



August 2, 2016

Mr. Robert Leible
City of Aurora
44 E. Downer Place
Aurora, IL 60507

Re: Well 29

Mr. Leible:

The Well 29 Byron Jackson submersible pump has been removed due to tripping on a "LRC/I2T" fault approximately one minute after start initiation. The Byron Jackson 400 HP, 2300V, Type H submersible motor has been inspected in our shop. Please reference the attached City of Aurora Well 29 Inspection Report dated 08/02/16.

The motor is not eligible for field service. Layne recommends returning the motor to Flowserve for factory inspection, report, and repair/replace recommendations.

The damage to the motor's balance tube, and to the balance tube channel, requires more discussion. The missing balance tube and worn channel are in the same location and are at the lower one foot of the motor bottom motor can. The balance tube insert fitting into the lower can remains in place. While the pump setting was designed to place the bottom of the motor at 905' below the top of the pitless adapter, and the 2014 Well 29 television survey placed the top of the well's 18" liner at 915', I am theorizing, from the nature of the damage, that the lower one foot of the motor may have been resting just inside the top of the liner and operational vibration created the wear to the balance tube and the channel. I have had all the components field tallied and have confirmed the 905' motor bottom setting. Nevertheless, it is difficult to come up with an alternate explanation for the nature of this unusual wear to the balance tube components. Layne recommends a television survey of the well, another careful tally of the length of all components that will be reinstalled, and decreasing the pump setting five to ten feet after confirming that the reduced pump setting is appropriate with recent Well 29 City pumping level data.

The bowl assembly and pipe have no issues and can be reinstalled as is. As meg readings were indeterminate regarding the cable condition, Layne recommends a HyPot test of the cable.

WATER RESOURCES

Layne recommends a Phase II scope of work to include

- Ship motor to Flowserve for inspection, report, and repair/replace recommendations
- HyPot test cable
- Televise well

If contracted, Layne will perform the work on a time and material basis per the attached Work Order Form and will follow the terms and conditions of our Professional Services Agreement (PSA) with the City. The attached Work Order Form lists Layne's standard published rates. The estimates in this letter include the PSA stipulated 5% deduct applied toward labor and 10% deduct applied toward special services. A proposed Phase II PSA Task Order is included that reflects this scope and references the estimate in this cover letter.

The proposed scope and budget estimate of Phase II are as follows:

Ship motor to Flowserve in Taneytown, PA, HyPot test cable, televise well Submit motor, HyPot, and Television Survey reports	\$ 3,905
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In anticipation that the motor will be replaced by a factory exchange motor, additional estimates to return the pump to service are as follows:

- | | |
|--|-----------|
| 1. Byron Jackson 400 HP, 2300V, Type M submersible motor,
shipping and handling | \$128,800 |
| 2. Pump reinstallation and testing | \$ 40,000 |

Turnaround time for the factory exchange motor is approximately 12 weeks. The City should be aware that if circumstances require a more immediate return to service, Layne maintains a Byron Jackson 400 HP, 2300V, Type M motor in stock at its Aurora yard. There is a significant premium for the stock motor at a cost of \$154,550.

Thank you for the opportunity to present this information. If you have any questions, or if Layne may be of any service, please do not hesitate to contact me.

Layne Christensen Company



William Balluff, P.E.
Senior Project Manager





721 WEST ILLINOIS AVE.
AURORA, IL 60506
630.897.6941 PHONE
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CITY OF AURORA
WELL NO. 29 PUMP
INSPECTION REPORT

JOB NAME	Aurora	WELL NO.	29	DATE	08/02/16
JOB NO.	41890	INSPECTED BY	M. Poppen, J. Poppen, B. Balluff		
		BOWL ASSEMBLY	Byron Jackson 12 stage 13MGH11L1		
		COLUMN ASSEMBLY	871' of 8" T&C (including 8' of stainless off bowl)		
		MOTOR	Byron Jackson 400 HP, 2300V, Type H		

MOTOR



400 HP Byron Jackson motor in Layne yard, top end with motor shipping bracket.



Bottom end. Balance tube fitting still in place but missing lower one foot of balance tube.



Balance tube fitting. Closer view of missing balance tube.



Missing section of balance tube. Balance tube steel channel also missing in same area.



Top end of motor without shipping bracket.



Erosion on top centering bracket.

Motor Observations

The motor is missing the lower one foot of balance tube. The balance tube steel protective channels are also missing in this one foot area. The motorwinding resistance tests very low, in the teens. The shaft projection is 1/32" lower than spec. The shaft is extremely tight to turn. The seal does not float properly. The top case adapter centering flange is eroded. The exterior surfaces of the motor are in very good condition.

Motor Recommendations

Ship motor to Flowserve for inspection and report. Consider setting the pump at least five feet shorter.



