

U. S. DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Water Resources Division Well Schedule Form

MASTER CARD

Record by P.J. Horick Source of data Files Date 5/27/65 Map H. & T.

State Iowa County Emmet Sequential number: 32

Latitude: 43 23 56 N Longitude: 09 45 3

Local well number: 09934W Other number: W-1243

Local use: 01293 Owner or name: ESTHERVILLE

Owner or name: ESTHERVILLE Address: Estherville, Iowa

Ownership: County, Fed Gov't, City, Corp or Co, Private, State Agency, Water Dist M

Use of water: Air cond, Comm, Dewatering, Fire, Dom, Irr, Ind, P S, Stock, Instit, Unused P

Use of well: Anode, Drain, Seismic, Obs, Oil-gas, Recharge, Spring, Test, Unused, Withdraw, Waste, Destroyed W

DATA AVAILABLE: Well data 2 Freq. W/L meas.: IRREGULAR Field aquifer char. T

Hyd. lab. data: 73

Qual. water data; type: COMPLETE 74 C

Freq. sampling: IRREGULAR Pumpage inventory: yes 75 no, period: 76

Aperture cards: 77

Log data: GEOLOGIST LOG 78 G

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 759 ft Meas. accuracy 6

Depth cased: 461 ft Casing type: STEEL Diam. 16 in

Finish: porous concrete, gravel w. concrete, (perf.), (screen), (H) horiz. open, (O) gallery, end, (P) perf., (S) ad. pt., (T) shored, (W) open hole, (X) other X

Method Drilled: air bored, cable, dug, rot., (A) rot., (B) cable, (C) dug, (D) rot., (H) jetted, (J) air reverse, (P) percuss., (R) rotary, (T) driven, (V) wash, (W) drive, (X) other, (Z) 72

Date Drilled: 1940* Pump intake setting: 9:40 ft 73

Driller: Thorpe Well Co. (1940) Varner Well Co. (1955)

Lift (type): air, bucket, cent, jet, multiple, multiple, (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple, (M) multiple, (N) nose, (P) piston, (R) rot., (S) submerg, (T) curb, (V) other, (W) other, (Z) 74

Power (type): diesel, elec, gas, gasoline, hand, gas, wind, H.P. 75 Trans. or meter no. 76

Descrip. MP LSD above ft below lsd, Alt. MP 1270

Alt. LSD: 1270 Accuracy: 7

Water Level 85 ft above below MP; FC below lsd Accuracy: DRILLER'S LOG 77 3

Date meas: 1940 Yield: 1200 gpm Method determined 78 6

Drawdown: 6 ft Accuracy: 6 hrs 79 6

QUALITY OF WATER DATA: Iron 1.8 Sulfate 540 Chloride 1.5 Hard. 820

Sp. Conduct 1600 K x 10⁶ Temp. 48 Date sampled 16 DEC. 1969 80 D 6 9

Taste, color, etc.

* Original depth 381'; deepened in 1955 to 759

Well Number 43 23 56 N 094 50 13.1 S

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD Physiographic Province: **ENTRAL LOWLAND 1:2** Section: **WESTERN**

LAKE Drainage Basin: **DES MOINES 2:5:8** Subbasin: _____

Topo of well site: local depression, flat surface, hilltop, hillside, terrace, valley flat, _____

MAJOR AQUIFER: **Cambrian, St. Croixan 3:3** **Jordan Sandstone 5:J**

Lithology: **FINE SANDSTONE 2:V** Origin: **MARINE 6** Aquifer Thickness: **104** ft

Length of well open to: **104** ft Depth to top of: **625** ft **6:2:5**

MINOR AQUIFER: **Ordovician, Charzian 4:2** **St. Peter Sandstone M:P**

Lithology: **FINE SANDSTONE 2:V** Origin: **MARINE 6** Aquifer Thickness: **85** ft

Length of well open to: **64** ft Depth to top of: **440** ft **4:4:0**

Intervals Screened: _____

Depth to consolidated rock: **105** ft **1:0:5** Source of data: **WELL CUTTINGS 4:C**

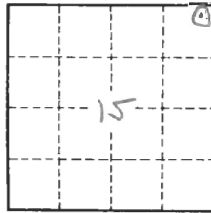
Depth to basement: _____ ft _____ Source of data: _____

Surficial material: **SANDY TILL 7:7** Infiltration characteristics: **POOR 7:4**

Coefficient Trans: _____ gpd/ft _____ Coefficient Storage: _____

Coefficient Perm: _____ gpd/ft²; Spec cap: _____ gpm/ft; Number of geologic cards: _____

Casing: 461' of 16" pipe set in top of St. Peter



Quality of water when well was 381' deep:

Fe 1.2

SO4 539.

