Ground Water Science
Science and Planning for Earth's Most Critical Resource

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Documentation of a high-pressure well cleaning project in screened wells in Connecticut

Introduction

HydroPressure Cleaning, Inc., of Camarillo, California (WellJet) is a provider of well-cleaning services using high-pressure (up to 20,000 lb/in^2 (psi), 1379 bar) water jetting, using a moving, rotating jetting tool with adjustable pressure and water flow rate (the WellJet® process, U.S. Patent No. 8,312,930). Most of this work has been conducted in deep wells in the western USA, but also deep (500-m+) screened and open-borehole wells in Jordan and Abu Dhabi. While subjectively realizing success in bringing wells back to usable capacity, objective evaluation by third party hydrogeologists has been sparse, although on record.

WellJet was invited by the South Central Connecticut Regional Water Authority (RWA) to treat several wells as a pilot project for potential use of the WellJet process in regular RWA well cleaning programs and possible provision of the service to other water utilities. WellJet jetting would be followed by reciprocal surging (both mechanical only and with chemicals) and pumping tests conducted by S.B. Church Company, Oxford, CT (a division of Weston & Sampson CMR, Inc.), RWA's on-call well services contractor. Work was also observed by hydrogeologists with WSP USA, Shelton, CT.

WellJet requested that Smith-Comeskey Ground Water Science LLC, consulting hydrogeologists (Ground Water Science) conduct a third-party documentation of the performance of WellJet well cleaning for the wells selected by RWA. Well histories would be provided using RWA-provided documentation, and data from step-drawdown tests conducted by S.B. Church, as well as on site observation and documentation by Ground Water Science during the February cleaning program. This is the summary report on findings.

Wells being serviced

North Sleeping Giant Well #1	**North Sleeping Giant Well #2/2N**
Drill date: 1965 Total Depth: 157' Diameter: 18" Construction: steel casing, original Everdur (brass) screen 130-157 ft (27 ft screen), now with stainless steel wire-wound liner & filter pack Static Water Level: 27' Design demand: 1,600 gpm Max Pump Capacity: 1,250 gpm (many years since) Most recent best specific capacity: 17.59 @ 686 gpm precleaning 11/3/2022, 13.33 @ 200 2/22/23	Drill date: 1967 Total Depth: 104' Diameter: 16" Construction: steel casing, Everdur (brass) screen, stainless steel insert screen, filter packed: Old: 15 ft screened, 20 ft inside. Static Water Level: 26' Design demand: 1,000 gpm Max Pump Capacity: 764 gpm (long time since) Most recent specific capacity: 16.2 @ 486 gpm

Seymour Well #5 (different aquifer, along Housatonic River, high manganese)
Drill date: 1981
Total Depth: 127'
Diameter: 16"
Construction: steel casing, stainless steel wire-wound screen, part filter pack, part (lower) natural pack
Static Water Level: 18'
Screen type + zone: screened 72-127' (55 ft total screen, multiple slot sizes, partially filter-packed)
Design demand: 800 gpm
Max Pump Capacity: 725 gpm (long time ago)
Most recent specific capacity: 10.2 @ 260 gpm.

More well details are attached as a table (Attachment 1).

Well challenges: The older NSG wells were far into their performance decline curves, and how the lining helped them operationally is open to question, probably to deal with sanding. This made them more difficult to rehabilitate, as the inner screens and filter packs took up energy that would go into the formation. Clogging was attributed to iron biofouling, according to file reports, which included BART culturing. Those results seemed somewhat ambiguous.

The Seymour wellfield had long been troublesome due to very high manganese, including likely deposits of MnIV oxides identifiable in drilling logs, not surprising in a highly organic sand and gravel.

