

CITY OF HIGH POINT

AGENDA ITEM



Title: Riverdale Sewer Lift Station- Pressing Need Repairs
Charles R. Underwood Inc.

From: Terry Houk – Public Services Director
Derrick Boone – Public Services Asst. Director

Meeting Date: April 5, 2021

Public Hearing: N/A

Advertising Date: N/A

Advertised By: N/A

Attachments: (A) Change Order # 1

PURPOSE:

To approve Change Order No. 1 to Charles R. Underwood Inc. (PO # 104331) for additional materials and work outside of the scope of work for the pressing need repairs to the existing pumps in the dry well of the Riverdale Pump Station.

BACKGROUND:

Phase I of the expansion project for the Riverdale Pump Station was recently completed. The three existing 10 MGD Wemco-Hydrostal pumps (installed in 1996) were not replaced as part of the phase I expansion project. After the pump station was brought back online, Plant Maintenance staff observed significant vibration from the pumps and also discovered that the 18” discharge valves for the pumps were not holding. Charles R. Underwood Inc. was hired under a pressing needs situation to perform work on the three pumps including fabricating and installing restraint supports and replacing the existing 18” discharge valves. The amount of PO # 104331 was \$89,500. Change Order No. 1 is for additional items required to complete the project including the replacement of drive shafts for pumps #2 and #3.

BUDGET IMPACT:

Funds for this project are available in the 2020-2021 Budget.

RECOMMENDATION / ACTION REQUESTED:

The Public Services Department recommends that Council approve Change Order No. 1 to Charles R. Underwood Inc. in the amount of \$41,512 increasing the amount of the contract to \$131,012.



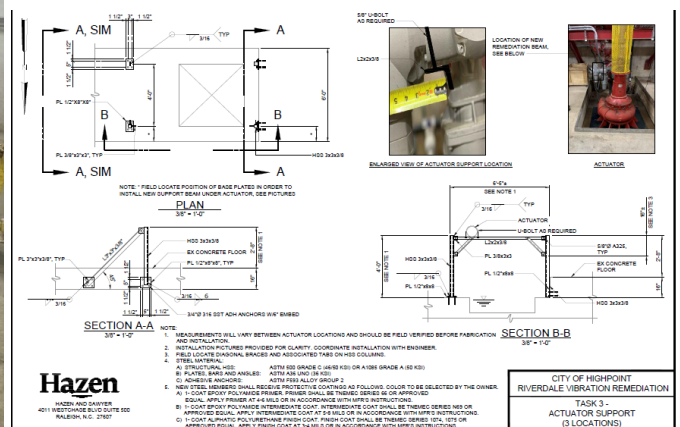
Existing 18" Plug Valve



Newly Replaced 18" Plug Valve



10 MGD Wemco-Hidrostal Pumps and Drive Shafts



Support Drawings for Vibration Remediation



Hazen and Sawyer
450 Hanes Mill Road – Suite 240
Winston-Salem, NC 27105

March 25, 2021

Mr. Terry Houk
Public Services Director
211 S. Hamilton Street – Room 206
High Point, NC 27260

Re: Riverdale Pump Station
Pump Vibration Analysis and Remediation
Change Order No. 1

Dear Mr. Houk,

Enclosed for your review and approval is Change Order No. 1 for additional materials, equipment, and labor provided by the Contractor, Charles R. Underwood (CRU), during performance of work associated with pump vibration analysis and remediation at the Riverdale Pump Station. Included with the Change Order are Work Change Directives (WCD's) 1, 2, and 3 which contain detailed information about the additional items provided by CRU. A summary of the information contained within the WCD's is as follows:

- WCD No. 1 – This original scope of work for CRU included removing existing pump discharge plug valves and replacing with new Owner furnished plug valves. Motorized valve actuators on the existing plug valves were to be removed and installed on the new plug valves. However, the existing actuators required an adapter plate to properly fit onto the new plug valves. Therefore, this WCD was executed to authorize addition of the required adapter plate for all three of the existing motorized valve actuators. The cost for additional materials and labor associated with providing and installing the adapter plates was \$4,000.
- WCD No. 2 – The original scope of work for CRU included providing new bearings for the existing motor of Pump # 3. During work to replace the motor bearings, problems were discovered with the bearing carrier and with the fan keyway on the motor shaft. Therefore, this WCD was executed to authorize repairs to the bearing carrier and motor shaft. The cost for additional labor associated with the repairs was \$1,012.
- WCD No. 3 – Riverdale Pump # 3 experienced a drive shaft failure in January of this year. Since CRU was on site, they were requested to ship the shaft back to its manufacture for a failure analysis. CRU was also requested to coordinate with the shaft manufacturer to perform a finite element analysis (FEA) for all the pump drive shafts currently installed at Riverdale Pump Station. The FEA revealed that drive shafts installed on variable speed Pumps 2 and 3 were undersized. (These pumps were originally constant speed; however, they were converted to variable speed at some time in the history of the pump station.) In addition to the above described shaft analysis, CRU was requested to inspect and repair (if necessary) the rotating assembly and motor of Pump # 3. Fortunately, the motor was found to have no issues, and the pump required very minor repair. Therefore, this WCD was executed to reimburse CRU for drive shaft analysis and pump/motor



inspections. The WCD also authorized procurement and installation of new drive shafts for Pumps 2 and 3, and repairs to Pump # 3. Finally, the WCD authorized performance of vibration spectrum analysis on all three pumps after all other work is complete. The cost for additional materials, equipment, and labor associated with the work described above is \$36,500.

The total added cost for WCD's 1, 2, and 3 is \$41,512. Hazen considers this cost to be reasonable and we consider the additional materials, equipment, and labor provided by CRU to be acceptable. Therefore, we recommended approval of this Change Order by the City of High Point.

Please feel free to give me a call if you have any questions or require additional information.

Very truly yours,

HAZEN AND SAWYER, P.C.

Barry F. Bickerstaff

Barry F. Bickerstaff, P.E.
Associate Vice President

Date of Issuance: March 24, 2021

Effective Date: March 24, 2021

Owner: City of High Point, NC

Owner's Purchase Order No.: 10410433

Contractor: Charles R. Underwood, Inc

Contractor's Project No.: N/A

Engineer: Hazen and Sawyer, P.C.

Engineer's Project No.: 31408-012

Project: Riverdale Pump Station

Contract Name: Vibration Analysis and Remediation

The Contract is modified as follows upon execution of this Change Order:

Description: Modifications to Owner furnished valves, repairs to Pump # 3, pump drive shaft failure analysis, replacement of drive shafts for Pumps 2 and 3 (based on failure analysis), and vibration spectrum analysis of all three pumps upon completion of all repairs and modifications.

Attachments: [List documents supporting change]

- Work Change Directions 001, 002 and 003

CHANGE IN CONTRACT PRICE	CHANGE IN CONTRACT TIMES [note changes in Milestones if applicable]
Original Contract Price:	Original Contract Times: 30 Days (Beginning Dec 1, 2020)
\$ 89,500.00	Substantial Completion: 30 Days
	Ready for Final Payment: 30 Days
[Increase] [Decrease] from previously approved Change Orders No.0 to No. 1	[Increase] [Decrease] from previously approved Change Orders No.0 to No. 1
N/A	Substantial Completion: N/A
	Ready for Final Payment: N/A
Contract Price prior to this Change Order:	Contract Times prior to this Change Order:
\$ 89,500	Substantial Completion: 30 Days (Beginning Dec 1, 2020)
	Ready for Final Payment: 30 Days
[Increase] [Decrease] of this Change Order:	[Increase] [Decrease] of this Change Order:
\$ 41,512.00	Substantial Completion: 150 Days
	Ready for Final Payment: 150 Days
Contract Price incorporating this Change Order:	Contract Times with all approved Change Orders:
\$ 131,012.00	Substantial Completion: 180 Days
	Ready for Final Payment: 180 Days (Ending May 30, 2021)

RECOMMENDED:By: Barry F. Bickerstaff

Engineer (if required)

Title: Associate Vice PresidentDate: March 24, 2021**ACCEPTED:**

By: _____

Owner (Authorized Signature)

Title: _____

Date: _____

ACCEPTED:By: [Signature]

Contractor (Authorized Signature)

Title: General ManagerDate: 3/24/2021**Approved Funding Agency (if required)**

By: _____

Title: _____

Date: _____

Work Change Directive No. 001

Date of Issuance:	December 28, 2020	Effective Date:	December 28, 2020
Owner:	City of High Point, NC	Owner's Purchase Order No.:	104331
Contractor:	Charles R. Underwood, Inc.	Contractor's Project No.:	N/A
Engineer:	Hazen and Sawyer, P.C.	Engineer's Project No.:	31408-012
Project Site:	Riverdale Pump Station	Contract Name:	Vibration Analysis and Remediation

Contractor is directed to proceed promptly with the following change(s):

Description:

Modification of existing motorized actuators to facilitate connection to new Owner furnished plug valves.