Cl 2.5

Hard. 740

Sp. Cond. 1360

Date sampled 9/52

SEE SEQ #2 for SHALLOW WELL (DAKOTA)

UNITED STATES DEPARTMENT OF THE INTERIOR

Geological Survey
Water Resources Division

Local Well No. 099-34W-15AAA

Aquifer Code(s) KIDZ

Water Quality
(ppm)

Owner's Name ESTHERVILLE CITY #41940

W Number 1243

Card Q

State: Iowa 1 | 9 County: EMMET 3 | 2 Town: ESTHERVILLE, IA.

Well No. 4 | 3 | 2 | 3 | 5 | 6 | N 0 | 9 | 4 | 5 | 0 | 1 | 3 Seq. No. 2 Date 0 | 9 | 1 | 6 | 5 | 2

Sampling Depth 3 | 8 | 0 Type 1 Kx10⁶ 1 | 3 | 6 | 0 pH 7 | 1 Temp. °F

SiO₂ Ca 1 | 9 | 2 Mg 6 | 3 Na 5 | 9 K 5 | 5

HCO₃ 3 | 0 | 7 CO₃ 1 | 7 SO₄ 5 | 3 | 9 Cl 2 | 5 Source No. 3 Q

Card R

Duplicate Columns 1-25 from Card Q

F 5 NO₃ 8 | 1 PO₄ B Al Fe 1 | 2

Mn 0 Cu Pb Zn

Determined 1 | 1 | 7 | 0 Solids Calc. Ca, Mg 7 | 4 | 0 Hardness Non-Carb. 4 | 6 | 0

Color No. R

Card S

Duplicate Columns 1-25 from Card Q

Br I Alk. as CaCO₃ 2 | 8 | 0 Free CO₂ SAR

RSC ABS

Alpha (pc/l) Beta (pc/l) Ra (pc/l) U (ug/l)

No. S
80

Recorded by: D. AARONSON

Punched by: T Date: _____

Published: _____

UNITED STATES DEPARTMENT OF THE INTERIOR

Geological Survey
Water Resources Division

Local Well No. 099-34W-15AAA

Aquifer Code(s) C35J

Water Quality
(ppm)

Owner's Name ESTHERVILLE, IOWA #4

W Number 1243

Card Q

State: IOWA County: EMMET Town: ESTHERVILLE, IA.

Well No. 432356N Seq. No. 1 Date 101160

Sampling Depth 759 Type 1 Kx10⁶ 1510 pH 7.1 Temp. °F 54

SiO₂ 251 Ca 231 Mg 561 Na 611 K 50

HCO₃ 505 CO₃ 0 SO₄ 5061 Cl 1 Source No. 3 Q

Card R

Duplicate Columns 1-25 from Card Q

F 5 NO₃ 53 PO₄ 1 B 1 Al 1 Fe 16

Mn 24 Cu 1 Pb 1 Zn 1

Determined 987 Solids 1 Ca, Mg 810 Hardness 396

Color 1 No. R

Card S

Duplicate Columns 1-25 from Card Q

Br 1 I 1 Alk. as CaCO₃ 414 Free CO₂ 1 SAR 1

RSC 1 ABS 1 1

Alpha (pc/l) 1 Beta (pc/l) 1 Ra (pc/l) 1 U (ug/l) 1

No. S
80

Recorded by: D. ARONSON

Punched by: T Date: _____

Published: _____

UNITED STATES DEPARTMENT OF THE INTERIOR

Geological Survey
Water Resources Division

Local Well No. 099-34W-15AAA

Aquifer Code(s) C355

Water Quality
(ppm)

