

6W - Marion County

November 29, 1971

Mr. R.R. Pim, State Director
Farmers Home Administration
873 Federal Building
210 Walnut Street
Des Moines, Iowa 50309

Dear Mr. Pim:

On November 19 you wrote us concerning groundwater forecasts of available shallow prospects for eight widely scattered communities around Iowa.

Enclosed are copies of previous reports I made on the groundwater conditions both shallow and deep, at five of these communities--Dallas, Atalissa, Deep River, Derby and Drakesville. As soon as possible I will review the shallow aquifer possibilities at Conway, Yorktown and Archer and forward these additional reports to you.

I trust this is the information you wanted. Should the accompanying reports raise any questions or if I can be of additional assistance in these matters, please feel free to write me.

Very truly yours,

Paul J. Horick
Chief of Groundwater Geology

PJH:cs
Enclosures

Comments on the Geology and
General Ground-Water Conditions at
Dallas-Melcher, Iowa

The following discussion represents an interpretation of the available hydrogeologic data in the files of the Iowa and U. S. Geological Surveys.

The communities of Dallas and Melcher are located on high ground mostly in sec. 11, T.74N., R.21W., (Dallas township) Marion County, but include the south quarter of sec. 2 of Dallas township. This is in the southwestern part of the County about eight miles southwest of Knoxville. Surface elevation varies from about 920-950 feet above sea level. Based on the higherelevation as a starting point, a generalized log of the anticipated underlying geologic units down through the St. Lawrence Dolomite is outlined as follows:

<u>Geologic unit</u>	<u>Thickness (ft)</u>	<u>Depth Range (ft)</u>
Quaternary System		
Pleistocene Series (glacial drift, may include some sand and gravel within or at base)	50-115	0-80±
Pennsylvanian System		
Des Moines Series (mostly shale, usually some sandstone, minor coal, trace of limestone)	420±	80±-500±
Mississippian System		
Warsaw-Keokuk-Burlington Formations (mostly dolomite, some limestone, considerable chert, trace of shale)	95	500±-595
Hampton Formation (limestone and dolomite, some chert in lower half)	100	595-695
Starrs Cave Limestone	25	695-720
Prospect Hill Siltstone	5	720-725
Devonian System		
Maple Mill Shale	35	725-760
Lime Creek Formation (limestone and dolomite, minor shale)	120	760-880
Cedar Valley Formation (limestone at top, underlain by dolomite, contains gypsum-anhydrite in lower 2/3's)	330	880-1210
Wapsipinicon Formation (dolomite with gypsum-anhydrite interbedded)	100	1210-1310
Silurian System?		
Undifferentiated dolomite	25	1310-1335
Ordovician System		
Maquoketa Formation (shale in upper part, dolomite with considerable chert below)	230	1335-1565
Galena Formation (dolomite, some limestone, minor chert in lower half)	185	1565-1750

<u>Geologic unit</u>	<u>Thickness(ft)</u>	<u>Depth Range(ft)</u>
Decorah-Platteville Formations (limestone and dolomite, may include minor shale)	80	1750-1830
St. Peter Sandstone	35	1830-1865
Prairie du Chien Formation (dolo- mite, sandy in upper half; no sand in lower half, but some chert)	445	1865-2310
Cambrian System		
Jordan sandstone, may have some dolomite	55	2310-2365
St. Lawrence Dolomite	100+	2365-2465+

Some adjustments probably will be necessary on all these depth estimates owing to local variations in the structure and thickness of the beds and taking into account the fact that the nearest deep wells are a considerable distance away.

The combined population of these two communities according to the 1960 census is 1,259. Their water requirements probably will be about 50,000-100,000 gpd unless they have some unusually large water users. At present Melcher obtains its water from several shallow wells finished in sand layers in the glacial drift at depths ranging from about 40 to 110 feet. The productions are not large and the water contains enough water in solution to require treatment for removal. Dallas is not reported to have a public water system and may obtain its water from Melcher.

