Coded Wt 115 Mineral No. 2540

THE STATE UNIVERSITY OF IOWA
STATE HYGIENIC LABORATORIES
IOWA CITY

No. G-917

Mineral Water Analysis

(Parts per Million)

July 26, 19 46

Town Mason City County Cerro Gordo Source 1765' drilled well #8, Owner: Mason City

Collected by H. G. Hershey on July 16 19 46

Total Solids 877 Suspended Solids ..... Dissolved Solids .....

Turbidity ..... Coefficient of Fineness ..... Color ..... pH 8.2 7-23-46

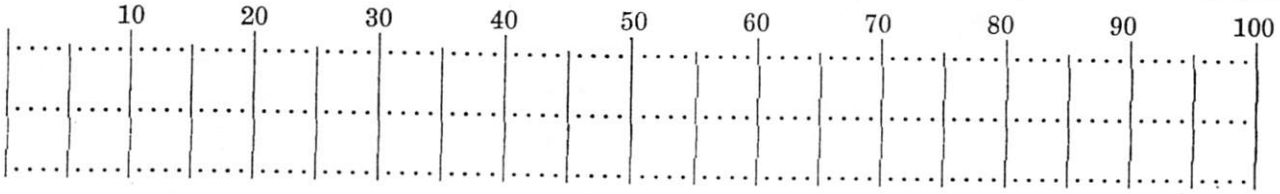
Alkalinity (to MeO) 370 Alkalinity (to Phn.) 18 Free Carbon Dioxide .....

Insoluble Matter 7. Silica (SiO_2) ..... $Fe_2O_3+Al_2O_3+Mn_2O_3$ 4.

POSITIVE IONS.	r		rM+	NEGATIVE IONS.	r		rA⁻
N as NH_4+	.....	x 0.0714 =	.....	N as NO_2^-	.....	x 0.0714 =	.....
Alkalies as Na+	304	x 0.0435 =	13.224	N as NO_3^-	0.0	x 0.0714 =	0.000
K+	.....	x 0.0256 =	.....	F^-	3.6	x 0.0526 =	0.189
Na+	.....	x 0.0435 =	.....	Cl^-	55	x 0.0282 =	1.551
Ca++	17	x 0.0499 =	0.848	SO_4^{--}	262	x 0.0208 =	5.450
Mg++	5.9	x 0.0822 =	0.485	HCO_3^-	407	x 0.0164 =	6.675
(Fe++)	0.5	x 0.0358 =	.....	CO_3^{--}	22	x 0.0333 =	0.733
(Mn++)	0.0	x 0.0364 =	.....	OH^-	.....	x 0.0588 =	.....
(Al+++)	.....	x 0.1112 =	.....	PO_4^{---}	.....	x 0.0316 =	.....
(Pb++)	.....	x 0.0097 =	.....	(BO_3^{---})	.....	x 0.0510 =	.....
(Zn++)	.....	x 0.0306 =	.....	(Free CO_2)	.....	x 0.0454 =	.....
TOTALS:	.....	Sum rM+ =	14.557		.....	Sum rA =	14.598

$$E = \frac{\text{Sum rM+} - \text{Sum rA}^-}{\text{Sum rM+} + \text{Sum rA}^-} \times 100 = -0.1 \text{ o/o}$$

Calculated Hardness as $CaCO_3$ = (Ca x 2.497) + (Mg x 4.115) + (Fe x 1.792) + (Mn x 1.822) = 68 p.p.m.



One space = _____ milligram equivalent

Specific Conductance @ 25°C
K = 131 x 10^{-5}

Principal Chemist
Iowa Geological Survey

√ coded

W#115 Mineral No. 2541

THE STATE UNIVERSITY OF IOWA
STATE HYGIENIC LABORATORIES
IOWA CITY

(3)

29 '46

No. G918

Mineral Water Analysis

(Parts per Million)

July 26, 1946

Town Mason City County Cerro Gordo Source 1765' drilled well#8 Owner: Mason City

Collected by H. G. Hershey on July 15 1946

Total Solids 880 Suspended Solids .... Dissolved Solids ....

Turbidity .... Coefficient of Fineness .... Color .... pH 8.3 7-23-46

Alkalinity (to MeO) 370 Alkalinity (to Phn.) 18 Free Carbon Dioxide ....

Insoluble Matter 6 Silica (SiO_2) .... $Fe_2O_3+Al_2O_3+Mn_2O_3$ 2.

POSITIVE IONS.	r		rM+	NEGATIVE IONS.	r		rA⁻
N as NH_4^+		x 0.0714 =		N as NO_2^-		x 0.0714 =	
Alkalies as Na^+	304	x 0.0435 =	13.224	N as NO_3^-	0.0	x 0.0714 =	0.000
K^+		x 0.0256 =		F^-	3.6	x 0.0526 =	0.189
Na^+		x 0.0435 =		Cl^-	55	x 0.0282 =	1.551
Ca^{++}	15	x 0.0499 =	0.749	SO_4^{--}	263	x 0.0208 =	5.470
Mg^{++}	4.3	x 0.0822 =	0.353	HCO_3^-	407	x 0.0164 =	6.675
(Fe^{++})	0.5	x 0.0358 =		CO_3^{--}	22	x 0.0333 =	0.733
(Mn^{++})	0.0	x 0.0364 =		OH^-		x 0.0588 =	
(Al^{+++})		x 0.1112 =		PO_4^{---}		x 0.0316 =	
(Pb^{++})		x 0.0097 =		(BO_3^{---})		x 0.0510 =	
(Zn^{++})		x 0.0306 =		(Free CO_2)		x 0.0454 =	
TOTALS:		Sum rM+ =	14.326			Sum rA =	14.618

$$E = \frac{\text{Sum rM+} - \text{Sum rA}^-}{\text{Sum rM+} + \text{Sum rA}^-} \times 100 = \pm 1.0\ \%$$

Calculated Hardness as $CaCO_3$ = (Ca x 2.497) + (Mg x 4.115) + (Fe x 1.792) + (Mn x 1.822) = 56 p.p.m.