Owner's Name ESTHERVILLE CITY#4

W Number 1243

Card Q

State: IOWA 1 9 County: EMMET 3 2 Town: ESTHERVILLE IOWA

Well No. 4 3 2 3 5 6 N 0 9 4 5 0 1 3 Seq. No. 1 Date 0 4 0 4 5 6

Sampling Depth 7 5 9 Type 1 Kx10⁶ 1 5 0 0 pH 7.5 Temp. °F

SiO₂ 2 4 1 Ca 2 2 2 Mg 6 3 1 Na 5 3 1 K 5 3

HCO₃ 4 7 8 CO₃ 0 SO₄ 5 3 4 1 Cl 5 1 0 3 Q

Card R

Duplicate Columns 1-25 from Card Q

F 4 NO₃ 0 PO₄ B Al Fe 1 5

Mn 2 7 Cu Pb Zn

Determined 1 1 9 0 Solids Calc. Ca, Mg 8 1 4 Hardness Non-Carb. 4 2 2

Color No. R

Card S

Duplicate Columns 1-25 from Card Q

Br I Alk. as CaCO₃ 3 9 2 Free CO₂ SAR

RSC ABS

Alpha (pc/l) Beta (pc/l) Ra (pc/l) U (ug/l)

No. S
80

Recorded by: D. AARONSON

Punched by: J Date:

Published:

UNITED STATES DEPARTMENT OF THE INTERIOR

Geological Survey
Water Resources Division

Local Well No. 099-34W-15AAA

Aquifer Code(s) C35J

Water Quality
(ppm)

Owner's Name ESTHERVILLE CITY#4

W Number 1243

Card Q

State: Iowa 1 9 County: EMMET 3 2 Town: ESTHERVILLE, IOWA

Well No. 4 3 2 3 5 6 N 0 9 4 5 0 1 3 Seq. No. 1 Date 1 2 2 9 5 4

Sampling Depth 7 5 9 Type 1 Kx10⁶ 1 4 9 0 pH 7 7 Temp. °F

SiO₂ Ca 2 2 2 Mg 7 0 Na 4 2 K 6 0

HCO₃ 4 9 8 CO₃ 0 SO₄ 5 2 6 Cl 4 0 Source No. 3 Q

Card R

Duplicate Columns 1-25 from Card Q

F 4 NO₃ 0 PO₄ B Al Fe 1 7

Mn 0 Cu Pb Zn

Solids Hardness

Determined 1 1 7 0 Calc. Ca, Mg 8 4 2 Non-Carb. 4 3 4

Color No. R

Card S

Duplicate Columns 1-25 from Card Q

Br I Alk. as CaCO₃ 4 0 8 Free CO₂ SAR

RSC ABS

Alpha (pc/l) Beta (pc/l) Ra (pc/l) U (ug/l)

No. 5
80

Recorded by: D. AARONSON

Punched by: + Date:

Published:

UNITED STATES DEPARTMENT OF THE INTERIOR

Geological Survey
Water Resources Division

Local Well No. 099-34W-15AAA

Aquifer Code(s) C35J

Water Quality
(ppm)

Owner's Name ESTHERVILLE CITY#4

W Number 1243

Card Q

State: Iowa 19 County: EMMET 32 Town: ESTHERVILLE, IA.

Well No. 432356N Longitude 0945013 Seq. No. 1 Date 121669

Sampling Depth 759 Type 1 Kx10⁶ 1600 pH 70 Temp. °F 48

SiO₂ 221 Ca 208 Mg 731 Na 621 K 621

HCO₃ 499 CO₃ 0 SO₄ 5401 Cl 15 Source No. 3 Q

Card R

Duplicate Columns 1-25 from Card Q

F 6 NO₃ 4 PO₄ 18 B 18 Al 18 Fe 18

Mn 25 Cu 15 Pb 15 Zn 15

Determined 1220 Solids 1220 Calc. 1220 Ca, Mg 820 Hardness Non-Carb. 411

Color 12 No. R

Card S

Duplicate Columns 1-25 from Card Q

Br 121 I 121 Alk. as CaCO₃ 409 Free CO₂ 121 SAR 121

RSC 121 ABS 121 121 121

Alpha (pc/l) 121 Beta (pc/l) 121 Ra (pc/l) 121 U (ug/l) 121

No. 5
80

Recorded by: D. AARONSON

Punched by: T Date: _____

Published: _____

#4

Estherville Iowa

Sept, 6, 1940, 2

Dr. H. G. Hershey
Iowa Geological Survey
Iowa City, Iowa.