Cleaning program

The cleaning program evolved in discussions, but essentially consisted of the following:

North Sleeping Giant Well #1	**North Sleeping Giant Well #2/2N**
Pump removed, evaluated and stored Na hypochlorite poured into the well by RWA 2 WellJet passes at 18,000 psi (1,240 bar) Cleanout surge (airlift capable of 175-200 gpm) 1 WellJet pass at 18,000 psi (Added during visit) Physical and chemical redevelopment (SB Church) using crane with hydraulic surge arm and tools Step-drawdown test (SB Church)	Pump removed, evaluated and stored Na hypochlorite poured into the well by RWA 3 WellJet passes at 15,000 psi (1,034 bar) Cleanout surge (airlift 175-200 gpm) SB Church Physical and chemical redevelopment (SB Church) using crane with hydraulic surge arm and tools Step-drawdown test (SB Church)

Seymour Well #5
Pump removed, evaluated and stored
Na hypochlorite poured into the well by RWA
2 WellJet passes at 5700 psi (393 bar, just above idle for this pump and engine)
Cleanout surge (airlift 175-200 gpm)
Mechanical redevelopment (no chemicals used due to history of extended Mn problems in the past).
The lower WellJet pressure was selected due to the natural development completion of part of the screen.

In each case, WellJet passes resulted in several feet of fill in the bottom of the screen, removed by the airlift pass. For NSG No. 1, fill was 5 ft, NSG No. 2/2N, also 5 ft, and Seymour No. 5, fill was 11 ft. Some material was relatively coarse, but appeared to be formation material vs. filter pack. There were no indications of screen breach due to the jetting.

Results

Specific capacity history prior to the February 2023 work:

Historic specific capacities (Q/s) at higher flow rates (Q) are reported, but we did not see a full data history. For **NSG No. 1**, a Q/s of 84.7 is reported for March 1965, but at an unknown Q, possibly the rated 1250 gpm. Other NSG No. 1 values over time:

Date	Q/s	Q	Comments
2015	33.64	?	post rehab
2019	18.1	429?	
2020	19.1	429?	
9/15/2021	18.5	429	recovery test
11/3/2022	32.89	251	Step test
	19.23	500	
	17.59	686	

NSG No. 2/2N:

Date	Q/s	Q	Comments
May 2019	30.7	260	post rehab
Nov 2020	16.5	255	

Permanent decline in transmissivity in these unconfined sand-and-gravel aquifers probably explains some of the decline, but residual clogging beyond the reach of historically used rehabilitation tools is a phenomenon that we commonly observe.

Seymour No. 5:

Date	Q/s	Q	
2010	25	250?	sketchy Qs post rehabs
May-20	7.75	296?	pre-surging
Nov-20	14.17	175?	post-surging
1/31/2023	6.48	187	

Cleaning Process results

NSG No. 2/2N:

Date	Q/s	Q	Comments
2/23/2023	24.85	175	Just cleanout
3/6/2023	33.52	175	Airlift, chemical
3/14/2023	25.2	280	Step-drawdown test
	26.26	427	Developing
	23.26	715	

In the case of NSG No. 2/2N, it has been many years since Q/s values calculated for Q = 427 and 715 gpm in the March 14, 2023 step test have been observed. This is a successful result considering the age of the well, restrictions and impairments. Note that, although drawdown in the field data was stabilized at 30 min. and 427 gpm, the higher Q/s at 427 gpm vs. that at 280 gpm indicates that the well continued to develop.

NSG No. 1

The step-test (April 27, 2023) results from NSG No. 1 were not as favorable as for NSG No. 2/2N in calculated specific capacity, but exhibited the classic pattern of a well still developing, specific capacities (Q/s) rising as flow rate Q is increased:

April 27, 2023				November 2022		
Q/s	Drawdown s (ft)	Q gpm		Q/s	s (ft)	Q gpm
6.90	41.75	288		32.89	7.63	251
10.56	47.35	500		19.23	25.99	500
11.69	59.9	700		17.59	38.99	686

The Q/s at the lower Q is lower than during the brief airlift test in February, and much lower than the step-test results in November 2022 (as illustrated above), which followed the normal, stabilized pattern of lower Q/s at rising Q. The third high-pressure pass may have compacted fines drawn into the vicinity of the screen, and these are being developed out. Also, it is not unusual for a well in a severely plugged state to exhibit a drop in specific capacities as fines are drawn in, before further development brings better results.