	10	20	30	40	50	60	70	80	90	100
rM+										
rA⁻										

One space = ______ milligram equivalent

Specific Conductance @ 25°C
K = 132 x 10^{-5}

Grace Matlack
Principal Chemist
Iowa Geological Survey

115

MASTER CARD - A

9-26-69
RP 11-22-70

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	17	43	09	33	N	093	11	42	1

WELL SCHEDULE

US GEOLOGICAL SURVEY

IOWA DISTRICT WRD

WELL NO 096-20W-03CABB CO CERRO GORDO

OWNER CITY WELL #8 ADDRESS MASON CITY

DRILLER THORNE DATE DRLD 1942

MAP

SOURCE OF DATA FILE

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

CONTINUED FROM ABOVE	ACCURACY	T.	R.	E/W	SEC.	QUARTERS	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	03	CABB	00115	/ / 32 CITY 8	MASON CITY	M	P	W	1	I			C	I			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)	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
	1765	3	1447	16	X		942					1098	7	178	D	7	42	1200												B

HYDROGEOLOGIC CARD - C

DUPLICATE CARD A CC 1-19	PHYSIOGRAPHY PROV.	PHYSIOGRAPHY SEC.	DRAINAGE BASIN	SUBBASIN	TOPO SETTING	MAJOR AQUIFER SYSTEM	MAJOR SERIES USGS	MAJOR SERIES IGS	MAJOR UNIT	MAJOR LITHOLOGY	MAJOR ORIG.	MAJOR THICKNESS	MAJOR LENGTH WELL OPEN TO	MAJOR DEPTH TO TOP OF	MINOR AQUIFER SYSTEM	MINOR SERIES USGS	MINOR SERIES IGS	MINOR UNIT	MINOR LITHOLOGY	MINOR ORIG.	MINOR THICKNESS	MINOR LENGTH WELL OPEN TO	MINOR DEPTH TO TOP OF	DEPTH TO CONSOLIDATED ROCK	SOURCE	DEPTH TO BASEMENT	SOURCE	SURF. MAT. LITHOLOGY	SURF. MAT. INFIL.	COEF TRAN SIG FIG	COEF TRAN XIO	COEF STOR SIG FIG	COEF STOR XIO-	GEOL. CARDS	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
	12	8	258		5	C	3	S	R	V	6	53	48	A44 (1442)	C	3	S	E	V	6	75	75	A50 (1495)												C

CASING AND SCREEN (SIZE, TYPE, INTERVALS):

367'6" OF 16-INCH HOLE FROM 0 TO 367'6"

59'8" OF 14-INCH HOLE FROM 367'6" TO 427'2"

349'9½" OF 12-INCH PIPE; 1'5" OF 10"x12" NIPPLE

49'4¼" OF 10-INCH PIPE; 1'4" OF 8"x10" NIPPLE

1044'9½" OF 8-INCH PIPE BOTTOMED AT 1446'9"

SHOE + 3 CANVASS PACKERS MUDDED IN AT BOTTOM

CODED BY Hexum SD DATE 12/20/72

PUNCHED BY Hexum DATE 12-21-72

VERIFIED BY ______ DATE ______

SKETCH ON REVERSE: YES ______ NO ______

03

WELL NO 096-20W-03CABB

Mason City

City Well No 8

July 16, 1946

* CASING

Top casing 1'5" below floor

349'9½" of 12-in. pipe
1'5½" nipple 10" x 12"
49'4½" of 10-in pipe
1'4" nipple 8" x 10"
1044'9½ of 8-in pipe. 8-in shoe on bottom of 8-in pipe.
Canvass packers just above, 6 ft. above & 12 ft above 8" shoe.
Total 1446'9" of all pipe

PUMP

21'3½ of 6" suction
12'5" of 17-stage 8-in bowls
1'10" of pump head
334'9¼ of 9-in. OD. and 8-in ID. pump column - screw pipe

Top of old 10-in casing 427'2"

Hole reamed to 16-in. dia to 367'6", then 14-in. to top of 10-in. pipe.

↓ 178' SWL on Mar 21, 1946 after 5 hrs shutdown of all wells.

Hole filled to 1402' with "blue clay" mixed with 8" bit. "Blue clay" is shale cuttings. The 8-in casing lowered, and seal held.

* Data from C.B. Patchen

John C. Moore Corporation, Rochester, N. Y. Binder and holes in leaves Patented. FORM 410846

Mason City, Cerro Gordo County.

City Well No 8

July 15, 1946

* T.D. 1765'

370'4" to top of suction from floor. (CBP Floor elev. 58.97 NE cor.) 1039.24 conv. USGS

336'8" top of bowl - 33'8" = bowls & suction

348' = " of airline in 8". 226' of airline outside Marshalltown 100 lb. 230' gage (reversed) Layne Western 150 lb. 346' gage

1448' bottom of 8" pipe - shoe and 3 canvass wrappers mudded in. "Good seal, checked every way" B.B.

36'9" of 8-inch discharge. Discharge vertically down into Wier box.

Wier box 1'11½" x 8' x 2'. Square opening 12" across with end contractions 11/8" below measuring point; a bar at top of box. Two baffle plates 1'2" and 1'11" from end of box receiving discharge. 18 holes 2" dia. in each baffle plate. Steel construction

Pump: Peerless head, belt driven from Climax Eng. Co. gasoline engine model R 41 Blue Streak No 14128.
Pomona 17-stage pump assembly

Water level measurements by airline and gage

Static water level during drilling = 152'

Datum for sample (cuttings) wood plank floor 1 ft. above natural ground level. El. 58.97 (city datum) at NE cor of floor by C.B. Patchen, Supt. Water Dept. et al. et. seq. P.A.

* Data from Mr. B. Borgeson except as noted.

