Groundwater
& Environmental Services, Inc.

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October 4, 2016

Mr. Maurice Moore
NYSDEC Region 9
270 Michigan Avenue
Buffalo, New York 14203

Re: **Pilot Test Summary Report**
Former Vac Air Alloys Facility
300 Falconer Street
Frewsburg, New York
NYSDEC Site #907016

Dear Mr. Moore:

Groundwater & Environmental Services, Inc. (GES) has prepared this *Pilot Test Summary Report* for New York State Department of Environmental Conservation (NYSDEC). This report summarizes the total phase extraction (TPE) pilot test activities conducted at the site on July 20 and July 21, 2016. The objective of the TPE pilot test was to determine total fluid recovery flow rates to size a replacement pump.

The TPE test was completed using the existing recovery well infrastructure and GES' data acquisition and processing laboratory (DAPL) platform. The DAPL unit is a self-contained pilot testing platform that provides computerized on-site real-time data acquisition and processing evaluation. The DAPL unit is fully equipped with blowers, pumps, sensors, and the hardware needed to perform a wide range of testing including groundwater extraction. Onboard sensors monitor and continuously log system operating conditions and field responses, including vacuum/pressure responses, vapor and liquid flow rates, and groundwater levels. The onboard computer manages and integrates the incoming data and performs real-time calculations and analyses to allow for immediate evaluation of test conditions.

The pilot test was performed at four locations: EW-10, EW-4, EW-14, and the North Header Line. A network of existing monitoring points was utilized to monitor the in-situ conditions during the pilot test. Prior to the test, GES personnel gauged baseline depth to water at the extraction wells and monitoring points. At the start of the test, EW-4, EW-5, EW-9, EW-10, EW-14, EW-15, MW-3, and MW-11R had fully submerged screened intervals.

Well ID	**Bottom of Screened Interval Elevation**	**Top of Screened Interval Elevation**	**Ground Elevation**	**Static Depth to Water** (feet below grade)	**Static Groundwater Elevation** (feet below grade)
EW-4	1231.18	1236.18	1248.93	7.17	1241.76
EW-5	1227.35	1232.35	1249.35	5.81	1243.54
EW-9	1232.18	1237.18	1250.10	7.31	1242.79
EW-10	1230.93	1235.93	1249.10	5.99	1243.11
EW-14	1233.35	1240.35	1251.35	9.01	1242.34
EW-15	1233.27	1240.27	1251.27	8.09	1243.18

Well ID	Bottom of Screened Interval Elevation	Top of Screened Interval Elevation	Ground Elevation	Static Depth to Water (feet below grade)	Static Groundwater Elevation (feet below grade)
MW-2	1238.60	1243.60	1251.60	12.04	1239.56
MW-3	1232.30	1242.30	1252.30	9.52	1242.78
MW-11R	1235.80	1240.80	1250.80	4.05	1246.75
PZ-1	NM	NM	1250.22	4.99	1245.23
PZ-3	NM	NM	1250.82	6.36	1244.46

Test #1 at EW-10

On July 20, 2016, GES personnel completed the TPE pilot test at extraction well EW-10, located adjacent north of the groundwater treatment facility. The objective of the test was to determine the groundwater recovery flow rate from EW-10. The TPE test included placing a one-inch drop tube in EX-10, approximately twenty (20) feet below the top of well casing, or approximately fourteen (14) feet below static groundwater levels. The well was sealed at the surface to enhance groundwater recovery using an applied vacuum. Recovered liquids were treated through the system.

During the test, influent volatile organic compounds (VOCs), lower explosive limit (LEL), and oxygen reading were collected from the recovered air stream. Pressure transducers were installed at monitoring points PZ-3, MW-2, and EW-9 to monitor vacuum influence and hydraulic influence during and after the extraction test. The remote monitoring equipment data is tabulated and found in **Appendix A**. **Figure 1** shows hydraulic influence observed in monitoring wells versus time.

EW-10

- Maximum blower vacuum was applied at 23 inches of mercury column (in. Hg), yielding approximately 18 in. Hg vacuum and 10 standard cubic feet per minute (scfm) of air flow at the well head. **Figure 2** shows applied blower vacuum and resultant flow and well vacuum versus time at extraction well EW-10.
- A constant liquid level drawdown of approximately eleven (11) feet below static water level was maintained throughout the test. **Figure 3** shows applied blower vacuum with resultant well vacuum and hydraulic influence at extraction well EW-10 versus time over the test duration.
- A total of approximately 25 gallons of liquid was removed over the seventy (70) minute test. The groundwater pumping rate was estimated at 0.36 gallons per minute (gpm).
- Soil vapor concentrations were monitoring throughout the test with a Photoionization Detector (PID). PID readings ranged from 40.3 parts per million by volume (ppmv) to 114 ppmv.

EW-9 (71 feet west of EW-10)

- A maximum liquid level drawdown of approximately 1.30 feet was observed during the pilot test. Vacuum influence was not observed during the pilot test.

MW-2 (76 feet northwest of EW-10)

- MW-2 is located on the northern side of the slurry wall. Vacuum influence and hydraulic influence were not observed over the duration of the pilot test.

PZ-3 (67 feet southeast of EW-10)

- PZ-3 is located on the eastern side of the slurry wall. Hydraulic influence was not observed over the duration of the pilot test.

Test #2 at EW-4

At the completion of the pilot testing conducted at EW-10, GES personnel set up on extraction well EW-4, located northwest of the Front Processing Building. GES personnel placed a one-inch droptube approximately twenty (20) feet below grade (approximately thirteen (13) feet into the water table). The well was sealed at the surface to enhance groundwater recovery using an applied vacuum. Recovered liquids were treated through the system. During the test, influent VOCs, LEL, and oxygen readings were collected and vacuum influence and hydraulic influence were monitored for approximately one hour at monitoring well MW-3 and extraction well EW-5. **Figure 4** shows hydraulic influence observed in monitoring wells versus time.

EW-4

- Maximum blower vacuum was applied at 18 in. Hg, yielding approximately 11 in. Hg vacuum and 28 scfm of air flow at the well head. **Figure 5** shows applied blower vacuum and resultant flow and well vacuum versus time at extraction well EW-4.
- A constant liquid level drawdown of sixteen feet below top of well casing (nine feet below the static water table) was maintained. **Figure 6** shows applied blower vacuum with resultant well vacuum and hydraulic influence at extraction well EW-4 versus time over the test duration.
- A total of approximately 62 gallons of groundwater was recovered during the seventy (70) minute test. A groundwater extraction flow rate of 0.87 gpm was observed over the duration of the test.
- PID readings ranged from 2.8 ppmv to 3.9 ppmv.

EW-5 (38.5 feet east of EW-4)

- A maximum liquid level drawdown of approximately 0.07 feet was observed. A maximum pressure of 0.06 in. H_2O was observed during the pilot test.

MW-3 (35.5 feet northeast of EW-4)

- A maximum vacuum influence of 0.02 in. H_2O was observed and a maximum liquid level drawdown of approximately 0.35 feet was observed.

Test #3 at EW-14

At the completion of the pilot testing performed at EW-4, GES personnel set up on extraction well EW-14, located east of the Front Processing Building. During the test, influent VOCs, LEL, and oxygen readings were collected and vacuum influence and hydraulic influence were monitored for approximately one hour at monitoring wells MW-11R, PZ-1, and EW-15. **Figure 7** shows hydraulic influence observed in monitoring wells versus time.