A large number of test wells were drilled in the unconsolidated materials in past years which led to the development of the existing shallow wells. All of these tests are believed to have been drilled in the general vicinity of Melcher. There is no data indicating the communities explored the aquifer potential of the White Breast Creek alluvium a few miles to the north. Perhaps they could try this if they wish to make a thorough investigation of all possibilities. Most of the valley floor of White Breast Creek will be above the level of Lake Red Rock expected during maximum pool stage. Thus it might be possible to develop a shallow well field there if a reasonably thick alluvial sand can be found. One of the most objectionable features of this type of water system is the long and costly pipeline construction that would be needed to bring the water over to the towns.

Formerly, Melcher had a well completed in the top of the Mississippian rocks at 515 feet. The original test delivered 75 gpm with a drawdown of 50 feet from a static head of 175 feet. The water was found to be extremely hard and to have more than 3,000 parts per million sulfate. Subsequently, the well was found to be depositing

excess iron that necessitated repeated cleanings of the pump. This well probably has been abandoned.

Highly mineralized water is also anticipated in the Devonian and Galena Formations in this part of Iowa.

Productions of 50 to 100 gpm or so might be found in the St. Peter Sandstone, but wells that go this deep almost always find it more profitable to continue to the Jordan Sandstone. Furthermore, there is some question about the quality of the water in the St. Peter.

The Jordan Sandstone and associated dolomite strata at about 2,250 to 2,400 feet seems to be the most promising aquifer for large capacity wells in this area. Successful wells have been completed in this aquifer in recent years at Knoxville, Pleasantville, Milo, Indianola, and Russell. Productions of several hundred gallons a minute of acceptable quality water are practically assured from this zone and by developing the wells extensively the yields may be increased to 1,000 gpm or more. The general construction plan for Jordan wells is to set casing from the surface into the top of the Prairie du Chien Dolomite and grout the pipe in place with neat cement to provide a good seal. This should prevent any mixing of the water in the upper and lower beds. The piezometric head of the Jordan aquifer is estimated to lie about 260 feet below the surface at Dallas-Melcher.

Several mineral analyses showing the quality of water in the Melcher wells and in deep Jordan wells in the surrounding area are summarized on a separate sheet appended to this report.

To conclude, the Jordan aquifer appears to be the most promising source for a large capacity well at Dallas-Melcher. The water should be as good as the water from the existing shallow wells and probably will be lower in iron. The fluoride content may be a bit higher than desirable however. The towns might consider drilling some exploratory wells in the alluvium of White Breast Creek in an effort to develop a new shallow well field. It is hard to predict what results would be found in these shallow sands. The cost of a long pipeline will be a factor to consider. Seemingly, there is little prospect for developing a satisfactory well in the upper and intermediate levels of the bedrock owing to the poor quality of the water.

IOWA GEOLOGICAL SURVEY
TABULATION OF WATER ANALYSIS
(Dissolved constituents in parts per million)

TOWN - Well No. Owner		DATE OF COLL.	Depth (ft.)	Geol. Source	O _F	Diss. Solids	Solids		Mn	Ca	Mg	K	Na	CO ₃	HCO ₃	SO ₄	Cl	F	NO ₃	Hardness cal as CaCO ₃			pH	Cond
							Fe	Total												tot.	carb.	non carb.		
Elcher town No. 10		9/15/60	116	Pleist. s.s. & gr.		381	1.0	.19	108	28	2.0	40	0	519	39	0.5	0.2	0.7	384	384	0	7.2	810	
Elcher town No. 15		"	108	"		579	1.4	.51	81	34	2.6	83	0	557	53	0.5	0.3	0.2	340	340	0	7.4	870	
Elcher town No. 19		"	92	"		398	.12	.77	94	28	1.8	25	0	456	16	7	.35	2.4	352	352	0	7.2	710	
Elcher town (1942)		11/25/44	575	Miss.		5088	2.8	0	347	71	1091	-	2833	3065	72	2.8	99	1154	323	836	7.7	-	-	
Boxville city No. 3 (1963)		11/14/68	2460	Jordan		72	695	.05	74	28	19	140	0	323	270	49	1.5	0.7	299	265	34	7.7	1100	
Gasconville town (1967)		2/1/67	2405	"		70	700	2.2	.05	78	40	17	100	0	348	190	77	1.8	0.4	361	285	76	7.2	1000
Elmer town (1964)		7/12/64	2556	"		79	711	.17	.05	61	24	16	144	0	305	242	52	2.5	0.1	250	250	0	7.8	1130
Russell town (1956)		10/56	2519	"		75	923	1.0	.05	69	24	19	208	0	307	318	100	3.2	0.1	272	252	20	7.5	1380

NOTES:

Charlie:

Town of Dallas, 1973

- SW, SE, SW, NE Sec. 11
+ T. 74 N., R. 21 W.