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Mason City

City Well No 8

Overcast
July 15, 1946

	Time	Water Level inside 8" pipe	Water Level outside	Wier Read in inches	Prod. 10 G.P.M	Temp Air	Temp H_2O Fahrenheit	
July 15	7:00 am		197					Measured by Mr. Bergeson
	10:50	1.52	196					Water running into hole thru garden hose. 25 gpm
	11:45	1 28				65°		Start pump
	12:00 n.							
	12 02 pm	238						
	12 03	258		2"	98.9			
	12:05	265	198	1 5/8	72.5			Water light rusty color.
	12:10	270	198					1130 RPM. 760 rpm Pump head Motor take-off
	12:13			1 1/2	64.9			
	12:15	276	198					
	12:20	281	198	1 5/8	72.5			
	12:30	280			72			Drillers readings Water clearing
	12:45	290			72			
	1:00	300			72			
	1:20	298	199	1 5/8	72.5			
	1:30	299	199			68	55	Water clearing
	1:45	298	199	1 5/8	72.5	70	55	Motor 754 rpm Pump 1212 RPM Note A
	1:54							Motor speeded up
	1:56	333		2 3/4	157.05			
	1:56	342		2 1/2	136.67			
	1:57	<348±						
	1:59			2 1/4	117.22			
	2:00			2 1/8	108			Motor 895 RPM
						70	55 1/4	Thermom "G"
	2:10							Shut down
	2:11	223 ?						"Bounce" from water in pump column.
	2:13	166 ?						
	2:30	170						
	2:35	167						

Note A: Mr. Bergeson repts. counter slipping. Second motor rpm 822

3

Mason City
Well No. 8

July 16, 1946

Time	Water Level inside	Water Level	Prod. in G.P.M			
1:18						Start
1:19±			200±			Discharge } Surge
1:21						Broke suction }
2:28						
2:29			320±			"
2:29:57						
2:34						
2:35			330±			"
2:35:54						
4:03		208				START
4:06	293		2 1/8	110		
4:10	303	208	2	99		
4:15	308			81		
4:20	309			81		
4:25	309			81		
4:30	311	209		81		
4:45	314	209	1 3/4	81		
4:52	314	209	1 3/4	81	70°	51 1/4
4:54						Slowed motor & adjusted
4:56	287		1 5/8	73		" "
4:58	289		1 1/2	63		
5:00	290		1 1/2	63		
5:05	288		1 1/2	63		
5:10	286		1 1/2	63		
5 15	286	209		63		
5 22	286			63		

MOORE'S MODERN METHODS

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Mason City

City Well No. 8

July 15, 1946

Time	Water Level inside	Water Level outside	Wier Read	Prod G.P.M	
4:21	220				
4:22	215				
4:23	200				Stopped pumping
4:25	120±				
4:27	138				Motor started high speed
4:33					Broke suction & shut off for repairs
5:00		S			Pump started fast for surging
5:03					Broke suction
5:15		U			Pump started
5:20		R			Pump started
5:23					Broke suction
5:30		G			Pump started
5:31					Broke suction
5:36		I			Pump started
5:37					Water appeared
5:38		N			Broke suction
5:42					Pump started
5:43		G			Water at discharge
5:44					Broke suction & shut down for night.

Water cloudy during surging

MOORE'S MODERN METHODS

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Mason City

City Well No 8

July 15, 1946

Time	Water Level in 8"	Water Level outside	Wier Read	Prod. GPM	Temp A	W	
2:35							Pump started
2:36	216	198					Variable speed. Exp. to keep pump line full.
2:37	248						
2:38	261						
2:41	233						
2:44	215						Near true
2:44							Motor speeded.
2:46	300±		3½	222.52			
2:47	325						
2:48	348±		2¾	157.			
2:50	<348		2¼	117			1294 Pump RPM
2 53	<348		2⅛	108			
2 55	<348	198	2⅛	108			
3:00			2 -	98.9	74	55	Thermom "A" + City thermon
3:05			2⅛	108			
3:10			2⅛	108			
3:17			0				Broke suction
3:19			Variable				Picked up water again.
3:20			0±				Broke suction
3:22	305		0±				
3:23	298						
3:24			2¼	117			Picked up
3:25	318		1⅞	90			
3:26	321						
3:27	322		1¾	81			
3:29	323						
3:30	324		1⅞	90			
3:35	328		1⅞	90			
3:40	328		1⅞	90			
3 45	328	198	1⅞	90			
3:50	327	198	1⅞	90	75	55½	Both the monitors
4:08	325	198	1 13/16	95			Sample collected G·64
4:16	326	198					
4:17	280			1±			Motor slowed
4:18	258			1±			
4:19	240						
4:20	231						

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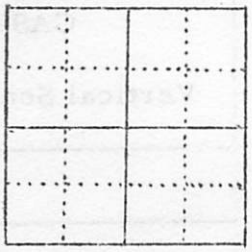
Mason City
City Well No 8

July 16, 1946

	Time	Water Level in 8"	Water Level outside	Weir Head in inches	Prod. G.P.M	Temp A	Temp W	
July 16	7:25 a.	136	198'6"					Static after 3/4" hose running full 75 lbs for about 13½ hrs. at 191 g.p.m.
	7:30							
	7:35	272	198'6"	2½	136.67			Motor 854 rpm. Pump 1207
	7:40	315	198'8"	2¼	117.22			
	7:45	318	198'6"	2	98.9			
	7:50	321	199	2	98.9			
	7:55	322	200	2	98.9			
	8:00	323	201	2	98.9			Motor 863 rpm. Pump 1212 RPM
	8:15	328	200	2	98.9			
	8:30	330	201	2	98.9			Considerably clearer 8:25
	8:45	330+	201	2	98.9	70°	54°	No odor
	9:00	331	201	2	98.9			
	9:15	331	201	2	98.9	72°	55°	
	9:30	330	201	1⅞	90			
	9:45	330	201	1⅞	90			
	10:00	330	201	1⅞	90	74°	55¼°	No odor
	10:15	330	201	1⅞	90			
	10:30	330	201	1⅞	90			
	11:00	331	201	1⅞	90			
	11:30	331	201	1 13/16	86	77°	55¾°	Water clear.
	12:00	330	201	1⅞	90			
	12:30	329	202	1¾	81	79°	56°	
	1:00	330	206	1⅞	90			
	1:30	329	206	1⅞	90	79°	55¼	Sample G25
	1:31							Shut down to surge
	1:50							Start Discharge Broke suction — Surge
	1:51				300±			
	1:51:40							
	2:01							"
	2:02				300±			
	2:02:50							
	2:10				300±			"
	2:11							
	2:12							

C-115

IOWA GEOLOGICAL SURVEY
In Cooperation with U. S. Geological Survey
RECORD OF WELL



Location:

Town: Hazelton (NE) (SW) :County Buchanan

SW NW NE ~~SE SW~~ sec. 11 T. 90 N., R. 9 ~~W.~~ E. Twp.