EW-14

- An applied blower vacuum of approximately 14 in. Hg, yielded approximately 5 in. Hg vacuum and 35-38 scfm of air flow at the well head. **Figure 8** shows applied blower vacuum and resultant flow and well vacuum versus time at extraction well EW-14. Spikes in flow and blower vacuum numbers at the beginning of the test and at approximately ten minutes into the test were not used in evaluating pilot test data.
- An approximate liquid level drawdown of seventeen feet below top of well casing (eight feet below the static water table) was maintained. **Figure 9** shows applied blower vacuum with resultant well vacuum and hydraulic influence at extraction well EW-14 versus time over the test duration.
- A total of approximately 87 gallons of groundwater was recovered during the sixty (60) minute test. A groundwater extraction flow rate of 1.45 gpm was observed over the duration of the test.
- PID readings ranged from 9.8 ppmv to 14.2 ppmv.

EW-15 (29.5 feet southwest of EW-14)

- A maximum vacuum influence of 0.27 in. H_2O and a maximum liquid level rise of approximately 1.40 feet was observed.

MW-11R (10 feet southeast of EW-14)

- Minimal vacuum influence (less than 0.10 in. H_2O) was observed. A maximum liquid level drawdown of approximately 0.25 feet was observed.

PZ-1 (46 feet northwest of EW-14)

- Minimal vacuum influence (less than 0.10 in. H_2O) was observed. A maximum liquid level drawdown of approximately 0.10 feet was observed.

Test #4 at North Header Line

On July 21, 2016, GES personnel completed pilot testing activities on the North Header Line. The North Header Line runs adjacent to the south bank of the Conewango Creek and consists of a three (3) inch HDPE header pipe plumbed to extraction wells EW-1 through EW-10 via 1.5 inch carbon steel laterals. For this test, applied blower vacuum and resulting flow was monitored on the North Header Line. Hydraulic influence of surrounding monitoring wells was not monitored during Test #4A. Significant amount of water was observed in the North Header Line at the beginning of the test. Once the line was cleared, GES personnel observed that the pitless adapters for extraction wells EW-4, EW-5, EW-9, and EW-10 were in inoperable condition, and these wells were subsequently taken offline. A total of six (6) extraction wells (EW-1, EW-2, EW-3, EW-6, EW-7, and EW-8) were left online for the remaining duration of the test.

North Header Line

- An applied blower vacuum of approximately 22 in. Hg yielded an air flow rate of approximately 10 to 20 scfm during the approximate three (3) hour test. **Figure 10** shows applied blower vacuum and resulting flow through the North Header Line versus time over the duration of the test.

- A total of approximately 1,214 gallons of groundwater was removed during the test. A groundwater extraction flow rate of 7.14 gpm was observed over the duration of the test.
- PID influent readings ranged from 4.5 ppmv to 10.5 ppmv.

Summary

The groundwater treatment system equipment was originally sized to pump a total of 50 gpm at 25-feet suction lift and 30 psi discharge pressure. A Burks Model No. 330WA6BF capable of 64 gpm at 25-feet suction lift and 30 psi discharge pressure is installed at the site. Head loss calculations indicate this pump is undersized for groundwater recovery.

Based on the pilot testing results, GES recommends replacing the existing centrifugal pump with a rotary claw blower. The replacement TPE pump will be operated at an applied blower vacuum of approximately 20 in. Hg. The pump will recover an estimated air flow rate of up to 20 scfm from the six (6) EW/SVE wells and up to 15 scfm from the 12 EW wells, for a total design flow of 300 scfm. The average groundwater recovery rate is estimated at approximately 1.5 gpm per well, for a total flowrate of 27 gpm with all of the wells operating simultaneously.

GES recommends replacing the existing pump with a 20 HP Busch Model MI-1502-BV rotary claw blower. The Busch Model MI-1502-BV blower is capable of 300 acfm at 21" Hg. The recovered fluids will be directed to a 220-gallon moisture separator. Groundwater will be pumped from the moisture separator at a rate of 35 gpm via a Moyno 367-01 progressive cavity pump.

Estimated Costs for System Upgrades

At the request of NYSDEC, GES is including a budgetary costing forecast to perform the necessary remediation system upgrades in accordance with the results of this pilot test as based on discussions with NYSDEC on the current status of system components. Please note that the costs provided below are only for budget estimation is not being provided as a cost proposal for acceptance.

- Costs for Dual Phase Extraction Skid, includes delivery and taxes: $60,000
- Electrician to provide power and interlock with the remediation system: $10,000
- Installation, plumbing, parts, and testing of system upgrades: $20,000
- Replacement of pitless adaptors at all extraction wells: $20,000
- **Total estimated costs: $110,000**

If you have any questions or comments, please contact GES at your convenience.

Sincerely,
GROUNDWATER & ENVIRONMENTAL SERVICES, INC.

Meghan A. Proia
Digitally signed by Meghan Proia
DN: cn=Meghan Proia, o=GES, ou, email=MProia@gesonline.com, c=US
Date: 2016.10.04 14:57:23 -04'00'

Meghan Proia, P.E.
Project Engineer

Eric Popken
Digitally signed by Eric Popken
DN: cn=Eric Popken, o=GES, ou=Buffalo, email=epopken@gesonline.com, c=US
Date: 2016.10.04 14:50:59 -04'00'

Eric D. Popken
Senior Project Manager

Attachments

Figure 1 through Figure 10 – Pilot Test Data
June 30, 2016 Quote from H2K for Claw Style DPE Skid