Cut and hold as
still drilling - this is
to be a Jordan well,
approximately 2300'

R

3-13-74

Call from John Masters (ph 515-947-3921)
Dallas-Melcher Jordan well
Test pumped 3-12-74 to 3-13-74

SWL 270'

DD	SP. CAP	Rate, gpm	Pumping Level
3	33.3	100	273
13	15.4	200	283
19	15.8	300	289
33	12.2	402	303
48	10.5	503	318
100	7.0	703	370
52	9.6	500	322
95	7.4	700	365
53	9.4	500	323
36	11.2	402	306
19	16.6	316	289
13	15.4	200	283
4	23.5	102	274

7:00 PM to 8:00 AM

Csg.

18" 0-383

10" 0-572

7" 572-2128

6 1/8" open hole 2128-2439 TD

$$\begin{array}{r} 323 \\ 270 \\ \hline 53 \end{array} \begin{array}{r} 9.43 \\ 500 \\ 477 \\ \hline 230 \\ 212 \\ \hline 180 \end{array}$$

March 4, 1974

Mr. Gene Healy
Layne-Western Co., Inc
705 S Duff
Ames, Iowa 50010

Dear Mr. Healy,

I have examined drill cuttings from the Dallas-Melcher well and concur with the driller that the Jordan Sandstone interval is 2348' to 2377 feet. Sandstone is the lithology within this interval. The sandstone is weakly cemented with dolomite, and many individual sand grains show secondary overgrowth of quartz.

As you know, the lower part of the Jordan Sandstone formation often consists of slightly sandy dolomite, especially in south-central Iowa. The samples will be re-studied after they are processed in the laboratory. If the base of the formation is subsequently defined at a greater depth I will let you know. In any case, the interval of sandstone will remain as defined above.

Sincerely,

Donald L. Koch
Chf. Subsurface Geol

DLK:mph

3-1-74

Dallas-Melcher well : call from John Masters:
Currently at 2210', loss circulation
problems starting at 2198; engineer &
town officials wonder if a ~~test~~
production test should be run. I
related that a long-term supply probably
cannot be obtained without a Jordan
completion, but if a production test is
made it should be a duration test.

7" OD casing 0-2128

Dallas - Melcher

- 2330 - 35 Dol., lt. yel-gr, f. silty
 2335 - 40 Tr. v. sdy med. dol
 2340 - 45 glauc. sti. sdy dol. + dol. a.a.
 2345 - 50 30% ss. w/ mod. to weak dol cems, abund. 2nd. overgrowth; Dol. a.a.
 2350 - 2360 ss. a.a., dm. med.
 2360 - 2370 ss. a.a., w/ zones of v. sdy dol.
 2370 - 2375 ss a.a. & sli. to v. sdy dol.
 2375 - Dol., lt. brng. & pl, f. med; ss a.a.
 2377 Top St. Lawrence
 2375 - 2380 Dol. a.a.; void spaces lined w/ coarse dol + calcite

Top Jordan 2348

Top St. Lawrence 2377? TD = 2,439'

See letter to Gene Healy

Dallas-Melcher
well folder

December 18, 1973

Mr. Jack Bruin
Layne-Western Co.
705 S. Duff Avenue
Ames, Iowa 50010

Dear Mr. Bruin,

I have examined the wet cuttings from the Dallas-Melcher town well for the interval from 1700'-1910' and believe the formation tops to be as follows:

St. Peter 1867'
Prairie du Chien 1900'

This would therefore put the estimated tops of the Jordan and St. Lawrence formations at 2345' and 2400' respectively.