Well name and number Paul Niemann Core #1 KUNKLE

Owner _____ Address _____

Tenant _____ Address _____

Contractor Paul Niemann and Co Address Sumner Ia

Drillers _____

Drilling dates 1953

Well data:

Altitudes: Drilling curb _____ feet; Land surface ~~1119'~~ 1095' feet

Determined by Altimeter (T.G. Kling) Summer 1966

Topographic position _____

Total depth: Reported 37.6 feet, Measured _____ feet

Drilling method Core

Hole and casing data _____

Data & Core from Ia. Hwy. Comm.

Original depth to water _____ ft. above below _____ Date _____

Source of data _____

Sources of water: Principal _____

Others _____

CASING DIAGRAM	LOG
Vertical Scale ____________	
	0-9 - overburden?
	9-
	Wapsi-Sil??

Production Data

Date				
Static water level				
Measuring point				
Pumping water level				
Yield (g. p. m.)				
Duration of pumping				
Specific capacity				

Pump Data

Type pump _____ Column diameter and length _____

Cylinder or bowls diameter and length _____

Suction pipe _____ Airline _____

Power _____ Production _____ g. p. m. for _____ hours per day

Use of water _____

Dissolved constituents and properties (in parts per million except as indicated)

Date sampled				
Sampled by				
Silica (SiO_2)				
Iron (Fe)				
Manganese (Mn)				
Calcium (Ca)				
Magnesium (Mg)				
Potassium (K)				
Sodium (Na)				
Carbonate (CO_3)				
Bicarbonate (HCO_3)				
Sulfate (SO_4)				
Chloride (Cl)				
Fluoride (F)				
Nitrate (NO_3)				
Dissolved solids				
Hardness (as $CaCO_3$)				
Total				
Grains per gallon				
Noncarbonate				
Alkalinity (as $CaCO_3$)				
pH				
Specific conductance (micromhos at 25°C)				
Temperature (°F)				
Analysis No.				

Laboratory Data

Location Boxes 349-357

Well No. _____ Sample range _____ No. of samples 9'-37.6'

No. of dupls. and cond. _____ Washed range _____

Samples prepared by C Thomas Date Oct 12, 1953

Logged by _____ Date [illegible] 10/-/53

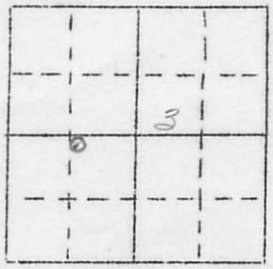
Correlations by _____ Date _____

More complete data in W.A. folder. To be checked when well is completed.

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

W-0115

RECORD OF WELL



Location:

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

NW/4-NW-NE-SW sec. 3 T. 96 N., R. 20 W. Mason Twp.

Well name and number City Well #8

Owner City of Mason City. Address

Tenant Address

Contractor Warren Thorne; Thorpe Well Co. Address Platteville Wis.

Drillers

Drilling dates 1912 - Repaired by Thorpe Well Co. 1933 deepened 1946

Well data:

Elevations: Drilling curb 1098.3 feet; Land surface 1097 feet

Determined by HGH

Topographic position Upland

Total depth: Reported 1331 feet, Measured feet

deepened from 1219 (1996) to 1765', filled back to 1331'

Drilling method cable tool

Hole and casing data 20" steel casing 0-100'; 10" steel casing 440-800
(Give amount, size, kind, and depth of all casing; type and position of seals and packers; cementing; how finished--perforated pipe, screen, gravel pack, open hole, etc.)
1498' bottom of 8-inch pipe - shoe & 3 canvas wrappers
mudded in. Bridged with piece of auto tire at 1420'
filled with half brick & some clay between 1370' & 1420'; took
about 800 bricks; clay & half brick 1357 to 1370; 8 sacks neat
cement 1352-1357; ½ yd. clay & 100 brick 1334-1352; 12 sacks cement
from 1331 - 1334

Original depth to water ft. above below Date

Original elevation of water level ft.; Source of data

Sources of water: Principal St Peter & Jordan; Others Galesville

Production data: Date July 15, 1946, July 16, & 17 1946

Static depth to water 152' see remarks Measuring point

Pumping level	at	g.p.m.	
298'	72.5		after 5 hrs. 20 min
<348	108		after 8 hrs,
330	90		after 2 hrs. (July 16,)
319	381		after 3 hrs. (July 17,)

Specific capacity 0.5+ g.p.m. per ft. drawdown; Temperature 55 1/4 °F.

Pump data; Type pump Airlift Column Dia. Length

Cylinder or bowls: Dia. Length Suction pipe

Power Airline

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

Use of water Public Supply

WATER ANALYSES (in parts per million)

Date sampled	May 17, 1946	June 3, 1946	June 4, 1946	June 5, 1946	July 15, 1946
Sampled by	C.B. Patchen	C.B. Patchen	C.B. Patchen	C.B. Patchen	H.G. Hershey
Total solids	754	912	870	985	880
Insoluble matter	24	13	13	17	6
Alkalinity (Meo)	360	358	340	360	370
Alkalinity (Phn)	10	0	0	10	18
pH	5/21/46 7.9	8.0	8.0	6/9/46 8.2	8.3
Fe_2O_3+ Mn_2O_3+Al_2O_3	6	2	10	8	304
Alkali as sodium	238.8	291	309	311	15
Calcium	28.2	19	13	13	4.3
Magnesium	10.5	5.5	0.6	0.6	0.5
Iron (unfiltered)	0.1	38	23	0.8	0.0
Manganese	0.0	0.74	0.5	0.0	0.0
Nitrate	2.2 ~~0.5~~	0	0	0	0.0
Fluoride	3.2	3.5	3.4	3.4	3.6
Chloride	39	53	52	53	55
Sulfate	201.2	252	265	265	263
Bicarbonate	414.8	437	439	415	407
Hardness (ppm)	113.8	70	35	36	56
Hardness (gpg)	6.7	4.1	2.0	2.1	3.3
Remarks	Depth 1445'	at 1523'	at 1525'	at 1525'	at 1765

Laboratory data: Sample storage location

Sample range 900 - 1761 No. spls. 136 No. dupls. & cond. 120 V.G

Spls. prepared by Staff Washed range 900-1761 by Staff I.G.S.