Figure 1
Satellite Well Liquid Level Change While Extracting at EX-10

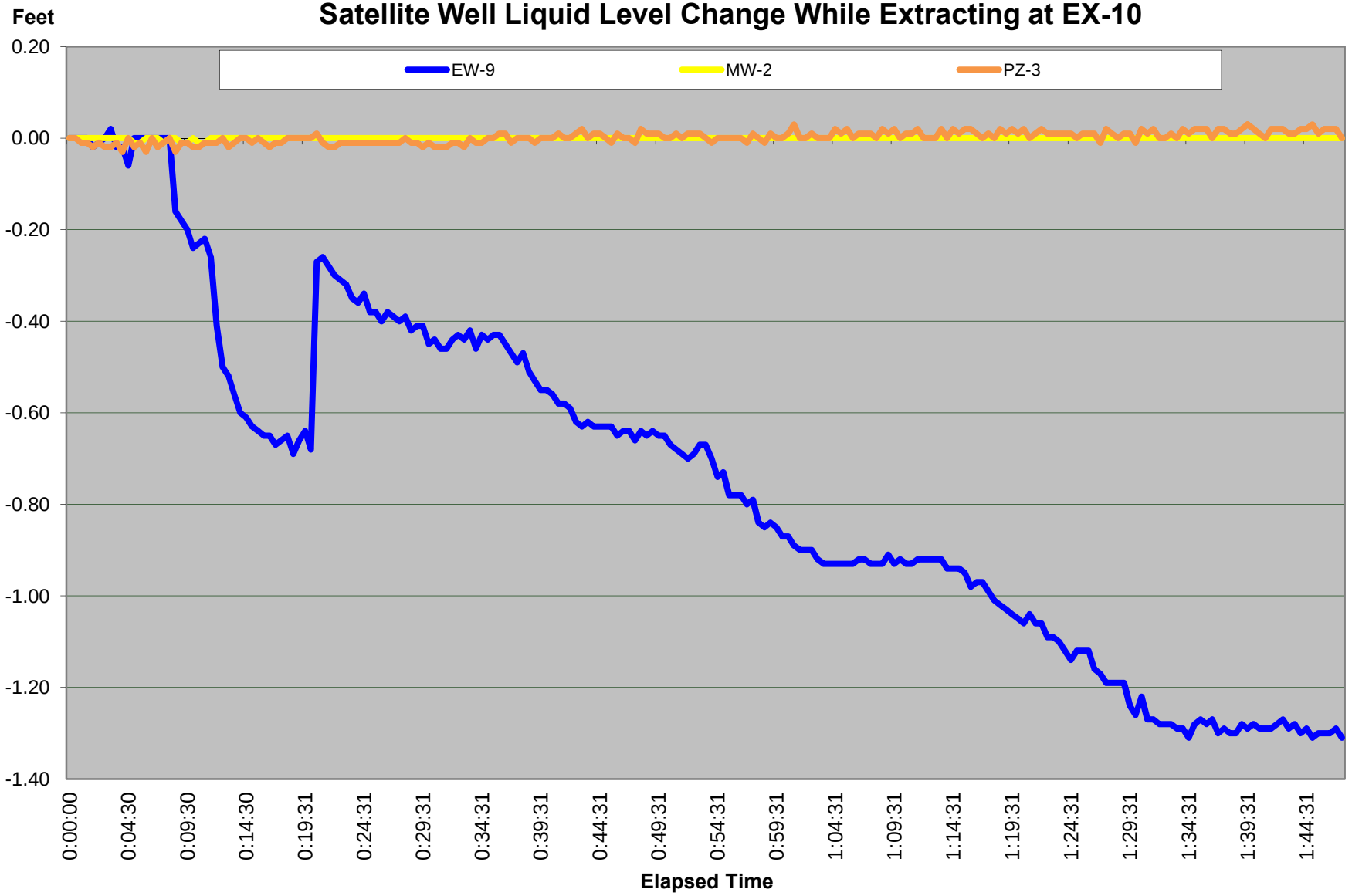


Figure 2
Flow and Vacuum Readings at Extraction Well EW-10

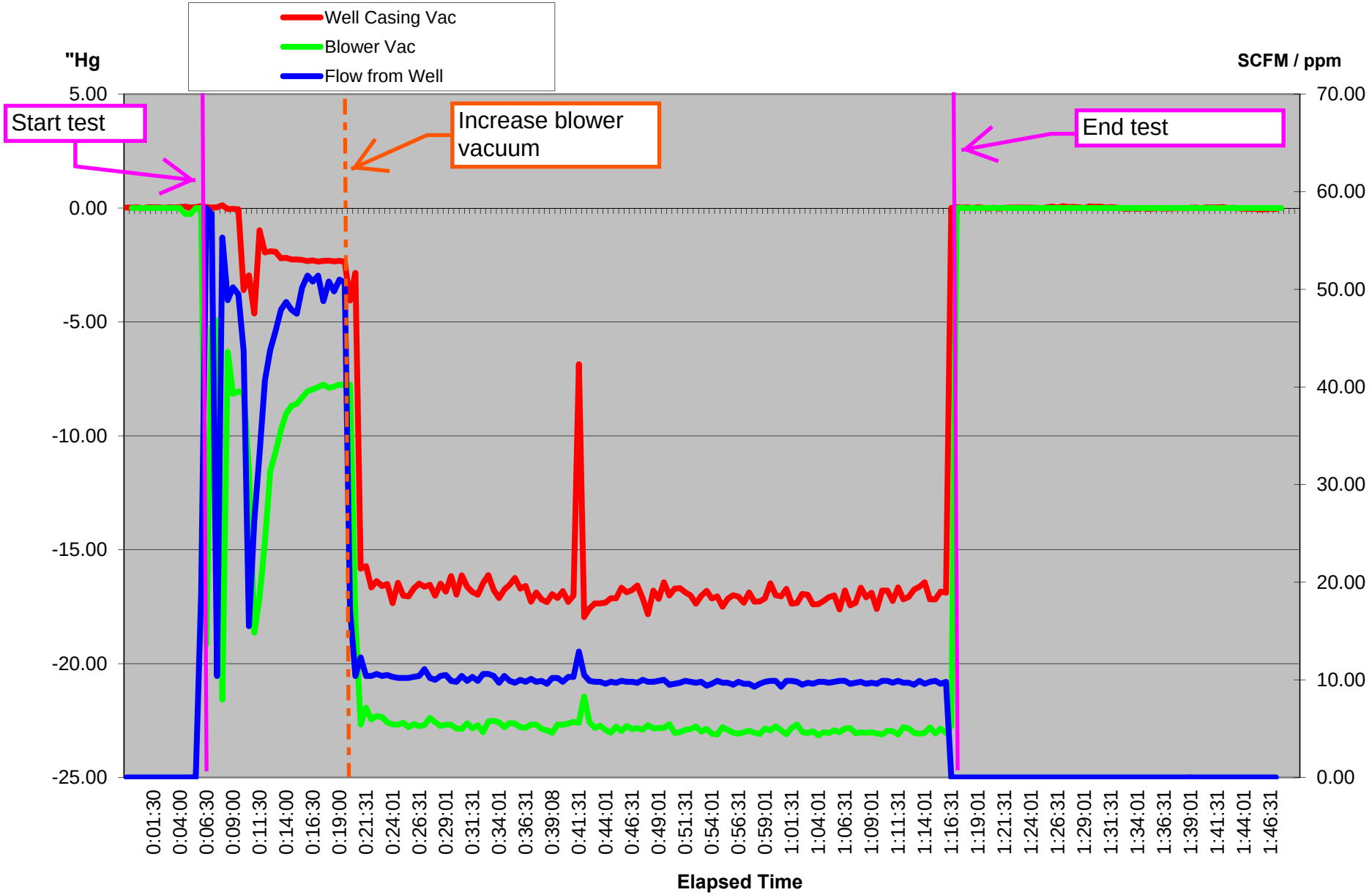


Figure 3