~~Copy~~

Dear Mr Hershey:

We checked the static head in the well a Ft. Defiance State park. It was 273' 8" from top of cone or cellar and 265' from pump base. [268' $\frac{1}{2}$ from ground surface where elev. ^{1476'} was taken 3/4/21]

I looked up the static head on test hole no. 1 for city. May 25, 1940 Depth 260' sandstone, static head 48' 6". May 27, 1940 Depth 294' gray shale static head 68' 4". June 1, 1940 Depth 381' sandstone static head 71' 10". June 3, 1940 " " " static head 70' 6".

We hit the sandstone at 232' and gray shale at 282' and sandstone again at 307' to 381'. We hit a light gray shale at 381' where we stopped.

I am always willing to cooperate any time that you feel I can supply any information.

Yours truly

Wymon Ellis

Estherville, Iowa,

Genl. Del.

September 10, 1940

Mr. Wyman Ellis
General Delivery
Estherville, Iowa

Dear Mr. Ellis:

Thank you very much for your letter of September 6 containing the static water level in the Fort Defiance State Park well and the data on the log and water levels in the new Estherville city well. I appreciate very much your courtesy and cooperation in furnishing this information.

According to the levels which I ran when I was in Estherville the elevation of the top step leading down to the Fort Defiance State Park well is 1476 feet above sea level and the elevation of ground surface at the new Estherville City well is 1270 feet.

I hope to make another trip to northwestern Iowa in the near future and will visit Estherville at that time. Meanwhile, I hope that your work there goes along smoothly.

Very truly yours,

H. G. Hershey

HGH:N

To Drill Deeper at Well No. 4

By BERNICE SCHUMACHER

The city council moved to drill deeper at well No. 4 last night in hopes that another deep well might be developed similar to the new one at the water treatment plant.

The action came after Supt. of Public Works, Larry Madden announced that the pump has been retrieved successfully from No. 4.

The council instructed the city attorney and superintendent to draw up specification for a letting to drill deeper so that it might be done as soon as possible. Estherville's water supply is dependent upon it.

At a meeting last week, City Clerk Glenn L. Story told councilmen that they could expect criticism from state examiners for not holding a public letting on No. 5 because its cost totalled considerably over the \$5,000 limit which legally requires a letting.

However, the concensus of the council was that it was an emergency and they would rather face two state examiners than 7,000 irate citizens when there was no water.

Madden recommended that the screen in No. 4 and the 12 - inch casing be pulled and it be charged as repairs under \$5,000 for the old well. The council then could hold a letting for drilling deeper in the well.

Since the 12-inch hole already extends about 400 feet down, the council felt the drilling should proceed more rapidly than at an entirely new location.

Councilman Kenneth Kautz computed that the city needs about 1,400 gallons a minute. The maximum that new No. 5 will put out is 1,200 gallons and under present pumping facilities is putting out about 800.

Madden said that No. 3 in the east part of town is pumping out 500 gallons a minute but beyond that it pumps mud.

Madden also reported back that he could not put in the curb and gutter along the downtown streets scheduled for widening this fall with city help. He said that the job would have to be let to a private contractor and asked that the council entertain a motion for a new letting on the work.

The work had been awarded to the Fagre Construction company by a four to one vote of the council last month but the mayor vetoed it because, he said, members of the company are "city officials." Fagre's was the only bidder on the project.

Estherville (Emmet)

Varner Co. Gets Contract For City Well

BY IRV GROSSMAN

At a special session of the city council held yesterday afternoon, the council adopted a resolution to award the contract for work on well No. 4 to the Varner Well and Pump Co. of Dubuque.

The special meeting was called by the city clerk under instructions of Councilmen Rost, Soper and Kautz. The vote for adoption was unanimous. Councilman Lyman was absent from the meeting.

The council action came as a complete suprise after council members were hopelessly dead - locked at the Thursday night meeting. At that time Rost and Soper refused to adopt a resolution awarding the contract to the Thorpe Well Co. of Des Moines. Soper felt that the Varner Co. deserved the contract on the basis that the company turned in the lowest of four bids received for the work specified.

Robinson and Kautz were in favor of awarding the contract to the Thorpe Co. Robinson said that he was willing to sacrifice the difference in bids for immediate construction, since Thorpe had his equipment over the hole and was ready to drill.