Attachments:

1. Quote Number 20230 from The Perkinson Company

Purpose for Work Change Directive:

☐ Owner Requested Change

☒ Change in Conditions

☐ Acceptance of Defective Work

☐ Resolve Contractor Claim

Change in Contract Price and Contract Times

Contract Price	\$ 4,000.00	[increase] [decrease]
Contract Time	N/A	[increase] [decrease]

Basis of estimated change in Contract Price:

<input checked="" type="checkbox"/> Lump Sum	<input type="checkbox"/> Unit Price	
<input type="checkbox"/> Cost of the Work	<input type="checkbox"/> Other	

Recommended:		Authorized:		Received:	
By:	<i>Barry F. Bickenstaff</i>	By:	<i>Terry Houk</i>	By:	<i>John C. Hummer</i>
	Engineer (Authorized Signature)		Owner (Authorized Signature)		Contractor (Authorized Signature)
Title:	Associate Vice President	Title:	Public Services Director	Title:	<i>General Manager</i>
Date:	December 28, 2020	Date:	1/4/2021	Date:	1/8/2021

The Perkinson Company

P.O. BOX 241428, CHARLOTTE, NC 28224 Tel: (704) 525-8191 Fax: (704) 527-6232 E-mail: Mail@PerkinsonUSA.com



AUMA Certified
Sales and Service

Quotation For:

CHARLES R. UNDERWOOD,
CHARLES R. UNDERWOOD, INC.
2000 BOONE TRAIL RD.
SANFORD, NC 27330

Quote Number 20230

Quote Date Dec 14, 2020
Page: 1

Phone: 919-775-2463

Fax: 919-708-7232

Customer ID		Expiration Date	Payment Terms	Sales Rep	
UNDERWOOD-NC		1/13/21	Net 30 Days	SETH PERKINSON III	
Qty.	Item	Description		Unit Price	Extension
1.00		MODIFICATION OF ACTUATOR OFFSETS WITH FIELD SERVICE FOR INSPECTION, REWOR AND DELIVERY, ETC. PROJECT: HIGH POINT- RIVERDALE PUMP STATION		4,000.00	4,000.00
FOB SHIPPING POINT/PREPAY ADD SEE WWW.PERKINSONUSA.COM FOR TERMS AND CONDITIONS ALL CREDIT CARD PAYMENTS ARE SUBJECT TO A 3% SURCHARGE				Subtotal	4,000.00
				Sales Tax	
				Total	4,000.00

Work Change Directive No. 002

Date of Issuance:	January 8, 2021	Effective Date:	January 8, 2021
Owner:	City of High Point, NC	Owner's Purchase Order No.:	104331
Contractor:	Charles R. Underwood, Inc.	Contractor's Project No.:	N/A
Engineer:	Hazen and Sawyer, P.C.	Engineer's Project No.:	31408-012
Project Site:	Riverdale Pump Station	Contract Name:	Vibration Analysis and Remediation

Contractor is directed to proceed promptly with the following change(s):

Description:

Problems with the bearing carrier component and fan keyway on the motor shaft were discovered during replacement of motor bearings for Pump No. 3. The problems were corrected concurrent with motor bearing replacement. Note that motor bearing replacement was part of the project's original scope.