Driller's log and cond. Yes good from 1220' to 1765'

Insoluble residues: Prepared by Studied by Strip log

Microscopic study 900 - 1761 SEH strip log 1946 SE 17

Gen. log Correl. by SE Harris

WATER LEVEL DATA

Measuring point _____

Date	Depth to water	Altitude	Remarks
June 3, 1946	160		Drilling depth 1523
June 4, 1946	162		Drilling depth 1525
Sept 13, 1932	155		T.D. 1219'
July 15, 1946	152'		T.D. 1765'

REMARKS

Vol. 33 p. 257

at 1219 SWL-155 pumping level 180'

At 1525' SWL-162' P.L. 242 at 65 gpm after 8 hrs pumping

Test Pump July 15, 1946

370'4" to top of suction from floor

336'8" top of bowl, 33'8" bowl & suction

348' of airline in 8" 226' of airline outside

THORPE BROTHERS WELL COMPANY

Drilled for Mason City Waterworks at Mason City, Iowa

Well No. 8 Kind of well Drilled Depth 1219'

Record of Permanent Pipe

Size Pipe	Amount of pipe	Depth to Bottom of pipe	Depth to Top of pipe
20"	99'	99'	Surface
10"	361'	710'	349'

Recased by us in 1932

Kind of Soil or Formation

No record of formation as not drilled by us.
Air lift

From Thorpe Borthers Well Co. October 1937

Mason City, Cerro Gordo County.

City Well No 8

July 15, 1946

* T.D. 1765'
370'4" to top of suction from floor. (CBP Floor elev. 58.97 NE cor.) 1039.24 Cent. ersion
336'8" top of bowl - 33'8" = bowls of suction
348' of airline. 10. 8". 226' of airline outside.
Marshalltown 100 lb. 230' gage (reversed) Layne Western 150 lb. 346' gage
1448' bottom of 8" pipe - shoe and 3 canvass wrappers mudded in. "Good seal, checked every way" B.B.

36'9" of 8-inch discharge. Discharge vertically down into wier box.
Wier box 1'11½" x 8' x 2'. Square opening 12" across, with end contractions 11⅛" below measuring point; a bar at top of box. Two baffle plates 1'2" and 1'11" from end of box receiving discharge. 18 holes 2" dia. in each baffle plate. Steel construction

Pump: Peerless head, belt driven from Climax Eng. Co, gasoline engine, model R 41 Blue Streak No 14128.
Pomona 17-stage pump assembly

Water level measurements by airline and gage

Static water level during drilling = 152'

Datum for sample (cuttings) wood plank floor 1 ft. above natural ground level. El. 58.97 (city datum) at NE cor. of floor by C.B. Patchen, Supt. Water Dept. et al. et. seq. P.A.

* Data from Mr. B. Bergeson except as noted.

Mason City

City Well No 8

2

July 16, 1946

* CASING

Top casing 1'5" below floor

349'9½" of 12-in. pipe
1'5½" nipple 10" x 12"
49'4½" of 10-in pipe
1'4" nipple 8" x 10"
1044'9½ of 8-in pipe. 8-in shoe on bottom of 8-in pipe.
Canvass packers just above, 6 ft. above & 12 ft above 8" shoe.
Total 1446'9" of all pipe

PUMP

21'3½ of 6" suction
12'5" of 17-stage 8-in bowls
1'10" of pump head
334'9¼ of 9-in. OD. and 8-in ID. pump column – screw pipe

Top of old 10-in casing 427'2"

Hole reamed to 16-in. dia to 367'6", then 14-in. to top of 10-in. pipe.

178' SWL on Mar 21, 1946 after 5 hrs shutdown of all wells.

Hole filled to 1402' with "blue clay" mixed with 8" bit. "Blue clay" is shale cuttings. The 8-in casing lowered, and seal held.

* Data from C.B. Patchen

3

Mason City
Well No. 8

July 16, 1946

Time	Water Level Inside	Water Level	Prod. in G.P.M	
1:18				
1:19+			200±	Start Discharge Broke suction } Surge
1:21				
2:28				
2:29			320±	"
2:29:57				
2:34				
2:35			330±	"
2:35:54				

4:03		208			START
4:06	293		2⅛	110	
4:10	303	208	2	99	
4:15	308			81	
4:20	309			81	
4:25	309			81	
4:30	311	209		81	
4:45	314	209	1¾	81	
4:52	314	209	1¾	81	70° 51¼
4:54					Slowed motor & adjusted
4:56	287		1⅝	73	" "
4:58	289		1½	63	
5:00	290		1½	63	
5:05	288		1½	63	
5:10	286		1½	63	
5:15	286	209		63	
5:22	286			63	

Mason City

City Well No 8

Overcast
July 15, 1946

	Time	Water Level inside 8" pipe	Water Level outside	Wier Read in inches	Prod. 10 G.P.M	Temp Air	Temp H_2O Fahrenheit	
July 15	7:00 am		197					Measured by Mr. Bergeson
	10:50	152	196					
	11:45	128				65°		Water running into hole thru garden hose. 25 GPM
	12:00 n.							Start pump
	12 02 pm.	238						
	12 03	258		2"	98.9			
	12:05	265	198	1 5/8	72.5			Water light rusty color
	12:10	270	198					1130 RPM. 760 rpm Pump head Meter take-off
	12:13			1 1/2	64.9			
	12:15	276	198					
	12:20	281	198	1 5/8	72.5			
	12:30	280			72			} Drillers readings Water clearing
	12:45	290			72			
	1:00	300			72			
	1:20	298	199	1 5/8	72.5			
	1:30	299	199			68	55	Water clearing
	1:45	298	199	1 5/8	72.5	70	55	Motor 754 rpm } Note A Pump 1212 RPM }
	1:54							Motor speeded up
	1:55	333		2 3/4	157.05			
	1:56	342		2 1/2	136.67			
	1:57	<348±						
	1:59			2 1/4	117.22			
	2:00			2 1/8	108			Motor 895 RPM
						70	55 1/4	Thermom "G"
	2:10							Shut down
	2:11	223 ?						
	2:13	166 ?						"Bounce" from water in pump column.
	2:30	170						
	2:35	167						