Flow, Vacuum, and Liquid Level Change Readings at Extraction Well EW-10

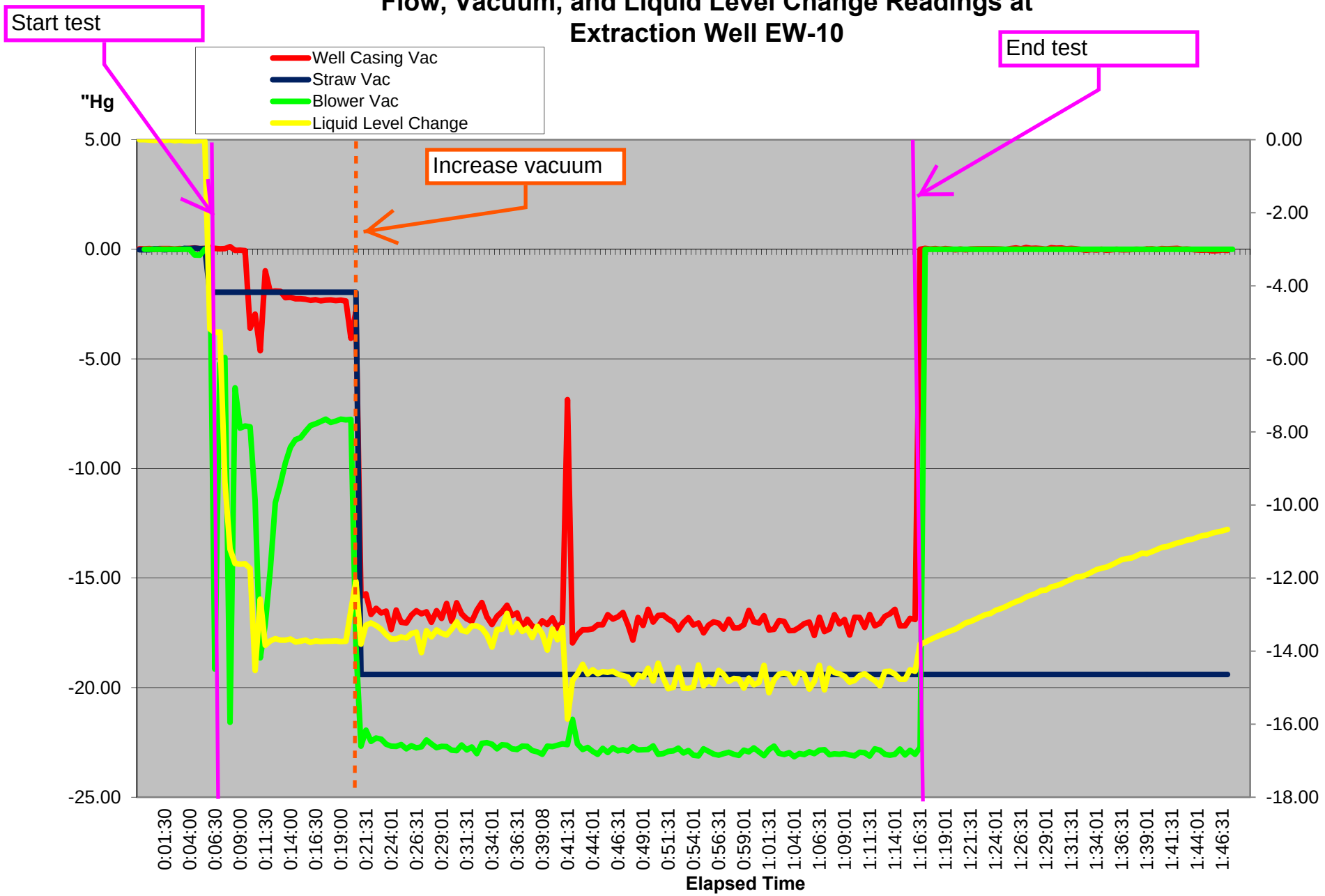


Figure 4
Satellite Well Liquid Level Change While Extracting at EW-4

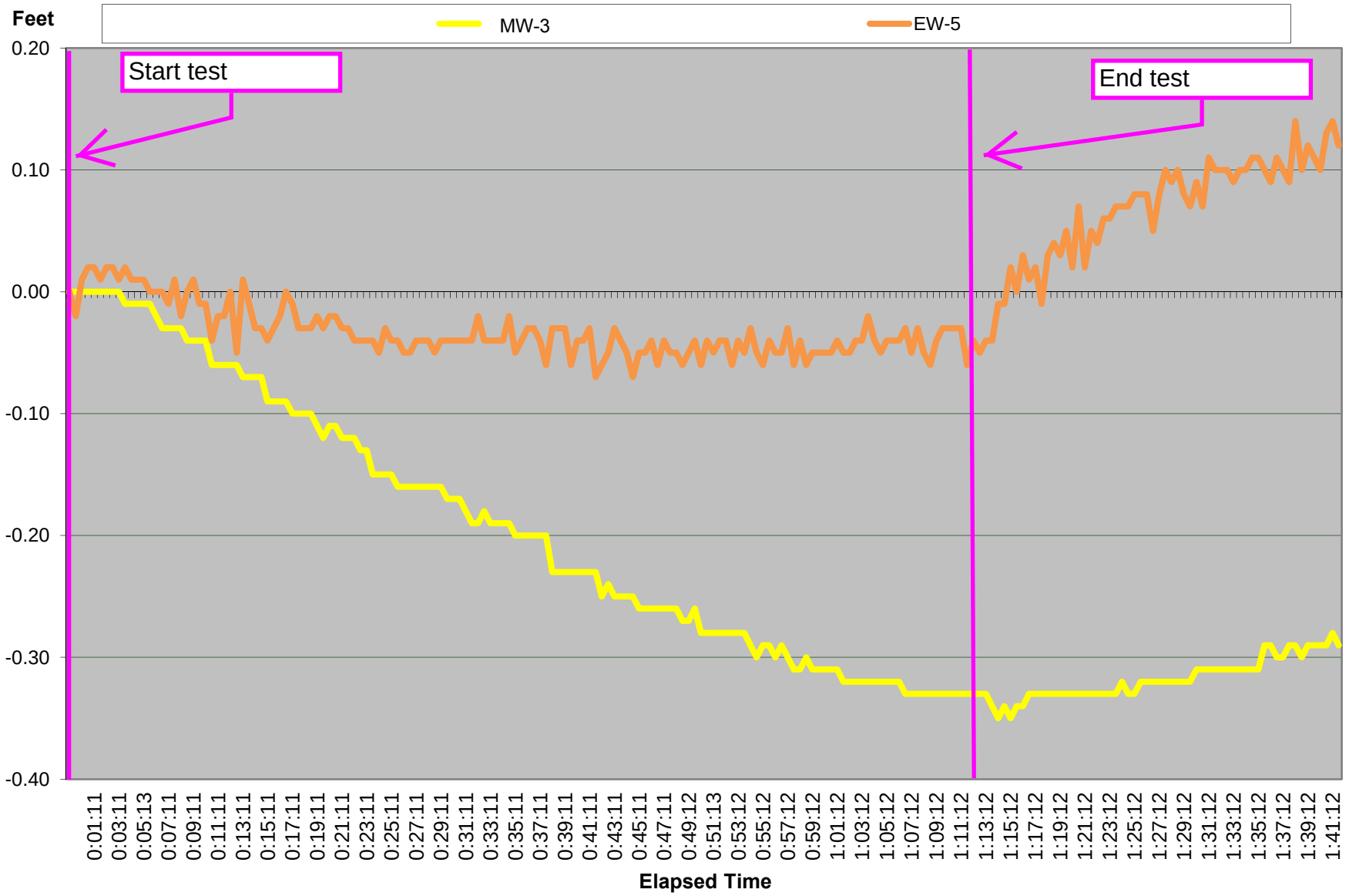


Figure 5