Seymour No. 5

Date	Q/s	Q	Comments
3/10/2023	10.9	200	Airlift surging cleanout
4/6/2023	18.05	211	Step-drawdown test
	18.19	314	Developing
	17.08	412	
	13.78	517	

Like NSG No. 2/2N, but in a different aquifer setting (low, close to the river, geochemically different), the Q/s values at 314 gpm and above have not been seen for a very long time (possible Q/s = 25 gpm/ft at 250 gpm in 2010).

Conclusions and Recommendations

1. The entire program appears to have been very effective in redeveloping NSG No. 2/2N and Seymour No. 5. Results are not as favorable in the short term for NSG No. 1, but the well is still redeveloping. Specific capacities at higher flow rates are relatively good and similar to Q/s at lower flow rates, suggesting that the well loss component has been reduced considerably.
2. As Seymour No. 5 was finished without chemical amendment, high-pressure jetting, followed by mechanical surging (the routine WellJet process), appears to be an important part of the results.
3. These are short-term results, and patterns of decay over the coming months and possibly years will indicate whether long-term success has been achieved.
4. If the Q/s values hold, these wells would appear to be economical to operate.
5. It bears repeating that all of these wells, each in their own way, is impaired and difficult to rehabilitate. A better test may be with less-challenging wells where jetting power can better reach further into the aquifer.

6. Well NSG No. 1 should be scheduled for further mechanical redevelopment, possibly with a clay dispersant, such as NW-200 used by SB Church.
7. Is the very high pressure jetting superior to lower pressure and longer application, justifying the mobilization as currently necessary? Only comparative tests can tell.
8. If the long-term results are favorable, it may be beneficial for the RWA to keep a WellJet system and trained team mobilized for its use and deployment to other utilities in the region as a relatively fast and effective redevelopment method, teamed with conventional “clean up” methods.
9. Ground Water Science can further analyze step-drawdown and other hydrogeological and biogeochemical information for additional insights, for example, calculating well drawdown linear and nonlinear components and influences on transmissivity, and key contributing factors in clogging, and can repeat this process for other projects. In general, biogeochemical data were not evaluated.

Attached:

1. More well details from RWA records
2. Post-cleaning step-drawdown test results supplied by SB Church via Brenden Fimian (RWA).

The courtesy and assistance of Brenden, RWA staff in general, and SB Church and WSP teams, is much appreciated. It was also a great pleasure to meet and work with the WellJet field crew.

Values and documents supplied by others are taken as provided, not necessarily verified, and subject to correction.

Respectfully submitted,

Stuart A. Smith, MS, CGWP
Consulting hydrogeologist, Partner
Ground Water Science
Groundwaterscience.com

Attachments

Attachment 1: Well information from RWA records

General Notes	Seymour5	NSG1	NSG 2/2N
	Aug-1981	Mar-1965	Dec-1967
Total Well Depth (feet)	127	157	104
Static Water Level (feet)	18	27	26
Well Pack	#5 Cape May Gravel & Russak 1/2" Gravel	#3 and #5 Howard Gravel	#3 Gravel
Protective Casing Diameter (inches)	24	24	24
Protective Casing Depth (feet)	71.5		86
Protective Casing	Steel	Steel	Steel
Protective Casing Wall Thickness (inches)	3/8"	3/8"	3/8"
Well Casing Diameter (inches)	16	18	16
Well Casing Depth (feet)	73	131	90
Well Casing Material	Steel	Steel	Steel
Well Casing Wall Thickness (inches)	3/8"	3/8"	3/8"
Screened Interval (feet)	55	27	Old 15, New 20
Nominal Screen Diameter (inches)	12	18	Old 16, New 10
Telescoping Screen (Yes/No)	No	Yes	Old Yes, New No
Screen Diameter Outer (inches)	12.75	16	Old 14, New 10.75
Screen Material	Stainless Steel	Brass	Old Brass, New Stainless Steel
Screen Slot Size	60 (20'), 55 (30'), & 70 (5')	40 (3') & 60 (17')	Old 60, New Tightwind (5') & 60 (15')
Lead Packer (Yes/No/Unknown)		Yes	Yes
Borehole CCTV			
Transmissivity (gpm/ft)			267100