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WELL NO. 29 PUMP
INSPECTION REPORT

BOWL ASSEMBLY

Bowl Assembly Observations

The bowl assembly was rebuilt to new spec and placed in operation in March of 2014. During this 2016 pump removal, the bottom casting was removed. Wear ring clearance is .037" and the bushing clearance is .010". The motor's shaft projection is 1/32" lower than spec which indicates that the pump adjustment was minimally effected by the motor failure and impeller/casing contact is not an issue.

Bowl Assembly Recommendations

Reinstall as is.

COLUMN PIPE

Pipe Observations

The column pipe is racked on site. The pump removal crew did not find any issues with the column.

Pipe Recommendations

Reinstall as is.

CABLE –

The motor and cable megged 65/75/77 in assembly. The motor alone megged 75/77/79 in the field and 13/16/18 in the shop.

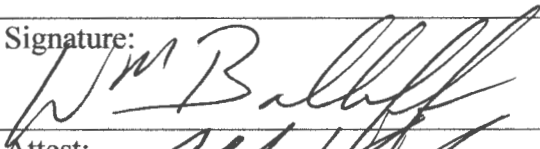
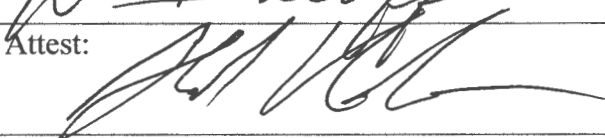
Recommend HyPot testing of cable.

WELL –

Recommend television survey.

Exhibit 1
Task Order
Phase II

Date	August 2, 2016
Project Name	Aurora Well #29 Pump Rehabilitation
Project Scope	<ul style="list-style-type: none"> • Ship motor to Flowserve for inspection, report, and repair/replace recommendations • HyPot test cable • Televis well
Schedule / timeline	As required and dictated by the City of Aurora and within Layne Christensen's competences.
Additional Information	See cover proposal and cost estimates dated August 2, 2016.

City of Aurora, IL	Layne Christensen Company
Print Name:	Print Name: William Balluff, P.E.
Title:	Title: Senior Project Manager
Signature:	Signature: 
Attest:	Attest: 
Date:	Date: August 2, 2016

WORK ORDER



Layne Christensen Company

721 W. Illinois Avenue, Aurora, IL 60506; Phone (630) 897-6941
 229 W. Indiana Ave., P.O. Box 489, Beecher, IL 60401; Phone (708) 946-2244

PSA SCHEDULE B

Purchaser: City of Aurora, IL
 Job Location: Well #29

SERVICE RATES - EFFECTIVE OCTOBER 1, 2015

	Straight Time		Overtime	Doubletime
	Per Hr.	8 Hr. Day	Per Hr.	Per Hr.
Serviceman w/hand tools	175.00	1400.00	262.50	350.00
Serviceman w/service truck and hand tools, or welder	204.00	1632.00	291.50	379.00
Helper	143.00	1144.00	214.50	286.00
Serviceman and 1 Helper	318.00	2544.00	477.00	636.00
<u>Small Rig or Winch Truck (\$40.00)</u>				
1 Man Crew	215.00	1720.00	302.50	390.00
2 Man Crew	358.00	2864.00	517.00	676.00
3 Man Crew	501.00	4008.00	731.50	962.00
<u>Middle Rig, Large Hoist or Flatbed Crane (\$62.00)</u>				
1 Man Crew	237.00	1896.00	324.50	412.00
2 Man Crew	380.00	3040.00	539.00	698.00
3 Man Crew	523.00	4184.00	753.50	984.00
<u>Big Rig, Large Hoist and Poles, or Large Crane (\$102.00)</u>				
1 Man Crew	277.00	2216.00	364.50	452.00
2 Man Crew	420.00	3360.00	579.00	738.00
3 Man Crew	563.00	4504.00	793.50	1024.00
4 Man Crew	706.00	5648.00	1008.00	1310.00
Power Tong Usage, per 8 hour shift		450.00		
<u>Machine Shop/Yard Labor and Equipment</u>				
Machinist and Equipment	169.00	1352.00	245.00	321.00
12" Threading Machine and Operator	195.00	1560.00	271.00	347.00
Serviceman w/hand tools	152.00	1216.00	228.00	304.00
Helper	139.00	1112.00	208.50	278.00
Sandblast Equipment and 2 man crew	339.00	2712.00	484.50	630.00
Mileage: Auto: \$0.55	Pickup: \$0.70	1-Ton:\$1.00	2-1/2 Ton Flatbed: \$2.10	Semi-Tractor: \$275

Subsistence-Per Man

Over 55 miles radius from home office.....\$60.00 + Hotel

REMARKS:

SUBMITTED WITH PHASE II ESTIMATE OF 08/02/16

Work Authorized on Behalf of Purchaser By: _____

Date: _____

Title: _____