Flow and Vacuum Readings at Extraction Well EW-4

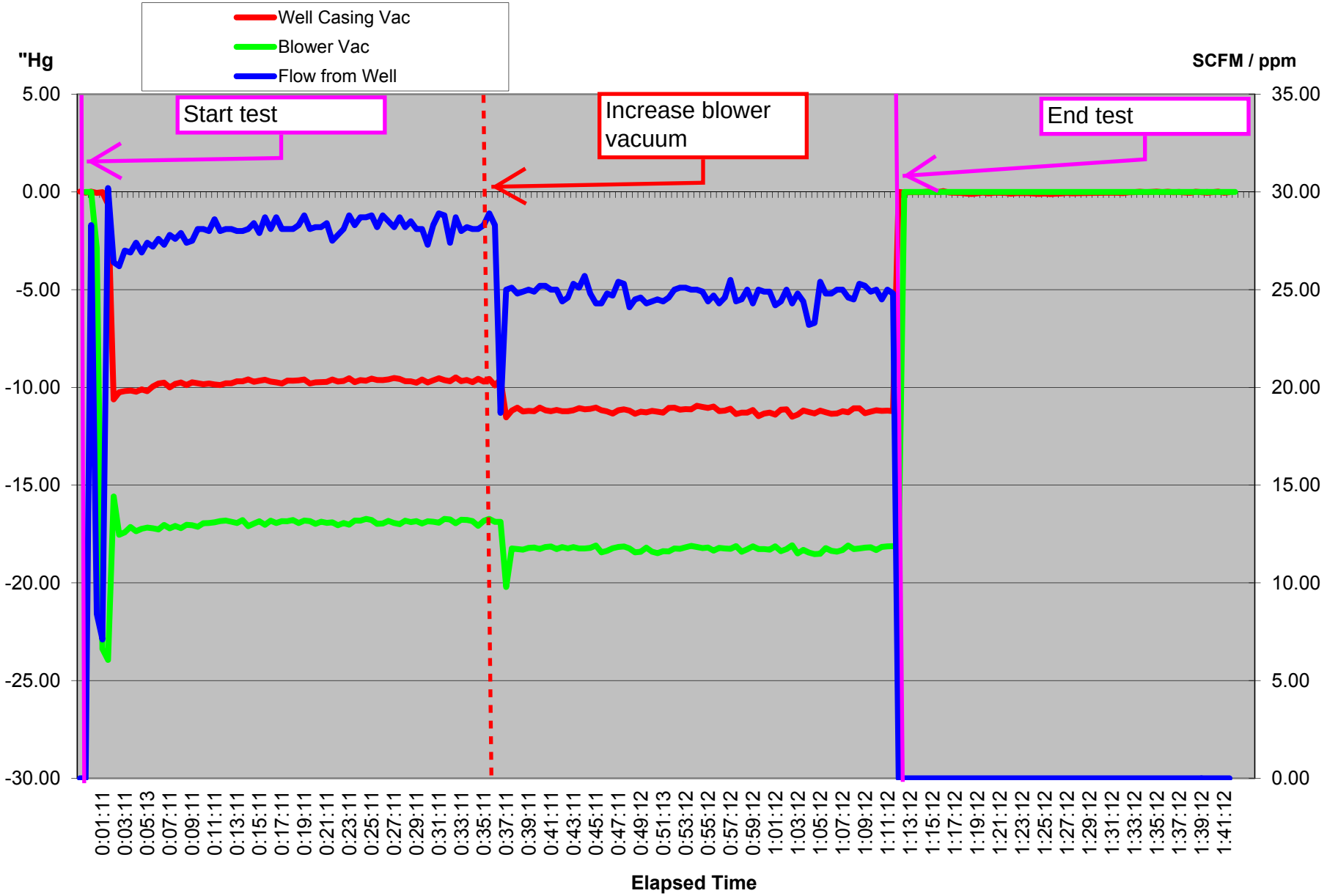


Figure 6
Flow, Vacuum, and Liquid Level Change Readings at Extraction Well EW-4

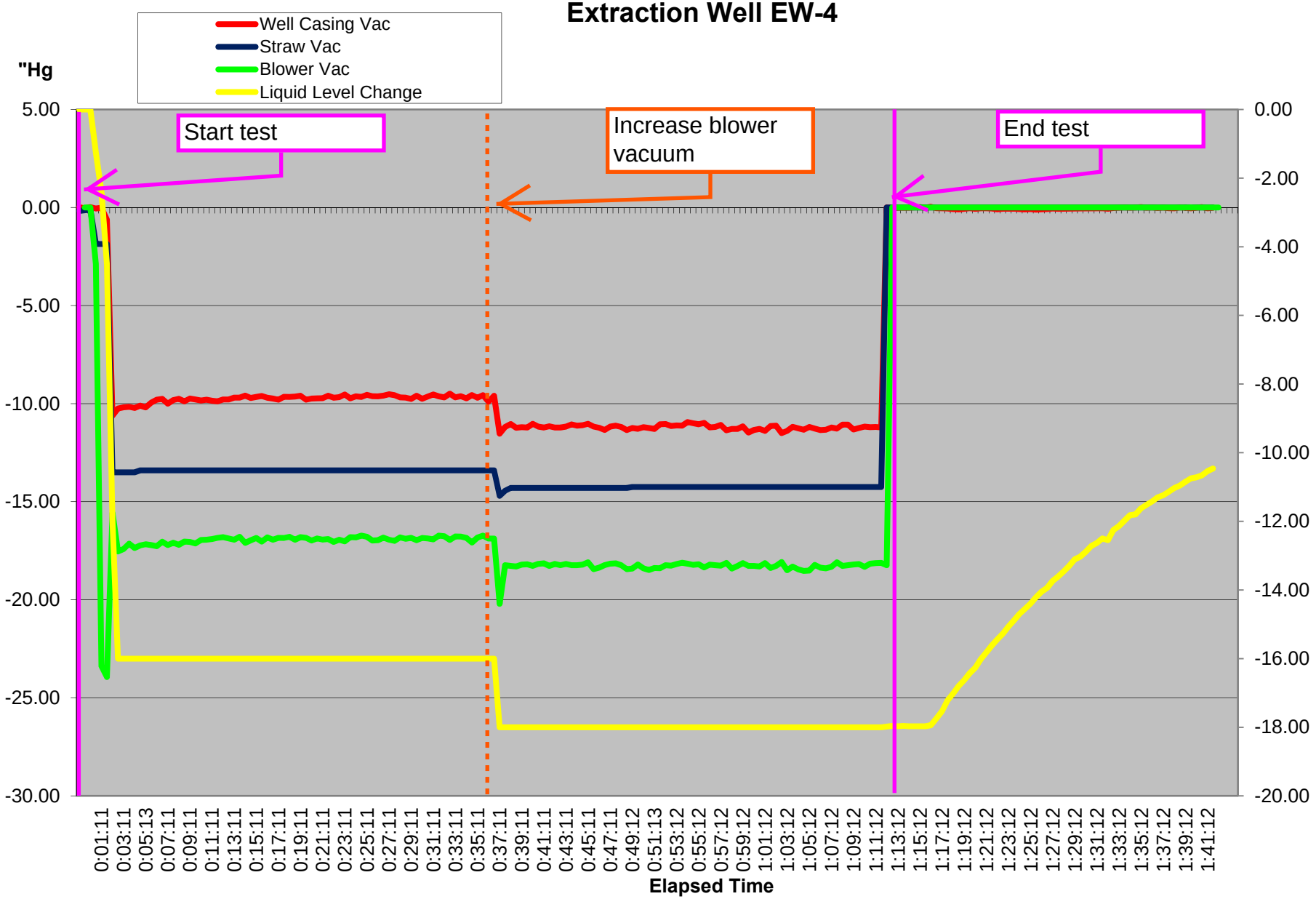


Figure 7