Kautz indicated that he lacked confidence in the Varner Co.

The sudden council action of yesterday afternoon may have been prompted by the awareness, through advice of the city attorney, that any contract that the council would award after mid -

night yesterday would not be valid.

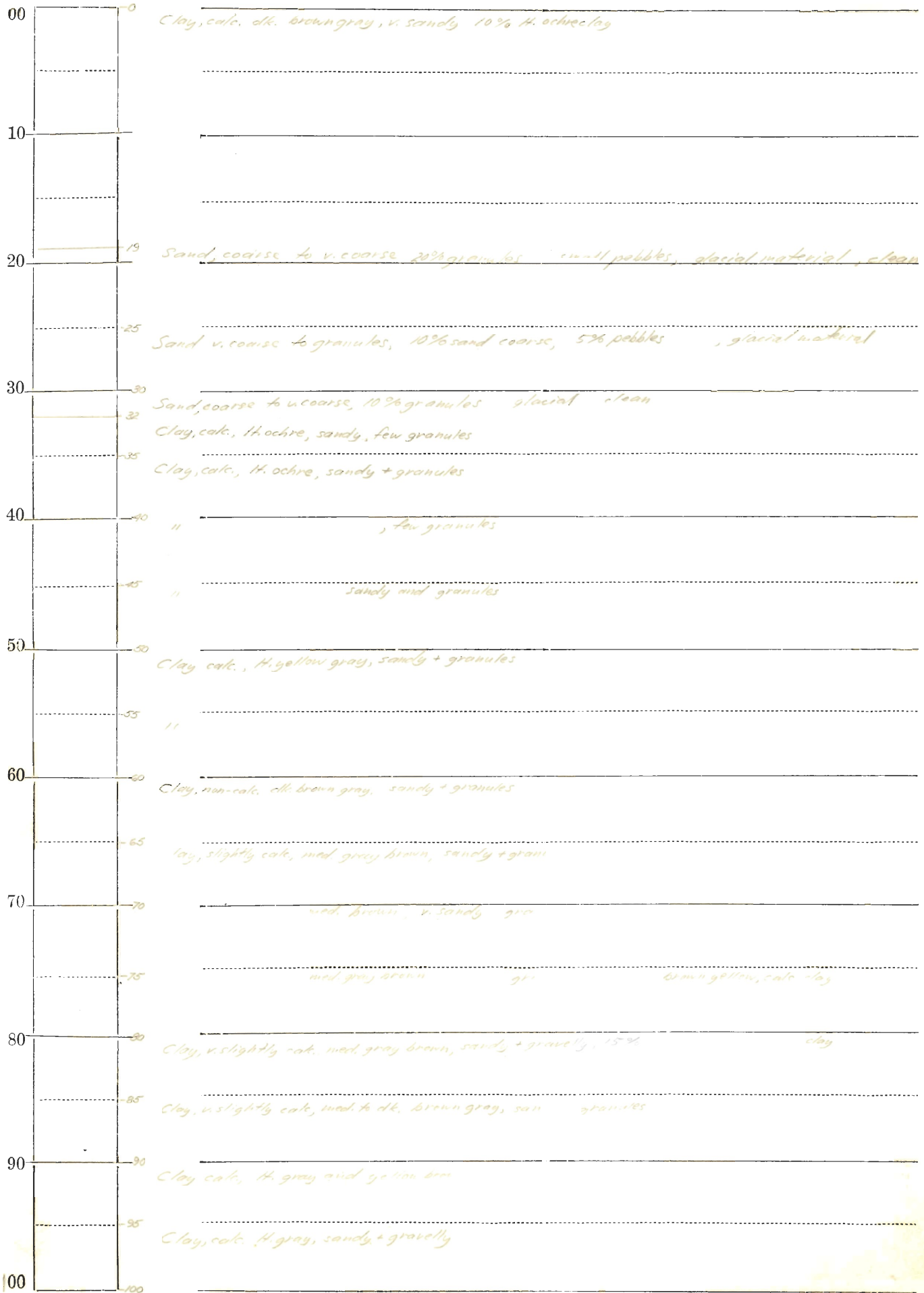
The council had specified in its advertisement for bids, that a contract would be awarded no later than 10 days after the bids were received. The 10-day period was terminated yesterday.