Note A: Mr. Bergeson rep'ts. counter slipping. Second motor rpm 822

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Mason City

City Well No 8

July 15, 1946

Time	Water Level in 8"	Water Level outside	Wier Read	Prod. GPM	Temp A	Temp W	
2:35							Pump started
2:36	216	198					
2:37	248						Variable speed. Exp. to
2:38	261						keep pump line full.
2:41	233						
2:44	215						Near true
2:44							Motor speeded.
2:46	300±		3½	222.52			
2:47	325						
2:48	348±		2¾	157.			
2:50	<348		2¼	117			1294 Pump RPM
2:53	<348		2⅛	108			
2:55	<348	198	2⅛	108			
3:00			2-	98.9	74	55	Thermom "H" + City thermom
3:05			2⅛	108			
3:10			2⅛	108			
3:17			0				Broke suction
3:19			Variable				Picked up water again
3:20			0±				Broke suction
3:22	305		0±				
3:23	298						
3:24			2¼	117			Picked up
3:25	318		1⅞	90			
3:26	321						
3:27	322		1¾	81			
3:29	323-						
3:30	324		1⅞-	90			
3:35	328		1⅞	90			
3:40	328		1⅞	90			
3:45	328	198	1⅞	90			
3:50	327	198	1⅞-	90	75	55½	Both thermometers
4:08	325	198	1 13/16	95			Sample collected G-64
4:16	326	198					
4:17	280			1±			Motor slowed
4:18	258			1±			
4:19	240						
4:20	231						

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Mason City

City Well No. 8

July 15, 1946

Time	Water Level inside	Water Level outside	Wier Read	Prod G.P.M	
4:21	220				
4:22	215				
4:23	200				Stopped pumping
4:25	120±				
4:27	138				Motor started High speed
4:33					Broke suction & shut off for repairs
5:00		S			Pump started fast for surging
5:03					Broke suction
5:15		U			Pump started
5:20			R		Pump started
5:23					Broke suction
5:30			G		Pump started
5:31					Broke suction
5:36				I	Pump started
5:37					Water appeared
5:38				N	Broke suction
5:42					Pump started
5:43				G	Water at discharge
5:44					Broke suction & shut down for night.

Water cloudy during surging

MOORE'S MODERN METHODS

7

Mason City
City Well No. 8

July 16, 1946

	Time	Water Level in 8"	Water Level outside	Weir Read in inches	Prod. G.P.M	Temp A	Temp W	
July 16	7:25 a.	136	198'6"					Static after ¾" hose running full 75 lbs. For about 13½ hrs. at 191 gpm.
	7:30							
	7:35	272	198'6"	2½	136.67			Motor 854 rpm. Pump 1207
	7:40	315	198'8"	2¼	117.22			
	7:45	318	198'6"	2	98.9			
	7:50	321	199	2	98.9			
	7:55	322	200	2	98.9			
	8:00	323	201	2	98.9			Motor 863 rpm. Pump 1212 RPM
	8:15	328	200	2	98.9			
	8:30	330	201	2	98.9			Considerably clearer 8:25
	8:45	330+	201	2	98.9	70°	54°	No odor
	9:00	331	201	2	98.9			
	9:15	331	201	2	98.9	72°	55°	
	9:30	330	201	1⅞	90			
	9:45	330	201	1⅞	90			
	10:00	330+	201	1⅞	90	74°	55¼°	No odor
	10:15	330	201	1⅞	90			
	10:30	330	201	1⅞	90			
	11:00	331	201	1⅞	90			
	11:30	331	201	1 13/16	86	77°	55¾°	Water clear.
	12:00	330	201	1⅞	90			
	12:30	329	202	1¾	81	79°	56°	
	1:00	330	206	1⅞	90			
	1:30	329	206	1⅞	90	79°	55¼	Sample G25
	1:31							Shut down to surge
	1:50							Start Discharge Broke suction — Surge
	1:51				300±			
	1:51:40							
	2:01							"
	2:02				300±			
	2:02:50							
	2:10				300±			"
	2:11							
	2:12							

9-230

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

File No. { Washington ---------
District ---------

GPO 6—9333

Mason City Well No 8 - Pump test of June 5, 1946

Time	Time since pump started	Depth to water	D.D.									
						Swl - 162'						
8:35a						Pumping started.						
9:20a	45	225	63									
9:26	51	227	65									
10:07	92	231	69									
10:25	110	231	69									
11:15	160	232	70									
11:30	175	233½	71.5									
11:50	195	236	74									
12:30	235	238	76									
1:30	295	235	73									
1:55	320	238	76									
2:03	328	242	80									
2:50	375	245	83									
4:10	455	239	77									
4:18	463	237	77									
	T_1	T_2	T_1/T_2									
4:18:30	463	0	∞			Pumping stopped						
4:20	464.5	1.5	309	73								
4:21	465.5	2.5	186	65								
4:22	466.5	3.5	133	58								
4:23:45	468.25	5.25	89.2	50								
4:25	469.5	6.5	72.2	45								
5:09	512.5	49.5	10.3	13								
5:20	524.5	61.5	8.5	10								

Mason City, Cerro Gordo County

City Well No 8.

Water Levels Furnished by the Water Department

Date	Time	Water Level	
Aug. 14, 1936.		183.55	Static level (7 gpm pumping)
Aug. 22, 1936		182.55	Static Level.
" 22, 1936		210.55	Pumping level 440 gpm.
Aug. 25, 1936		185.55	Static
Aug. 25, 1936		217.55	Pumping
Sept. 7, 1936		176.55	Static
Sept. 9, 1936			
Sept. 9, 1936		192.55	Pumping
Oct. 11, 1936		188.55	Pumping
April 14, 1937		179'55	Static

Mason City, Cerro Gordo County

City Well No 8

2

Subject: Water levels, 1937 — Elevation of point of reference = 1091.16 7/8

Sept. 11.