Satellite Well Liquid Level Change While Extracting at EW-14

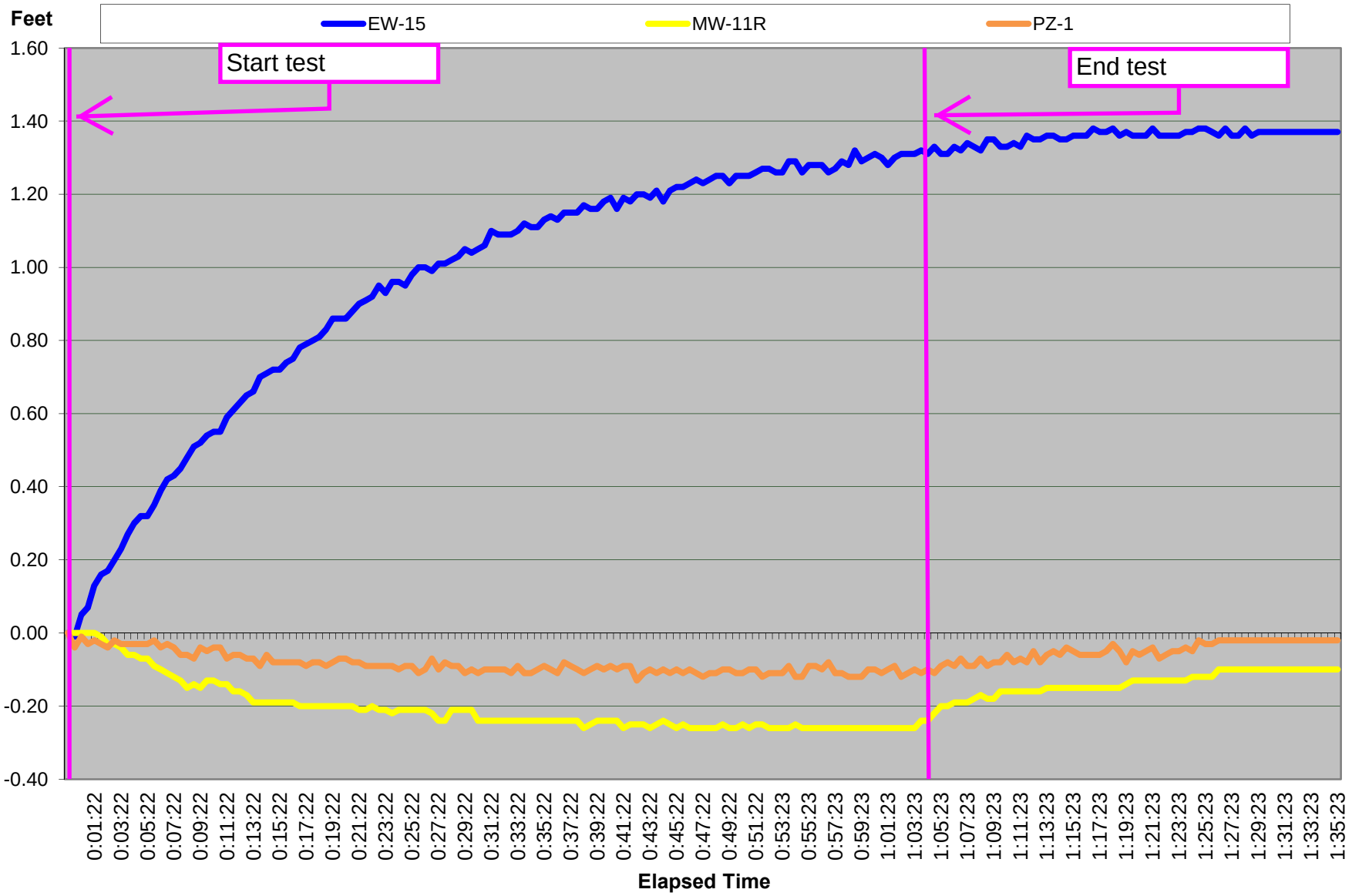


Figure 8
Flow and Vacuum Readings at Extraction Well EW-14

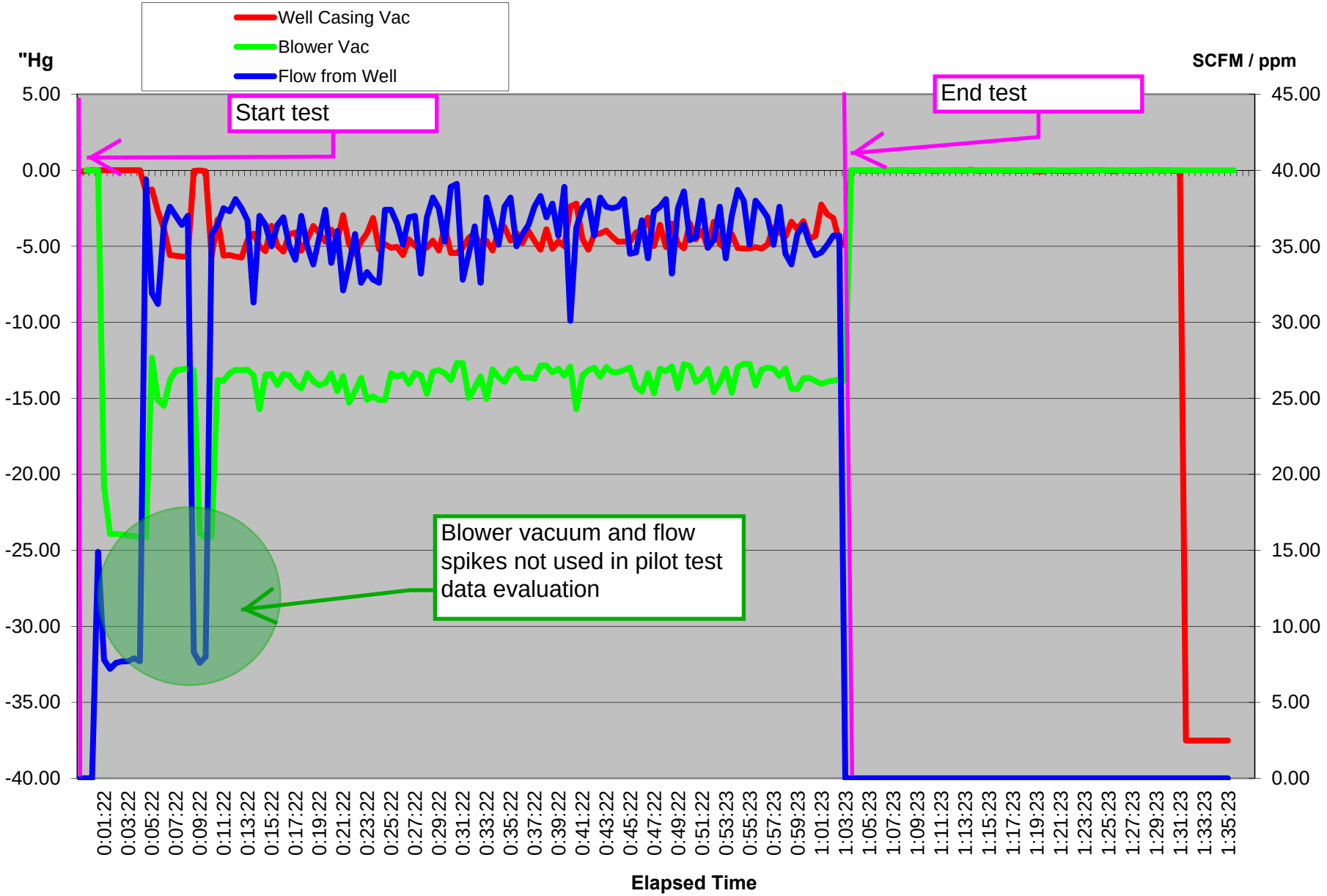


Figure 9
