clear
8:53	306.6	42-3/4	1353		Trace sand, clear
9:10	306.6	42-3/4	1353		Trace sand, clear
9:25	306.7	43	1356		Trace sand, clear
9:40	306.9	43	1356		Trace sand, clear
9:55	307.0	43¼	1360		Trace sand, clear
10:17	307.1	43½	1364		Trace sand, clear
10:35	306.8	42½	1349		Trace sand, clear
10:52	306.5	42-3/4	1353		Trace sand, clear
11:10	306.7	43-3/4	1368		Trace sand, clear
11:28	306.9	43	1356		Trace sand, clear
11:46	305.9	42¼	1345		Trace sand, clear
12:00 am	306.1	43	1356		
Apr. 26					
12:15 am	307.1	43¼	1360		Trace sand, clear
12:21	307.8	43½	1360		Trace sand, clear
12:33	307.8	43	1356		Trace sand, clear
12:42	307.6	43	1356		Trace sand, clear
12:52	307.7	43¼	1360		Trace sand, clear
1:00	307.7	43	1356		Trace sand, clear
1:15	307.9	43¼	1360		Trace sand, clear
1:30	307.9	43	1356		Trace sand, clear
1:45	307.9	43	1356		Trace sand, clear
2:00	307.3	43	1356		
2:15	307.4	43	1356		Trace sand, clear
2:30	307.4	43	1356		Trace sand, clear
2:45	307.4	43	1356		Trace sand, clear
3:00	307.4	43	1356		
3:15	307.4	43	1356		
3:30	307.4	43	1356		
3:45	306.7	43	1356		Trace sand, clear
4:00	307.8	43	1356		
4:15	307.4	43	1356		
4:30	307.8	43	1356		
4:45	307.7	43	1356		Trace sand, clear
5:00	307.7	43	1356		Trace sand, clear
5:15	307.7	43	1356		
5:30	307.7	43	1356		
5:45	307.6	43	1356		Trace sand, clear
6:00	307.7	43	1356		
6:15	307.2	43	1356		Water clear
6:30	307.4	43	1356		Water clear
6:45	307.6	43	1356		Water clear
7:00	307.6	43	1356		
7:15	307.4	43	1356		Water clear

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Apr. 26					
7:30 am	307.2	43	1356		
7:45	307.3	43	1356		
8:00	307.8	43	1356		
8:15	307.4	43½	1364		
8:30	307.6	43-3/4	1371		
8:45	307.5	43½	1364		
9:00	307.0	43	1356		
9:15	306.6	42-3/4	1353		
9:30	305.7	41½	1334		
9:45	306.1	41½	1330		
9:50					Closed valve to 45#/in^2 pressure equal to about 100 foot head
9:51	291.6	26¼	1069		
9:53	291.1	27	1084		
10:00	289.1	27	1084		
10:05	287.9	27	1084	52	
10:16	287.3	27	1084		
10:30	287.3	27½	1094		
10:45	287.0	27½	1094		
10:57	286.9	27½	1094	52	H_2O sample for analysis Water clear, trace fine sand
10:59					Pump off
10:59½	240				Recovery measurements
11:01	238.9				
11:02	237.9				
11:03	236.3				
11:04	234.7				
11:05	234.0				
11:07	232.6				
11:08	232.0				
11:09	231.3				
11:10	230.9				
11:12	230.0				
11:15	228.9				
11:20	227.6				
11:25	226.0				
11:30	225.6				
11:35	225.0				
11:40	224.3				
11:45	223.8				
11:50	222.3				
11:55	223.0				
12:00 m	222.6				
12:15	221.8				
12:30	220.8				
12:45	220.4				
1:15	219.2				
1:30	218.7				
1:45	218.1				

Date	Depth to Water (feet)	Discharge Orifice Inches	Discharge G.P.M.	Temp. °F.	Remarks
Apr. 26					
2:00 pm	218.0				
2:15	217.7				
2:30	217.7				
2:45	217.5				
3:00	217.0				
3:15	216.9				
3:30	216.9				
3:45	216.4				
4:00	216.2				
Apr. 27					
7:50 am	212.8				
8:15	212.7				
8:30	212.7				

September 11, 1946

Mr. Carl B. Patchen
Water Superintendent
Mason City, Iowa

Dear Mr. Patchen:

In response to your request of August 15, et seq., regarding another well near your south station, we have made some calculations with the following results.

First the coefficient of transmissibility and storage was determined, chiefly from Robinson's report containing his measurements and mine. Robinson's figure of 53,000 g.p.d. per foot, under a unit hydraulic gradient, as the average transmissibility appears to be within reason.

