**From:** Beggs, Tauren R - DNR
**Sent:** Thursday, April 12, 2018 10:43 AM
**To:** 'Henderson, Dave'; Maletzke, Jeff
**Cc:** GravelPit (GravelPit@manitowoc.org); Kasdorf, James H Jr - DNR
**Subject:** RE: Newton Pit - replacement well water quality discussion

Hi Dave and Jeff,

This is the information I received from Dave Johnson:

With the deep casing it will take a while (6-12 months) for the casing to settle in and so the iron will be higher than the ground water itself. Prefilters and iron curtain should help a lot. As for the hardness that too should settle down with some time. When you drill you expose a lot of fresh surface and that will react for some time but generally not as long as it takes for the casing to settle. We could explore treating the wells with acid to speed the process of "weathering" along.



Tauren R. Beggs
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**From:** Henderson, Dave [mailto:Dave.Henderson@aecom.com]
**Sent:** Thursday, March 8, 2018 8:36 AM
**To:** Beggs, Tauren R - DNR <Tauren.Beggs@wisconsin.gov>; Kasdorf, James H Jr - DNR <James.KasdorfJr@wisconsin.gov>; Johnson, Dave M - DNR <Dave.Johnson@wisconsin.gov>; Maletzke, Jeff <Jeff.Maletzke@aecom.com>
**Cc:** GravelPit (GravelPit@manitowoc.org) <GravelPit@manitowoc.org>
**Subject:** Newton Pit - replacement well water quality discussion

Tauren, et al:

The last three replacement portable wells we've installed have produced some water quality complaints from the home owners (e.g. Fe issues, taste, white residue, etc.). As such, we've been working to review the situation and find solutions.

As those complaints relate to TDS - we are in continuing discussions with the well driller, the plumber, and Jim directed us to Glen Schleuter at DSPS. We've also taken a new round of laboratory water quality samples w/ speciation for Fe and TDS. Jeff Maletzke, AECOM, has also taken a look at the depth of well install as it relates to the bedrock unit we're in and if a change in unit can affect water quality.

Dave Johnson – I think this question is more directed to you? Please see the attached documents:

- Replacement Potable Well Summary – an excel spreadsheet with specific well data.
- Manitowoc County preliminary bedrock map.
- Zoomed in bedrock map with the wells penciled in.

There are two dolostone units we're open borehole in:

Se – Engadine formation.
Sm – Manistique formation.

It appears most of our wells are open borehole in the Se unit (knowing/understanding that the x-section is approximate for our location).

It also appears that our recent wells penetrated the Sm unit – this is a change. The Manistique unit is noted as being "… very cherty…"

Taking a look at the summary data table, our most recent wells have TDS that is approx. 1/3 higher than the previous wells, which may be the root of our TDS complaints.

Dave – can you please provide technical support about the Se and Sm units and how they may relate to water quality?

Please give Jeff a call with any questions. We look forward to your input.

Thanks
dsh

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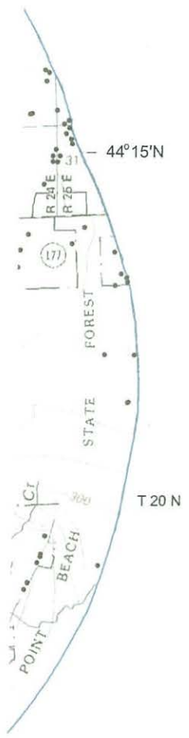


A

A'

Elevation in feet (above sea level)

MN-619

MN-614

FORMER NEWTON GRAVEL PIT

3305 HECKER

3120 CR 3023 CR 4010 THUNDER RIDGE

2918/3008 26TH

2201 ELM

LAKE MICHIGAN

Unconsolidated sediment

Se

Sm

Sbb

Smy

Sw

bts

Ordovician

900 850 800 750 700 650 600 550 500 450 400 350 300

750 700 650 600 550 532.5 516.5 500 450 400 350 300 250 200 150 100 50 0 -50 -100 -150 -200 -250 -300 -350

Elevation in feet (above sea level)

G75 - H2
G82 - C

Scale 1:100,000

1 0 1 2 3 4 5 6 7 8 9 10
KILOMETERS

1 0 1 2 3 4 5
MILES

Vertical exaggeration of cross sections is 20x

1 in = 400

1 - 1.5 miles south of A - A'

DRAFT - Table x
Replacement Potable Wells
Well Depth and Water Quality Summary
Former Newton Pit, Manitowoc Wisconsin

| Address | Replacement Well Data From Driller's Well Construction Reports (all measurements approximate ± a foot or two) | | | | | | | | Water Quality Information From Laboratory Reports | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground Surface Elevation (ft MSL) | Depth to Bedrock (ft BGS) | Elevation of Top of Bedrock (ft MSL) | Cased Depth (ft BGS) | Cased Elevation (ft MSL) | Total Well Depth (ft BGS) | Well Bottom Elevation (ft MSL) | Length of Open Borehole in Bedrock (ft) | Fe (mg/L) | TDS (mg/L) | Hardness (mg/L) |
| 3303 Hecker Road | 691 | 118 | 573 | 280 | 411 | 303 | 388 | 23 | 28.9 | 2,003 | 1,374 |
| 3515 Hecker Road | 691 | 110 | 581 | 277 | 414 | 300 | 391 | 23 | 1.22 | 2,156 | 1,504 |
| 3518 Hecker Road | 697 | 115 | 582 | 250 | 447 | 282 | 415 | 32 | 7.01 | 2,064 | 1,448 |
| 3609 Hecker Road | 696 | 131 | 565 | 290 | 406 | 300 | 396 | 10 | 5.08 | 2,264 | 1,591 |
| 3023 CTH CR | 667 | 133 | 534 | 275 | 392 | 308 | 359 | 33 | 5.17 | 2,164 | 1,545 |
| 3120 CTH CR | 683 | 121 | 562 | 279 | 404 | 305 | 378 | 26 | 4.82 | 1,966 | 1,309 |
| 3403 CTH CR | 667 | 150 | 517 | 275 | 392 | 307 | 360 | 32 | 0.32 J | 2,349 | 1,688 |
| 3504 CTH CR | 680 | 168 | 512 | 278 | 402 | 320 | 360 | 42 | 12.9 | 2,330 | 1,380 |
| 4002 Thunder Ridge Road | 686 | 171 | 515 | 319 | 367 | 420 | 266 | 101 | 14.5 | 2,450 | 1,753 |
| 4005 Thunder Ridge Road | 688 | 180 | 508 | 320 | 368 | 420 | 268 | 100 | 9.83 | 2,706 | 1,873 |
| 4010 Thunder Ridge Road | 687 | 178 | 509 | 320 | 367 | 400 | 287 | 80 | 9.77 | 2,658 | 1,588 |
| 2918 S 26th Street | 654 | 125 | 529 | 300 | 354 | 400 | 254 | 100 | 14.5 | 3,007 | 1,898 |

| Location | Avg Top of Bedrock Elev | Delta from Hecker - (ft) Lower | Approx Dist. From Hecker (ft) |
|---|---|---|---|
| At Hecker Rd | 575 | 0 | 0 |
| At CTH CR | 531 | 44 | 2,500 |
| At Thunder Rdg | 511 | 65 | 3,500 |
| At S 26th | 529 | 46 | 8,000 |