Very truly yours,

Jack Gilmore
Research Geologist

JG:mph

Dallas-Helena well
Folder

December 13, 1973

Mr. Jack Bruin
Layne-Western Company
705 S. Duff
Ames, Iowa 50010

Regarding: Dallas Twpn Well; request for verification of recommended length of 18 inch surface casing.

Specifications on well construction required 300 feet of 18 inch surface casing. This figure apparently was an arbitrary figure that would have resulted in setting the surface casing near the middle of the Pennsylvanian System, based upon an estimated depth of 500 feet for the top of the Mississippian System.

At the request of the driller (John Masters) I went to the drill site on October 24, 1973 to examine the drill cuttings. Current depth was 435', and the 12½" pilot hole was being reamed to 24" for setting surface casing. The cuttings indicated that the top of the St. Louis was encountered at a depth of 360 feet.

My recommendation was that the surface casing be extended to 370' to prevent caving of the shale units within the Pennsylvanian System from 300' to 360'. Such caving could be a serious problem, especially if circulation was temporarily lost within the upper part of the St. Louis.

Mr. Hesling of Garden Engineering has asked that I call him from the rig to inform him of my recommendation. He accepted the recommendation and indicated that an additional 70' of 18" casing would be obtained to extend the total length to 370'.

Sincerely,

Donald L. Koch
Chf. Subsurface Geology

DLK:mpj

10-25-73

Dallas - Melcher Town Well, 1973

Contractor: Layne-Western Co.; John Masters
Engineer: Garden Engineering, Oskaloosa; John Hesling
Location: SW, SW, NW, NE Sec. 11, T. 74 N., R. 21 W.
Elevation: about 935' (Melcher 15' topo.)
Drilling dates: 10-23-73 to _____
Contract depth: 2400'
Casing specifications:

18" OD, 3/8" wall,	1 to 300'*
10 3/4" OD	+ 3 to 550'
Reducer	550' to 575'
7" OD	575' to 1950'
6" open hole	1950' to 2400'

Test specifications: to pump 24 hours at up to 800 gpm with 500' pumping level.

* John Masters called at 1430 hours, 10-24-73 to say that the 12 $\frac{1}{4}$ " pilot hole was down to 475' (top of Pennsylvanian at 100'), and they were starting to ream to 24" for setting surface casing. He wanted to know what depth we ~~would~~ recommend for setting the surface string. Pauls' forecast indicated base of Pennsylvanian at 500'±; John said limerock was encountered above 475'. Paul went by the 1942 Melcher well (W-1510) which shows base of Pennsylvanian, top of Warsaw at 502'. The casing specifications called for only 300' of 18", leaving the remainder of Pennsylvanian units open. I went to the well site (arrival time 8:00 PM) to examine drill cuttings; base of Pennsylvanian, top of St. Louis is at 360'.

I called Jack Bruin and recommended to him that the surface string be extended to 370'. He agreed as long as it would be acceptable to the engineer. I called Mr. Hesling and made the same recommendation - he accepted the recommendation, and they will obtain another 70' of 18".

12-8-73

Down to ~1100 last week of Nov. when they had two fishing jobs; had another fishing job 1st week of Dec. (lost a few collars); down to 1485' with 12 $\frac{1}{4}$ " hole (in shale) as of 12-8-73 (info. from Gene Healy)

10-24-73

On-site examination of drill cuttings

D

- 355-60 blk. sh.
- 360-65 yel.-gr., v. f-S.L. sli. pyritic ls; v. lt. olive gr., f,
sli. dolo. ls.
- 375-80 v. lt. gr. f. Ss, w/ some calc. cem; lt. yel-gr. f., fos.
ls. w/ abund ost.
- 385-90 Ss, v. lt. gr., med-f, r-a, frost., free
- 395-400 poor sample
- * 475-80 v. pale yel-brn. dol, f, silty, tr. emb. sd.
- * 485-90 v. pale yel-brn., f, emb. sd.

* sample interval to 490' but actual depth from
geolograph is 475' — new helper on rig —
he goofed!

Reaming to 24" hole; down to 100' at 2115 hrs.

Projected tops from structure maps,
assuming surface elev. of 950':

- + 75 Maple Mill
- 525 Maguoketa
- 900 St. Peter
- 1375 Jordan