Well No. 10 working, Wells No 8 & 9 not working. No 7 shut off at 2 pm. Decker Nos. 2 & 3 pumping. Decker No 3. on at 10:00 am.

Time	Water Level	Recovery	Elapsed Time	Water Level Elev.
pm. 2:10	193'9 1/2"			898'1 3/8"
2:20	193'9"	1/2 rec		
2:35	193'1"	8		
2:45	192'10"	3		
* 2:55	192'7 1/2	2 1/2		
3:10	192'4 1/2	3		
3:47	192'1"	3 1/2		
4:10	191'11"	3		
4:45	191'9"	3		
5:10	191'8"	1		

Sept. 12 - City Nos. 7 & 10 pumping. 8 & 9 resting. Decker No. 2 pumping, No. 3 resting

		Di'down
2:00	182'5"	5'
* 2:15	182'10"	5"
2:30	188'3"	3'3"
6:00	186'6"	

Sept. 19 - City Well No. 7 pumping, 8, 9, 10 resting, Decker No 2 (6:00 - 7:30 am), (11:15 to end of day)

2:20	166'4 1/2"		925'6 7/8"
2:30	166'5 1/2"	1	
2:40	166'5 3/4	1/4	
2:50	166'6 1/2	3/4	
3:00	166'7"	1/2	
3:20	166'8"	1	925'2 7/8

See report on City Well No 10

Sept 19 - City Wells 7 & 9 pumping 8 & 10 resting

No. 7 started 7 am. No. 9 started at 3:40 pm.

5:15	170'4"		921'6 7/8
5:20	170'4 3/4	3/4	
5:30	170'6 3/4	2	
5:40	170'8 1/2	1 3/4	
5:50	170'10"	1 1/2	921'0 7/8

MASON CITY, CERRO GORDO COUNTY, WELL No. 8

A well was completed in 1912 for Mason City by W L Thorne, of Platteville, Wisconsin, in Jordan sandstone, with Saint Peter sandstone at 800 (?) feet. The diameters were 16-inch from the surface to 200 feet; 13-inch from 200 to 960 feet; and 10-inch from 960 feet to bottom. The static level when completed was 82 feet. It was originally uncased except for the first 20 feet, but now appears to be cased the first 200 feet with 14-inch, and 100 feet of 12-inch about 600 feet down, shutting out the shale above the Saint Peter sandstone. The cost of the well was $6,295.

In 1932 this well was repaired by Thorpe Bros. They found one 12-foot length of 16-inch cast iron pipe at the surface, seepage and caving below. It was reamed to 24 inches and 100 feet of 20-inch steel casing filled with concrete put in, using 12½ tons sand and 118 sax cement. The 10-inch casing was found at 608 feet. About 100 feet (4 lengths) which were in very bad shape were pulled. More casing, which would not be pulled, was drilled out. Three hundred and sixty feet of 10-inch steel casing was reset, which footed at 800 feet, and this appears to be the top of the Saint Peter sandstone. The well was cleaned up and air lines replaced as follows: 400 feet of 8-inch, and 378 feet of 2½-inch. Thorpe Bros. were paid about $4,500.

The well now is as follows: 20-inch steel casing from the surface to 100 feet; 10-inch steel casing from 440 to 800 feet. On September 13 1932 the water stood at 155 feet. When pumped at 98 pounds pressure, the draw-down was 25 feet.

25/180

From notes of Mr. Peter F. Hopkins
former City Manager

From above
Water levels

1912 = 82' = static
Sept. 13, 1932 = 155' = Static 180 pumping

COPY

STATE OF IOWA
IOWA GEOLOGICAL SURVEY
GEOLOGY ANNEX
IOWA CITY

May 18, 1946

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

Dear Mr. Patchen:

Your letter of May 17 reached me today, and I am glad to learn from it the most recent developments in regard to the drilling of your No. 8 well. I will look forward to receiving the bailer sample taken at 1445' and will get a report of the analysis back to you just as soon as possible.

It is quite understandable that the drilling contractor has decided to case the shale section that has just been drilled, and as you point out, it will have certain advantages for our purpose. Since talking with you yesterday I have spent almost a day reviewing the information that is available on the geology and water possibilities of the rocks below the Jordan sandstone. Enclosed is a sheet showing the succession of formation and members already drilled and to be expected. You may wish to keep this sheet handy for ready reference. We have studied the samples from the No. 8 well for the interval 1225' - 1410' in depth. The dolomite to a depth of 1325' is typical St. Lawrence. The dolomite and siltstone (siltstone is an extremely fine sandstone) from 1325' to 1375' we place in the Franconia along with the gray, pink and brown shales (1375' - 1410') containing dolomite partings.

From your oral description over the phone, we will probably also place in the Franconia the shale and limestone which you reported to a depth of approximately 1442'. The underlying sandstone which forms the present bottom hole formation is probably Ironton (lowest Franconia). Normally the Galesville sandstone immediately underlies the Ironton. The Galesville sandstone, as you can see from the attached sheet, is the topmost member of the Dresbach.

As already mentioned, our estimate of the thickness of the combined Ironton-Galesville is 50 feet, although there is a good possibility that it will reach a thickness of 65' - 70', and contain some shale. For your information alone, this sandstone is supposed to be the producing formation in the famous Murray Iron Works well at Burlington, which was drilled a few years ago by the same drilling contractor who is doing your work.

Because of the potentially great importance of this sandstone, I should like to suggest that sampling of the well cuttings be as complete as possible. This can probably be best accomplished by taking a sample each time the well is bailed and marking the sample for the exact interval drilled.

It will also be important to establish as definitely as possible the mineralogical character of the water, the direction of flow, if that is possible to determine, and a relative estimate of the potential quantity. It is entirely possible that you will not be able to get any data at all on the last two items, but I believe that if you talk with Mr. Bergeson that you should be able to get an additional representative water sample. Purely as a suggestion, you might caution Mr. Bergeson against the possibility of raising the bailer too fast, so that water taken from the sandstone horizon is not replaced by higher water as the bailer is taken from the hole.