If there was no council action on awarding a contract within the 10-day period, all bids automatically would be rejected and a new bidding procedure would have to be established. This would involve a 30-day period for advertising for bids, and the council believed that it would be better to iron out any differences and award the contract immediately rather than be forced to wait another month before any work could be undertaken.

The Varner Well and Pump Co. has advised the council that it will be ready to start work on the extension of well No. 4 within a week of the awarding of the contract.

Plans are for an additional 300 feet to be drilled on the present well and to cap the pipe at the top of the St. Peter level.

Location Emmet Co Date Drilled 1920 Analyst Elias

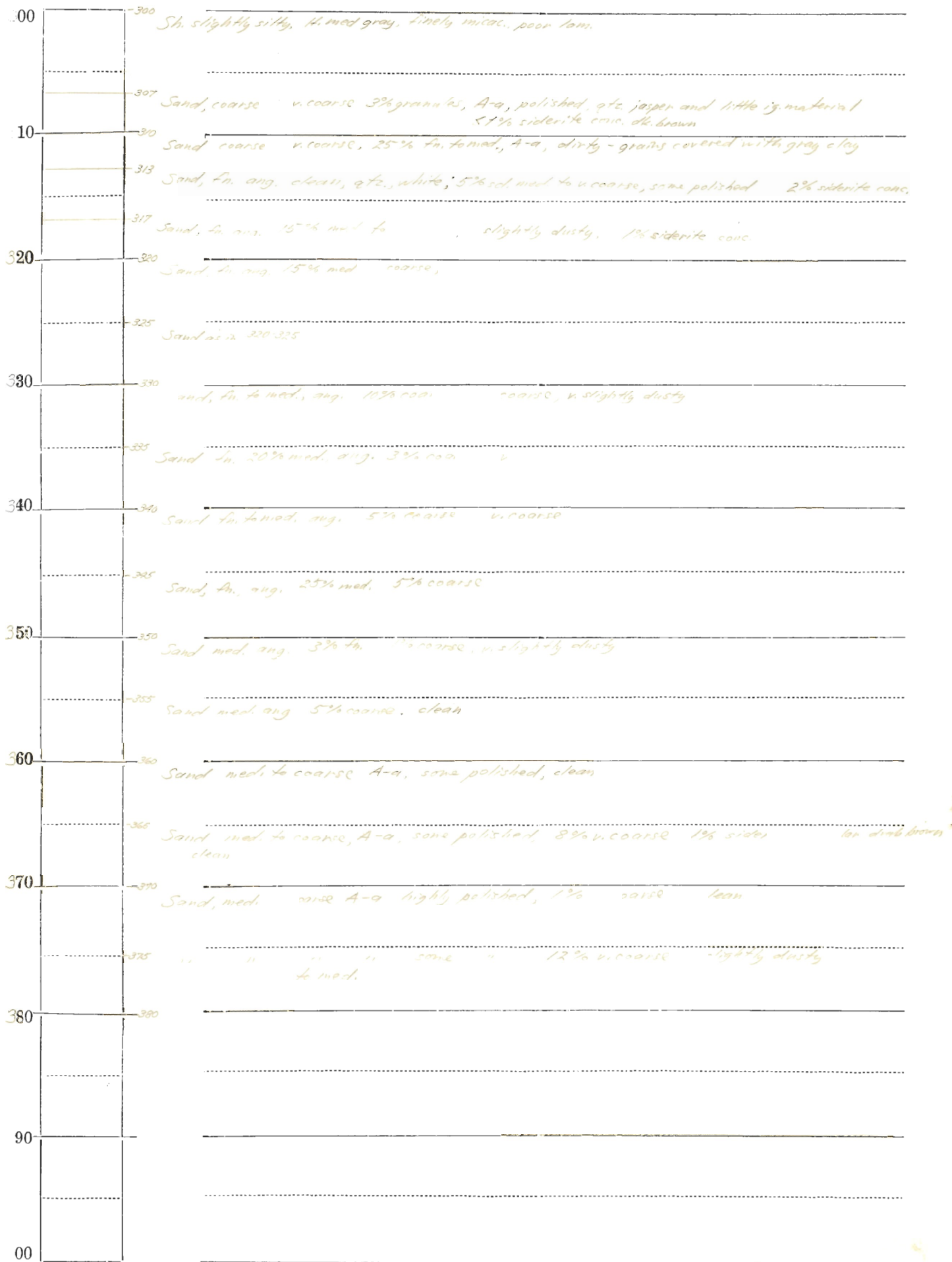




Location Emmet Co. Date Drilled 1940 Analyst Elias



Location Emmett Co. Date Drilled 1940 Analyst Elias



IOWA GEOLOGICAL SURVEY
Water Well Data Sheet

Survey Number **W-1243**

E.