Flow, Vacuum, and Liquid Level Change Readings at Extraction Well EW-14

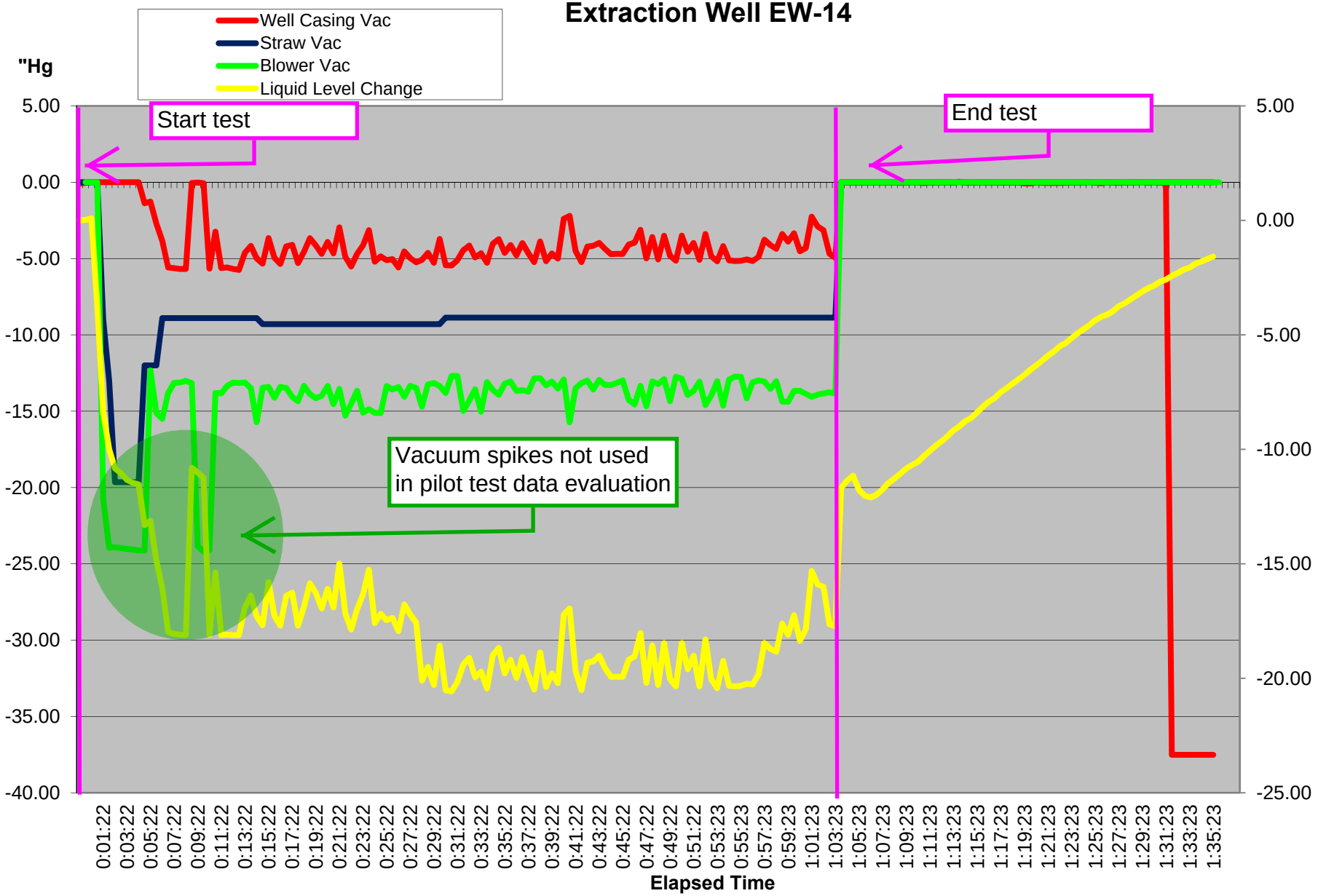
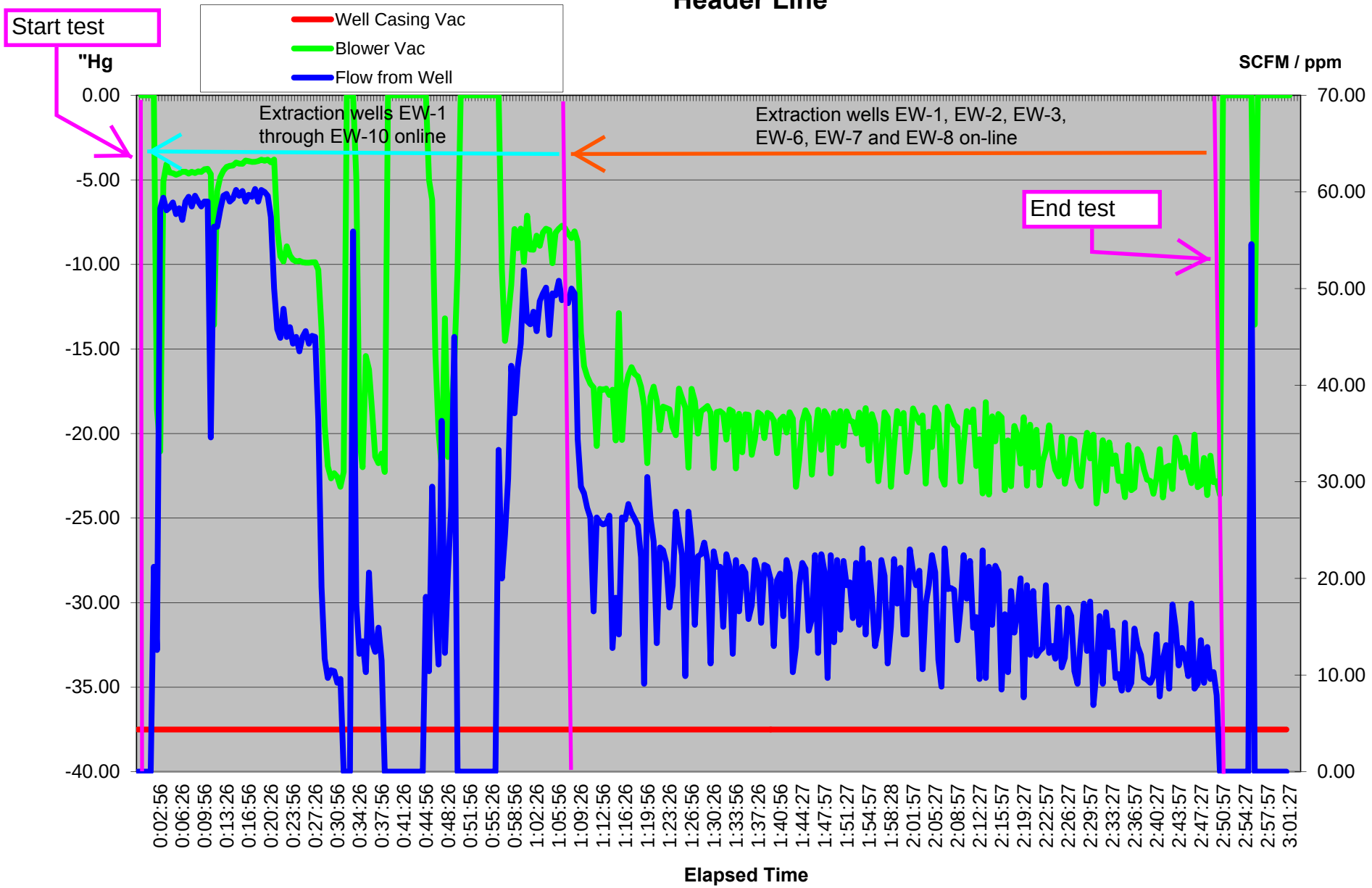


Figure 10
Flow and Vacuum Readings While Extracting at North Header Line



H2K Technologies, Inc.