By using formulated calculations and a weighted average for the coefficient of storage we arrived at the following figures:

Pumping Rate at pumped well	1500	1500	1500	1500	1250	1250	1250	1250
Distance of adjacent well	100	200	500	1000	100	200	500	1000
Drawdown at end of one day in adjacent well	33.3	28.8	22.9	20	27.8	24.1	19.1	16.65
Drawdown at end of one year in adjacent well	52.6	48.1	42.1	37.6	43.8	40.0	35.1	31.4
Drawdown at end of ten years in adjacent well	60.0	55.6	49.6	45.1	50.2	46.3	41.3	37.6

If one well is pumped at the rate of 1500 g.p.m. at a pumping level of 300 feet from a static level of 200 feet, the water level in an adjacent well will be 200 feet plus the drawdown for that particular condition alone. When both wells are pumping the level will be lower but the amount of interference of one well on the other as given in the table above. Thus for the case of two wells 200 feet apart, each pumping at a rate of 1250 g.p.m. for a one day period, if we assume a non-pumping level of 200 feet and a drawdown of 62 feet, the pumping level in both wells should be the same and be equal to 200 + 62 + 24, or 286 feet total.

I would be glad to go over the formula and calculations if you are interested. Obviously in calculations of this type one should keep in mind the several variable and unpredictable factors. If after the new well is drilled we could run some tests on it and your No. 11 well, I believe that we could give you more precise figures in regard to forecasting future water levels.

If you have any questions or if I can add to the foregoing remarks please let me hear from you.

Very truly yours,

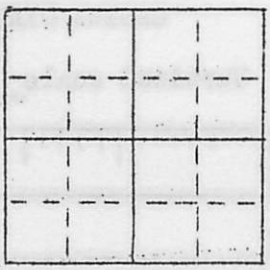
H. G. Hershey

HGH:BH

W-2971

IOWA GEOLOGICAL SURVEY
In Cooperation with U. S. Geological Survey

RECORD OF WELL



Location:

Town: Mason City (N E / S W): County Cerro Gordo E.

NE SE NE SE sec. 16 T 96 N., R. 20 W. Twp.

Well name and number Town Well #12

Owner Mason City Address

Tenant Address

Contractor Layne Western Co., Inc. Address Ames, Iowa

Drillers Don Simpson + Jewell Black, Fowler + Bennett

Drilling dates Started 7-2-47

Well data:
Elevations: Drilling curb 1165.4 feet; Land surface 1163.9 feet

Determined by

Topographic position upland

Total depth: Reported 1585? feet, Measured feet

Drilling method Cable tool

Hole and casing data 10' of 30" curbing 0'-10'; 145' of 20" pipe 0'-145' cemented in 26" hole; 22' of 18" pipe 793'-815' 147.5' of 14" pipe 732'-879.5' Open 12 1/4" hole 879'-1377'

Original depth to water ft. above / below Date

Original elevation of water level ft.; Source of data

Sources of water: Principal not known; Others

Production data: Date

Static depth to water Measuring point
Pumping level at g.p.m.

Specific capacity g.p.m. per ft. drawdown; Temperature °F.

Pump data: Type pump turbine Column Dia. Length
Cylinder or bowls: Dia. Length Suction pipe 20'

Power 150 hp electric motor Airline

Estimated rate of production: g.p.m. for hrs. a day
Use of water

WATER ANALYSES (in parts per million)

Date samples	Nov. 20, 47	April 1, '48	Apr. 26 '48	
Sampled by	W E H	W.E. Hale	S.B.C.	
Total solids	424	502	465	
Insoluble matter	10	11.	8.5	
Alkalinity (Meo)	3.96	3.96	3.74	
Alkalinity (Phn)	none	None	None	
pH	7.7	7.5	8.5	
Fe_2O_3+ Mn_2O_3 +Al_2O_3	4.5	5.	2.	
Alkali as sodium	29.5	56.8	40.4	
Calcium	85.7	90.6	95.5	
Magnesium	42.1	34.0	35.5	
Iron (unfiltered)	.11	.3	.27	
Manganese	none	None	None	
Nitrate	1.2	"	.89	
Fluoride	1.6	1.6	1.2	
Chloride	9.3	26.	21.	
Sulfate	15.8	48.4	46.5	
Bicarbonate	483.	483.	456.	
Hardness (ppm)	387.	367.	389.	
Hardness (gpg)	22.6	22.4	22.7	

Remarks

Laboratory data: Sample storage location

Sample range 0-1775 No. spls. 308 No. dupls. & cond. 306 P-G
Spls. prepared by P H Washed range 35-1775 by P H
Driller's log and cond.
Insoluble residues: Prepared by Studied by Strip log
Microscopic study 0-1775 strip log 2-9-48
Gen. log Correl. by R. Wehmer