Town Estherville County Emmett T. 99 N., R. 34 W.

Name City Well #4 Location NE NE 1/4 NE 1/4, Sec. 15

Contractor Thorpe Well Co Driller Ray McGrew - Wyman Ellis Use Drilling

Construction _____ Drilling Dates May 11, .. Depth _____

Topog. Valley of Des Moines River Elev. _____ Ref. _____ Total Depth 381

Final _____ above _____

Static Level _____ below Pumping Level _____ Draw down _____ gpm _____ Time pumped _____ Date _____

Depth to bot. pump _____ ft. with _____ ft. suction pipe. Calc. g/ft. _____ Prin. _____ Prod. _____

Producing _____

Horizons _____

Water levels and pumping tests on various horizons during drilling:

Depth Range	Stat. Level	Pump Level	Draw down	gpm.	Temp.	Producing horizons	Producing formations	Formations cased out

Additional information S.W.L. 7 1/6 W side hole. Ellis reports 7 1/6

Laboratory Data

Sample range 0-380 Number samples 76 Number Duplicates 76 Cond. Good
Log No. Drillers Boxed Summerford Range 0 380 Date Sept 10, 1940

Remarks Cut made for Gulf (123) (0 380) (76 sp/s.) Sept. 10, 1940.

Microscopic Study Range _____ Strip Log _____ Gen. Log _____ Blue Print _____ Samples Washed _____
Insol. Res. Study Range _____ Strip Log _____ Gen. Log _____ Insol. Res. Prepared _____ Well Corel. _____

JUL 27 1955

VARNER WELL AND PUMP CO. *Established 1906*

WATER WELLS - DEEP WELL PUMPS - WELL REPAIRS - SOUNDINGS

Contractors _____

POST OFFICE BOX 237—TEL. DUBUQUE 3-8226
905 AMERICAN TRUST BUILDING
D U B U Q U E , I O W A

July 26, 1955

Iowa Geological Survey
Geology Annex
Iowa City, Iowa

Gentlemen,

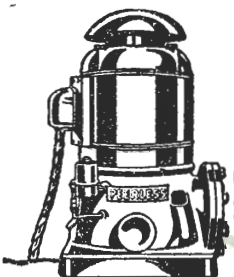
Enclosed is a copy of the driller's log
of Well No. 4 in the City of Estherville.

I.G.S.
W-1243

This work was completed in January of
this year.

Yours very truly
VARNER WELL & PUMP CO.

R. J. Braun



(DISTRIBUTORS OF PEERLESS PUMPS)

DATE STARTED November 1954 DATE COMPLETED January 1955

DEPTH 759'

DIAMETERS 19" to 310'; 16" to 613'; 15" to 759'

CASING 461' of 16" pipe

LOCATION Sec. 15 Twp. 99N, R34W

COUNTY Emmett

STRATA RECORD

Depth		Thickness	Description of Beds
From	To		
375	385	10	Sand, gravel
385	400	15	Shale, blue & solid
400	420	20	Blue shale
420	423	3	Brown shale & brown lime
423	425	2	Brown limestone, trace of gray
425	430	5	Limestone, very hard
430	432	2	Brown shale
432	435	3	Gray limestone
435	438	3	Lime, gray & hard
438	448	10	Sandstone
448	460	12	Sandstone
460	465	5	Soft sandstone
465	505	40	Sandstone
505	508	3	Sandstone, streak of shale
508	510	2	Sandstone, traces of shale & mud
510	515	5	Sandstone, some shale
515	520	5	Sandstone
520	525	5	Sandstone, traces of rock
525	527	2	Sandstone, broken formation very hard
527	530	3	Soft sandstone, broken formation
530	538	8	Gray rock
538	544	6	Hard rock
544	555	11	Hard gray lime
555	565	10	Hard white lime
565	579	14	Hard gray rock
579	586	7	Hard rock
586	595	9	Hard limestone
595	605	10	Limestone
605	609	4	Hard rock
609	617	8	Sandstone & hard lime
617	621	4	Sandstone, hard
621	624	3	Sandstone, light
624	645	21	Fine white sand
			CITY OF ESTERVILLE, IOWA