Storativity			0.11
Design Demand (gpm)	800	1600	1000
TDH for Pumps (feet)	350	355	330
Max Pump Capacity (gpm)	725	1250	764
Entrance Velocity at Max Pumping Rate (fps)			
Typical Pumping Rate (gpm)			
Entrance Velocity at Typical Operating Flow Rate (fps)			
Initial Yield (MGD)	1.44 @ 47'	2.88 @ 62.42'	2.02 @ 64.5'
Most Recent Specific Capacity (gpm/ft) before 2/2023	10.2 @ 260 gpm	18.1 @ 441 gpm	30.7 @ 260 gpm
Safe Yield (MGD)	2.5 (Total Wells 4B, 5, 6, and 7)	2.00	1.00
GPM MGD/24/60		1388.00	694.00
Pump	277		
Pump Curve(s)			
Pump/Intake Depth (ft bgs)	Goulds Vertical Turbine	Deming Vertical Turbine	Goulds Vertical Turbine
Motor HP		Yes	Yes
VFD (Yes/No)	74.31	98.33	83.83
	100	200	125
	No	Yes	Yes

Attachment 2: Copies of post-cleaning step-drawdown information as supplied

SB Church

Client RWA

Well 1 N5G

Date 4/27/23

Step Test Data

Name plate amps V 460 / A 224

Shutoff head High pressure N/A

Static 32.8

Circle One:

Pre Development

Post Development

Step 1

Time Since Start of Step in Minutes	Depth of Water in Feet	Flow Rate GPM
Start time:		
0		
1	71.5	288
2	71.00	
3	70.80	
4	71.80	288
5	71.55	
10	76.7	
15	74.2	
20	72.91	288
25	72.65	
30	74.55	

Amps at this step 150.30

Discharge pressure Theirs ours

Hertz or speed 59.9

leaking out back Blowoff

D pressure Theirs 157 | ours 145

D.O. 41.75

Specific 6.89

Step 2

Time Since Start of Step in Minutes	Depth of Water in Feet	Flow Rate GPM
Start time:		
0		
1	80.90	500
2	78.70	
3	78.97	
4	78.98	
5	79.00	500
10	79.40	
15	79.50	
20	79.50	500
25	80.55	
30	80.15	

Amps at this step 151.41

Discharge pressure

Hertz or speed 59.9

Leaking out Blowoff

Theirs 140 | ours 110

D.O 47.35

Specific 10.55

Step 3

Time Since Start of Step in Minutes	Depth of Water in Feet	Flow Rate GPM
Start time:		
0		
1	93.8	700
2	93.01	
3	92.62	
4	92.35	
5	92.40	700
10	92.45	
15	92.60	
20	92.65	700
25	92.66	
30	92.70	

Amps at this step 158.32

Discharge pressure

Hertz or speed 59.9

Theirs 136 | ours 75

D.D 59.9

Specific 11.68

Step 4

Time Since Start of Step in Minutes	Depth of Water in Feet	Flow Rate GPM
Start time:		
0		
1		
2		
3		
4		
5		
10		
15		
20		
25		
30		

Amps at this step

Discharge pressure

Hertz or speed

SB CHURCH
49 Great Hill Road, Oxford, CT 06478
Tel: 203.888.2132

March 14, 2023

Regional Water Authority
91 Sargent Drive
New Haven, CT 06519
brimian@rwater.com

Re: 2023 Well Rehabilitation at North Sleeping Giant #2N

Attn: Brenden Fimian,

Following is the report for the rehabilitation of the North Sleeping Giant #2N well we complete in March 2023.