Beneath the Galesville is the Eau Claire, composed of green, gray and reddish brown shales, generally containing dolomite and sometimes siltstone. Based on inconclusive evidence, we expect the Eau Claire to be 150' thick, but it could be 25' more or less, i.e., 125' - 175' thick and still be normal.

Immediately beneath the Eau Claire is the Mt. Simon sandstone. Drillers and drilling contractors often refer to this sandstone as the Dresbach, although in more precise terminology it is the lowest member of the Dresbach. No matter what it is called, it is from this sandstone that we all hope good water in large quantity can be developed.

The Mt. Simon has been found to rest on pre-Cambrian in all of the instances where the base of the Mt. Simon has been drilled in Iowa. The pre-Cambrian may be granite or some other igneous rock, or Red Clastics, which are loosely consolidated sandstones sometimes containing shales. We surmise that granite type pre-Cambrian occurs below the Mt. Simon at Mason City. The pre-Cambrian top surface is highly varied. I would not dare hazard a guess on the thickness of the Mt. Simon. As a matter of fact, the pre-Cambrian may be so high that it completely cuts out the Mt. Simon, although I would not expect that to be the case at Mason City. An old well at Blue Earth, Minnesota, reported granite which would occur at an equivalent depth of 1825'± in your No. 8 well.

Water from the lower beds of the well at Blue Earth just mentioned was reported to be "somewhat salty and hard," and the well was plugged back and later filled back so that the apparent lowest water producing formation was the sandstone which now forms the bottom hole formation in your No. 8 well.

This letter has turned out to be much longer than I had originally planned, but I am sending it on to you with the thought that it may be helpful as the work progresses. If you have any questions, please do not hesitate to let me hear from you.

We are sending you two crated gallon jugs for future use.

Very truly yours,

H. G. Hershey

HGH:BH

STATE OF IOWA
IOWA GEOLOGICAL SURVEY
GEOLOGY ANNEX
IOWA CITY

3

Cambrian Sequence of Rock Units
expected at
Mason City, Iowa

Trempealeau formation
- Madison sandstone member)
- Jordan sandstone member) Generally referred to as Jordan sandstone
- Lodi siltstone member)
- St. Lawrence dolomite member

Franconia formation
- Bad Axe member
- Hudson member
- Goodenough member
- Ironton sandstone member

Dresbach formation
- Galesville sandstone member
- Eau Claire shale and dolomite and sandstone member
- Mt. Simon sandstone member

MAY 18 1946

CITY OF MASON CITY
IOWA

HOWARD E. BRUCE
MAYOR

F. C. DESART, CITY AUDITOR
PEARL B. KELLOGG, CITY CLERK
C. E. CORNWELL, CITY SOLICITOR
H. E. WOLFE, CHIEF POLICE DEPT.
JAS. KELLEY, ACTING CHIEF FIRE DEPT.
DR. J. W. LANNON, HEALTH DIRECTOR
CARL B. PATCHEN, WATER SUPERINTENDENT
W. W. WEGNER, CITY ENGINEER
C. W. HAMBLIN, BUILDING COMMISSIONER

COUNCILMEN AT LARGE
H. H. JENNINGS
E. J. KELLY

COUNCILMEN
S. W. LOCK, FIRST WARD
HENRY RHEINGANS, SECOND WARD
FRED STEFFEN, THIRD WARD
E. EMIL KOERBER, FOURTH WARD

May 17, 1946

Mr H J Hershey
State Geological Survey
Iowa City Iowa

Dear Hersh

After I talked with you this morning, I had a long talk with Tom Thorpe. As I expected, he was very anxious to run the pipe in before going through the sand. This of course will give us definite information on what is in the sand and may work out for the best; however, it also may mean pulling all the pipe and reaming the hole out to 10" at a later date, nevertheless, he was very positive and under the conditions there was not much I could do.

We took a bailer sample at 1445' this morning and I will get it expressed to you today.

I imagine it will be a week or more before we get the pipe set, but will keep you advised as to the progress. Incidentally, it might be of interest to you to know that Thorpe dwelt considerably on the Mount Pleasant well and suggested if Howard Green, and somebody else whose name I did not understand, had not been so anxious to save money and go on without putting pipe in that all would have been well. This, of course, doesn't exactly check with what I had heard. He also seemed to be of the opinion that we might run into chlorides in the higher strata as rather than in the lower formations.

Would appreciate a note from you on the water sample as soon as the results are available.

With best regards, I am

Very truly yours
CITY OF MASON CITY

C B Patchen, Supt
Water Works

P S Just spent quite a while searching for a gallon jug. If you have plenty on hand could you send one up because we will surely have occasion to use it before this job is over. Thank you.

C B P

Measurement of static water level in City Well No. 8

S.W.L. = 177.59' feet below top of plate over casing at hole on West side.
at 2:05 p.m., July 10, 1942

Airgage reading = 68'

Recorder pen set to conform to measurement of electric line.

C.B.P. and K.E. A.
7/10/42

THORPE BROTHERS WELL COMPANY

Drilled for Mason City Waterworks at Mason City, Iowa

Well No. 8 Kind of Well Drilled Depth 1219'

Record of Permanent Pipe

Size Pipe	Amount of Pipe	Depth to Bottom of Pipe	Depth to Top of Pipe
20"	99'	99'	Surface
10"	361'	710'	349'

QUESTIONED BY McKEE. THINKS 125! 12"

Recased by us in 1932.

Kind of Soil or Formation

16" HOLE 100 to top of 12" (?) CASING

No record of formation as not drilled by us.

Air lift.

AIR LIFT. 8" Disch - 2½" INSIDE AIR.

BOTT 8" — 468' ± BELOW UPPER FLOOR

From Thorpe Brothers Well Co. October 1937

THORPE BROTHERS WELL COMPANY

Drilled for Mason City Waterworks at Mason City, Iowa

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Mason City Well 8 - June 5, 1946