<u>Depth</u>		<u>Thickness</u>	<u>Description of Beds</u>
<u>From</u>	<u>To</u>		
645	650	5	Fine white sand, very hard
650	665	15	Sandstone, hard
665	670	5	Sandstone & lime rock
670	695	25	Sand rock, no lime
695	705	10	Sandstone
705	730	25	Sandstone
730	735	5	Sandstone, hard limestone
735	740	5	Lime & shale
740	744	4	Shale, muddy
744	748	4	Shale & rock
748	759	11	Very hard gray limestone

STATIC WATER LEVELS

<u>From</u>	<u>To</u>	<u>Level</u>
465	505	115
505	527	97
527	579	95
579	595	93
595	621	95
621	695	90
695	705	88
705	744	90
744	759	85

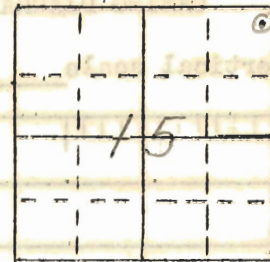
IOWA GEOLOGICAL SURVEY
In Cooperation with U. S. Geological Survey

W-1293

RECORD OF WELL

Location:

Town: Estherville (NE) County Emmet
(SW)
NE-NE-NE sec. 15 T 99 N., R. 34 W. Estherville Twp.



Well name and number TOWN WELL #4

Owner _____ Address _____

Tenant _____ Address _____

Contractor THORPE WELL CO. Address _____

Drillers RAY MCGREW & WYMAN ELLIS

Drilling dates May 11, 1940

Well data:

Elevations: Drilling curb 1270 feet; Land surface _____ feet

1256 NAMiner

1261.401 Estherville City East. 1954

Determined by A.H. H.G. Hershey

Topographic position: Valley of Des Moines River.

Total depth: Reported 750 feet, Measured _____ feet

Drilling method CABLE TOOLS

Hole and casing data WELL DEEPENED TO 750' BY VARNER WELL CO.

ORIGINAL TOTAL DEPTH 381'

Original depth to water 71'6" ^{above} ft. curt ^{below} Date _____

Original elevation of water level _____ ft.; Source of data _____

Sources of water: Principal Dakota ; Others _____

JORDAN - ST. LAWRENCE

Production data:

ATACI Date _____

Static depth to water 71'6" Measuring point _____
 Pumping level _____ at 750 g.p.m.

Remarks	Latitude	Depth to water	Date

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

Pump data: Type pump _____ 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 _____

WATER ANALYSES (in parts per million)

Date samples	_____	_____	_____
Sampled by	_____	_____	_____
Total solids	_____	_____	_____
Insoluble matter	_____	_____	_____
Alkalinity (Meo)	_____	_____	_____
Alkalinity (Phn)	_____	_____	_____
pH	_____	_____	_____
Fe ₂ O ₃ + Mn ₂ O ₃ +Al ₂ O ₃	_____	_____	_____
Alkali as sodium	_____	_____	_____
Calcium	_____	_____	_____
Magnesium	_____	_____	_____
Iron (unfiltered)	_____	_____	_____
Manganese	_____	_____	_____
Nitrate	_____	_____	_____
Fluoride	_____	_____	_____
Chloride	_____	_____	_____
Sulfate	_____	_____	_____
Bicarbonate	_____	_____	_____
Hardness (ppm)	_____	_____	_____
Hardness (gpg)	_____	_____	_____
Remarks	_____	_____	_____

Laboratory data:

Sample storage location _____

Sample range 0-380 No. spls. 76 No. dupls. & cond. 76 good

Spls. prepared by Summerford Washed range _____ by _____

Driller's log and cond. _____

Insoluble residues: Prepared by _____ Studied by _____ Strip log _____

Microscopic study 0-380 Gulf, Elias strip log March 1941 Gulf; Sept. 12, 1940 Elias

Gen. log _____ Correl. by Carmody, M.M. Elias

Cut made for Gulf 0-380 385-750 NONTWP 212155