Well Rehabilitation

The pump was removed from North Sleeping Giant #2N in November 2022 and a pre-development video was performed on the well. The video revealed that the top 8 feet of the liner screen was completely plugged with biofilms and associated minerals and the rest of the screen was coated in material. Additionally, the bottom of the well had an accumulation of debris related the shedding of biofilm growth and associated minerals above. In February, Well Jet performed two passes of high pressure jetting on North Sleeping Giant #2. SB Church mobilized to perform the cleanout and chemical redevelopment following the high-pressure jetting. The well was treated by mechanical development combined with chemical treatments of sodium hypochlorite and NW-220 (a phosphate free dispersant). The initial specific capacity by airlift pumping at 175 gpm was 24.86 gpm/ft. The redevelopment was successful at increasing the specific capacity at the same flow rate by 35%, to 33.52 gpm/ft.
A post treatment video was performed and revealed the screen was much cleaner than before treatment. The accumulation of biofilms and associated minerals have been removed from the bottom of the well. There is some minor casing scale at the bottom of the well.

Comments and Recommendations

Sleeping Giant Well #2N has recently been equipped with a liner screen. While the liner screen will prolong the life of the well, the well efficiency will be less due to the added layer of screen for the water to travel through. Additionally, the liner screen provides more surface area for biofilms and associated minerals to attach. Therefore, it is important to implement a frequent schedule of rehabilitations to prevent the clogging of the pore spaces and the spaces between the original and the liner screens. The current efforts of high-pressure jetting combined with the mechanical pumping and surging with chemical treatments was successful at increasing the specific capacity of the well by 30% from testing performed in August 2022. Continue to test wells and pumps annually to address problems that arise before they become emergent.

We trust that you will find this report complete, however, if you have any questions or require additional information, please contact me via email at orlando.joseph@wseinc.com or phone at (781)670-0049.

We appreciated this opportunity to be of service to Regional Water Company.

Sincerely,
SB Church / Weston & Sampson CMR, Inc.

Joe Orlando
Project Manager | Hydrogeologist

SB CHURCH
49 Great Hill Rd, Oxford, CT 06478
tel: 203-888-2132
www.westonandsampson.com

Owner: **Regional Water Authority**

Well ID: **North Sleeping Giant #2N**

Dates of Service: **February to March, 2023**

Type of Redevelopment: **Well Jet with Conventional Chemical Treatment**

Redevelopment Chemicals

Muriatic Acid	0 gallons	NuWell 220	4 gallons	Sodium Hypochlorite	19.5 gallons
NuWell 310	0 gallons	Sodium Hexametaphosphate	pounds	NuWell 410	10.5 pounds

Machine Time for Redevelopment 45 hours

Redevelopment Data

Event	Static Level	Flow Rate	Pumping Level	Draw Down	Specific Capacity	% Inc / Dec	Observations / Comments
Pre-Cleaning	26.00	175	33.04	7.04	24.86	--	Clean out bottom of well and get initial SC
Surge and Pump	26.33	175	32.81	6.48	27.01	8.64%	Dead Surge, then pump. Add Hypo.
Sodium Hypochlorite	26.42	175	32.47	6.05	28.93	16.36%	Neutralize. Add 4 gallons NW-220
NW-220	26.25	175	32.10	5.85	29.91	20.34%	Flush out. Add Hypo.
Sodium Hypochlorite	26.10	175	31.46	5.36	32.65	31.34%	Neutralize. Add Hypo.
Surge and Pump	25.83	175	31.05	5.22	33.52	34.87%	Neutralize. Finish Development.

Video Inspection

2022.11.03 16" diameter Well with a 10" diameter Screen. Top of Screen at 82' 2".
The casing had a lot of scale.
The top 8' of the screen was completely plugged with biofilms and associated minerals.
Heavy buildup and growth at the bottom of the well. The camera could not go deeper than 103.4'
2023.03.09 The screen was much cleaner following treatment.
The biofilms and associated mineral accumulation at the bottom of the well prior to treatment has been removed.
There is some casing scale at the bottom of the well.

A flash drive copy of the video inspection can be sent for the Water Department's records.

Pumping Equipment Inspection & Repairs

Pump Installed

Manufacturer:	Goulds	Intake:	77'
Model:	12CLC-6	Column Size:	8"
Serial #:	4210633		
# stages:	6		

Motor Installed

Manufacturer:	US Motors	Volts:	460
HP:	100	Amps:	114
Model #:	G05-BF66-M B1	Type:	RUSI

During the final test on the pumping equipment operated with moderate vibrations on the bottom of the motor.