7550 Commerce Street
Corcoran, MN 55340
Office: 763-746-9900
Fax: 763-746-9903

June 30, 2016

To: Matthew Crance
GES
5 Technology Place, Suite 4
East Syracuse, NY 13057
800-220-3069
mcrance@gesonline.com

Project Name: Claw DVE skid
Project Location: Frewsburg, NY
Quote Number: 4760

Dear Matthew,
Below is a quote you requested for the above referenced project. Quote is per the specifications with exceptions as noted. We appreciate the opportunity to bid on this project, please call or email with any questions.

Description/Pricing

(1) Moisture separator, ***H2K*** model VLS 220, to include
- Tangential inlet and demister for 99% + moisture removal
- Carbon steel construction, industrial enamel finish
- Full Vacuum design rating
- 4" NPT inlet and 4" NPT outlet
- 220 gallon total volume, 55 gallon liquid holding capacity
- PVC site glass with ss High/high-high & low level switches and union for easy removal
- Polypropylene demister element
- 6" Steel plate cleanout port
- (1) 4" PVC Butterfly valve on inlet
- (1) Vacuum gage on separator inlet
- (1) Sample port on separator inlet
- (1) 1" Drain ball valve
- (1) Vacuum relief valve on separator
- (1) Pressure gauge on discharge

(1) Moisture separator pump, Moyno 367-01 progressive cavity pump, to include:
- 2 hp, 240VAC, 3Ø, TEFC motor
- 35 gpm at 30 psi differential pressure
- Carbon steel housing and rotor, NBR rubber stator
- (1) 2" Brass ball valve on pump inlet
- (1) 2" Brass check valve on pump discharge
- (1) 2" Brass gate valve on pump discharge
- (1) Pressure gage on pump discharge
- (1) Sample port on pump discharge
- (1) 2" Brass flow totalizer on pump discharge, Zenner

(1) 4" Inline air filter, Solberg CT-235P-400
- Differential pressure gauge across filter

(1) Dilution intake air line including
- 2" Inlet filter/silencer on dilution air intake
- 2" PVC gate valve on dilution air intake

(1) DPE blower, Busch MI-1502-BV rotary claw blower, to include:
20 HP, 240/460 VAC, 3 ph, TEFC motor
300 acfm @ 21 “Hg capacity
Flexible couplings for vibration isolation on blower inlet and outlet
4” PVC butterfly valve on intake
Vacuum gage on inlet
Vacuum switch on blower intake
Pressure gage on blower discharge
Temperature gage on blower discharge
3” Stoddard silencer on blower discharge

Controls

(1) Control System

For operation on 230 VAC, 3Ø, 3 wire incoming electrical service. To control (1) 20 HP DPE blower & (1) 2 HP pump. Furnished mounted and wired on the equipment skid. To include:

QTY	DESCRIPTION
1	Enclosure, NEMA 4, 36"h, 36"w, 12"d with inner door for switches and indicators
1	Power distribution terminal block (65-335A) 3 pole; L1, L2, L3
1	Power distribution terminal block, 1 pole; Neutral
1	Motor starter: Contactor 23A FLA/Overload relay 5-15.0A, 3Ø; pumps
1	Motor starter: Contactor 23A FLA/Overload relay 20-56A, 3Ø; DPE Blowers
1	Panel Board, 230VAC, 3Ø, NEMA 3R, 80 Amp Main Circuit Breaker mounted next to control panel with the following:
	1 Circuit breaker 230V 3P60A DPE blower
	1 Circuit breaker 230V 3P10A; pump
	1 Circuit breaker 120V 1P15A: control power, lights
2	Switch; three position; Hand-Off-Auto with integral Run (green/LED) indication
2	Light (red/LED); alarms
1	Pushbutton (red/NO); alarm Reset
1	Automation Direct Click PLC controller, with I/O as required for operation
1	6” C-More greyscale touchscreen operator interface terminal
1	Industrial cell modem (landline modem available), for remote system access and alarm callout
1	Hour meters, non-resettable
	Phone line surge protector
2	Intrinsically safe barriers, discrete , 2 channel
	Engraved laminated legends for all door mounted devices
	Terminal blocks for external connections and fusing as required
	Color-coded wiring with wire markers at all terminations
	Fully documented, assembled, wired, programmed and pre-shipment test
1	UL 698A serialized label
1	Emergency stop, mounted on panel exterior door

(1) Equipment skid, approximately 8’ x 6’ x 4” tall dimensions
Includes 4” channel base
Mounting surface to be 3/16” steel sheet
Includes equipment piping and wiring

Piping will be schedule 40 galvanized for SVE discharge & PVC schedule 80 for SVE inlet and water. Wiring will be per NEC for a Class I, Div 2 Group D hazardous environment.

Price Breakdown

Cost for SVE skid as detailed above	**$ 54,768.00**
Freight to Frewsburg, NY (LTL shipment)	**$ 2,550.00**
Total cost of systems above	**$ 57,018.00**

Note:

1. Sales tax is not included with this quote, tax will be added to invoices unless a tax exempt certificate is provided.

General Conditions

1. Terms of payment to be negotiated, preferred 30% on submittal approval, 30% prior to delivery, remainder after receipt, net 45.

2. Proposal and pricing valid for 30 days from the date of this proposal.

3. This proposal and pricing are based on our interpretation of the specifications & P&ID's provided at the time of bid only. We reserve the right to review any and all written specifications and drawings that may apply to this equipment before accepting or stating that the equipment meets specifications at time of order, otherwise equipment is bid as quoted only.

4. H2K Technologies will not initiate work without a fully executed contract or purchase order. Fabrication will not be initiated until complete submittal approvals have been received.

5. Submittals will be provided within two weeks of receipt of a fully executed contract or P.O.

6. Equipment can generally be shipped within 7-9 weeks after receipt of completely approved submittals. Lead time will be updated at the time of order execution.

7. Shipping charges are not included in the prices quoted unless explicitly stated in the proposal. Actual freight costs will be pre-paid and added to the invoice.

8. The process quoted does not include sales tax. All applicable Federal, State and Local sales or use taxes must be paid by the customer.

For shipments to the states of Minnesota: State and local sales and use tax will be added to the invoice, unless a valid sales/use tax exemption certificate is supplied with the contract or purchase order for this project. Exemption certificates must be supplied at the time of order.

For shipments to any other states: The prices quoted do not include any state or local sales/use taxes. Customer is responsible for paying any applicable state and local taxes if this is a taxable sale and no exemption certificate is supplied.

If you have any questions or comments concerning this information, please feel free to give me a call at 763-746-9900. Thank you for the opportunity to bid on this project.

Sincerely,

Joe Udvari