Additional Observations / Comments

The well was treated with high-pressure jetting prior to well re-development activities which consisted of mechanical surging and chemical treatments.
The combined efforts at North Sleeping Giant Well #1 were successful at increasing the specific capacity during airlift pumping by 35%.
The post treatment pumping test revealed a specific capacity at 715 gpm of 23.26 gpm/ft, a 30% increase at a similar rate to testing in August 2022.
The specific capacity is down 24% from original specific capacity from 1967.
The liner screen does affect the well efficiency. It is important to pursue a frequent schedule of rehabilitations to maintain the gains made in these efforts.
The motor vibrations are moderate in the bottom of the motor. Consider field balancing the motor.
Test wells and pumps annually to identify and address any problems before they become emergent.

Report Submitted by: _____

Joe Orlando, Project Manager | Hydrogeologist

SB CHURCH
49 Great Hill Road, Oxford, CT 06478
Tel: 203.888.2132

Well & Pump Inspection Data Sheet

Owner: Regional Water Authority
Route 10
Hamden, CT 06518
Brenden Fimian
bfiman@rwater.com

Well / Pump: North Sleeping Giant Well #2N

Location: Route 10, Cheshire/Hamden, CT

Date of Service: 3/14/2023

Well Information

Casing Diameter:	16"
Total Depth:	104'
Screen Diameter:	10" T
Screen Length:	15'
Liner Screen:	Yes
Slot Size:	0.06
Year Installed:	1967
Last Serviced:	2020
Rated Capacity:	763

Pump Information

Serial Number:	4210633
Type:	Vert Turb.
Make:	Goulds
Model:	12 CLC-6
Design Point:	900 @ 360'
Column Size:	8"
Shaft Size:	1-1/2"
Intake:	77'
Airline:	80'
Transducer:	na
Year Installed:	2016

Design Curve Data

GPM	TDH
0	549.7
250	504.4
500	469.8
750	416.6
1,000	332.7
1,200	251.5
1,400	149.6

Motor Information

Make:	US Motor
Hp:	100
Voltage:	460
Amperage:	114
RPM:	1780
Frame:	
Type:	Holloshaft
MegOhms @ 500V:	Infinity
Year Installed:	
Efficiency %:	
Power Factor:	
Operating Hrs:	

Controller Information

Make:	
Model:	
Year Installed:	

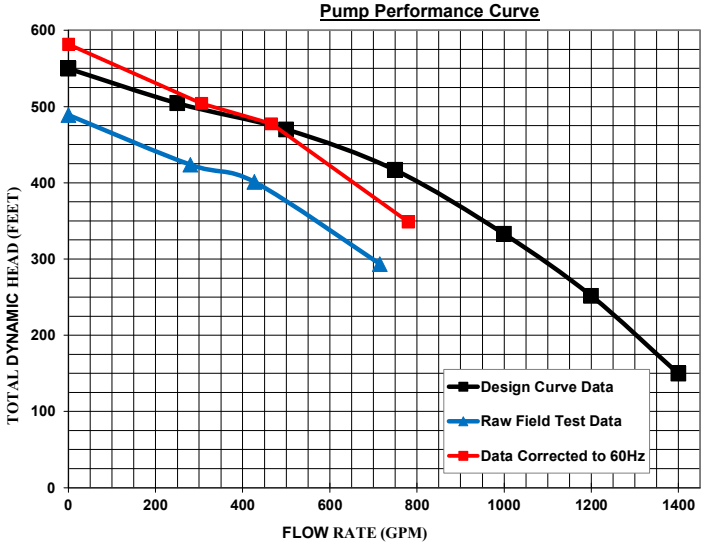
Field Test Data

Run @ 55 Hz

Static Water Level 26.74 **Pressure Gage Hght:**

Water Level	Draw Down	Flow Meter	Pitot or Orifice	Specific Capacity	Discharge Pressure	TDH	Amperages L1	Amperages L2	Amperages L3	Kilowatts L1-L2	Kilowatts L2-L3	Kilowatts Total		Horsepower Water	Horsepower Electric	Efficiency
26.74			0	Shut Off	200.0	**488.74**	--	--	--	--	--	--		--	--	--
37.85	**11.11**		280	**25.20**	167.0	**423.62**	74.5					**0.00**		**29.95**	**64.52**	**46.42%**
43.03	**16.29**		427	**26.21**	155.0	**401.08**	82.2					**0.00**		**43.25**	**71.20**	**60.74%**
57.48	**30.74**		715	**23.26**	102.0	**293.10**	98.5					**0.00**		**52.92**	**85.31**	**62.04%**

Pump Performance Curve



* Data Converted to 60Hz

Pump Performance History

	GPM	Design	Test	% Off
Previous Test:	965	346	345	**-0.29%**
Previous Test*:	811	402	402	**0.00%**
Current Test*:	780	410	349	**-14.88%**

Well Performance History

	Date	GPM	GPM/FT	% Off
Original Test:	9/21/67	1,200	30.77	
Previous Test:	2/24/16	1,200	25.12	**-18.36%**
Previous Test:	5/23/19	985	20.78	**-32.47%**
Previous Test:	8/10/22	743	17.87	**-41.92%**
Previous Test:	11/1/22	na	na	**--**
Current Test:	3/14/23	715	23.26	**-24.41%**

Maintenance Services

Motor Oil: Y Grease Bearings: Y

Replace Packing: Y

Vibration Analysis

Top Bearing
Side to Side: 0.06
Front to Back: 0.04
Bottom Bearing
Side to Side: 0.115
Front to Back: 0.09

General Comments

Test run at 55 Hz. Data converted and plotted for full speed, 60 Hz.

The specific capacity of the well improved by 30% from testing performed in August 2022. The specific capacity is down 24% from original in 1967.

The pump is operating at or slightly below the design curve.

Test pumps and wells annually to address problems as they arise.

Joe Orlando
(for SB Church)

SB Church

Step Test Data

Client R.W.A

Well #5 (Housatonic)

Date 4/06/23

Name plate amps 119.3

Shutoff head 195+

Static 16.01

Circle One:

Pre Development

(Post Development)

Step 1

Time Since Start of Step in Minutes	Depth of Water in Feet	Flow Rate GPM
Start time:		
0	16.01	
1	26.29	211
2	27.12	
3	27.30	211
4	27.41	↓
5	27.49	
10	27.55	
15	27.56	
20	27.59	↓
25	27.65	
30	27.70	

Amps at this step 65

Discharge pressure 165

Hertz or speed 60

Dr. DWN. – 11.69

Spec. – 18.04

Step 2

Time Since Start of Step in Minutes	Depth of Water in Feet	Flow Rate GPM
Start time:		
0	27.70	
1	33.06	314
2	33.13	
3	33.19	314
4	33.12	
5	33.12	
10	33.13	314
15	33.32	
20	33.32	↓
25	33.37	
30	33.39	

Amps at this step 70

Discharge pressure 158

Hertz or speed 60

Dr. DWN. – 17.26

Spec. – 18.08

Step 3

Time Since Start of Step in Minutes	Depth of Water in Feet	Flow Rate GPM
Start time:		
0	33.25	
1	38.31	412
2	38.72	
3	39.08	
4	39.25	
5	39.46	412
10	39.72	
15	39.81	
20	39.90	
25	40.04	
30	40.13	412

Amps at this step 79

Discharge pressure 148

Hertz or speed 60

Dr. DWN. – 24.12

Spec. – 17.08

Step 4

Time Since Start of Step in Minutes	Depth of Water in Feet	Flow Rate GPM
Start time:		
0	40.13	
1	49.20	517
2	50.14	
3	50.76	
4	51.15	517
5	51.43	
10	52.17	
15	52.24	517
20	53.40	
25	53.51	
30	53.54	517

Amps at this step 85

Discharge pressure 140

Hertz or speed 60

Dr. DWN – 37.53

spec. – 13.77

Pump Intake – at 67'-4"

Transducer & Airline – 62'-4" set at

Note – Post test after well setting and mechanical Re-development

☆ Recovery – Back to 16.21 after 20 mins.