Attachments:

1. Invoice Number 566472 from Randall Supply.

Purpose for Work Change Directive:

☐ Owner Requested Change

☒ Change in Conditions

☐ Acceptance of Defective Work

☐ Resolve Contractor Claim

Change in Contract Price and Contract Times

Contract Price	\$ 1,012.00	[increase] [decrease]
Contract Time	N/A	[increase] [decrease]

Basis of estimated change in Contract Price:

<input checked="" type="checkbox"/> Lump Sum	<input type="checkbox"/> Unit Price	
<input type="checkbox"/> Cost of the Work	<input type="checkbox"/> Other	

Recommended:		Authorized:		Received:	
By:	<i>Barry F. Bickersstaff</i>	By:	<i>Terry Houk</i>	By:	<i>John C. Hummer</i>
	Engineer (Authorized Signature)		Owner (Authorized Signature)		Contractor (Authorized Signature)
Title:	Associate Vice President	Title:	Public Services Director	Title:	<i>General Manager</i>
Date:	January 8, 2021	Date:	January 8, 2021	Date:	1/8/2021



RANDALL SUPPLY, INC
2409 WALKUP AVENUE
MONROE, NC 28110
UNITED STATES
(704)-289-6479

INVOICE

INVOICE NUMBER 566472
INVOICE DATE 12/16/2020
PAGE 1

S 001511
O CHARLES R. UNDERWOOD, INC.
L 2000 BOONE TRAIL ROAD
D SANFORD, NC 27330

T
O

S CHARLES R. UNDERWOOD, INC.
H 2000 BOONE TRAIL ROAD
I SANFORD, NC 27330
P

T
O

NET DUE 1,012.00

SALES REP	SHIP DATE	SHIP VIA	TERMS	JOB NO	TRANS ID
004	12/11/2020		2	0011076T	00005492
CUSTOMER PO: 22990		PO RELEASE: 29736		MISC NUMBER: 38971	

NAMEPLATE DATA

MAKE:US HP/ KW 250HP, R P.M. 1189, VOLTAGE 460, AMPS 290, PHASE 3, CYCLE 60, FRAME:449VP, TEFC (Y/N) Y

SPECIAL INSTRUCTIONS

No special instructions

ITEM # / DESCRIPTION / NOTES	LINKED JOB ID	UNITS	QUANTITY	UNIT PRICE	EXTENSION
ADDER... REPAIR BEARING CARRIER & FAN KEYWAY ON SHAFT					
Labor Subtotal					1,012.00
Material Subtotal					0.00

We appreciate your business.

RS SALES TAX
0.00

Per Zack-

TAXABLE	NONTAXABLE	FREIGHT	SALES TAX	MISC	TOTAL
0.00	1,012.00	0.00	0.00	0.00	1,012.00
PREPAYMENT	0.00			NET DUE	1,012.00

Work Change Directive No. 003

Date of Issuance:	March 22, 2021	Effective Date:	March 22, 2021
Owner:	City of High Point, NC	Owner's Purchase Order No.:	104331
Contractor:	Charles R. Underwood, Inc.	Contractor's Project No.:	N/A
Engineer:	Hazen and Sawyer, P.C.	Engineer's Project No.:	31408-012
Project Site:	Riverdale Pump Station	Contract Name:	Vibration Analysis and Remediation

Contractor is directed to proceed promptly with the following change(s):

Description:

Failure of the drive shaft for Pump # 3 has resulted in the need to inspect and repair the pump and motor. Additionally, investigation into the cause of drive shaft failure has revealed the need to increase shaft wall thickness for drive shafts of variable speed Pumps 2 and 3. Therefore, the Contractor has been requested to obtain and install new drive shafts for these pumps. Finally, vibration spectrum analysis of all three pumps is requested once all repairs and modifications are complete.

Attachments:

1. RFP No. 002
2. Cost proposal from CRU, Inc.

Purpose for Work Change Directive:

☒ Owner Requested Change

☐ Change in Conditions

☐ Acceptance of Defective Work

☐ Resolve Contractor Claim

Change in Contract Price and Contract Times

Contract Price	\$36,500.00	[increase] [decrease]
Contract Time	N/A	[increase] [decrease]

Basis of estimated change in Contract Price:

<input checked="" type="checkbox"/> Lump Sum	<input type="checkbox"/> Unit Price
<input type="checkbox"/> Cost of the Work	<input type="checkbox"/> Other

Recommended:		Authorized:		Received:	
By:	<i>Benny F. Bickerstaff</i>	By:	<i>Timothy H. H.</i>	By:	<i>Jack O'Hara</i>
	Engineer (Authorized Signature)		Owner (Authorized Signature)		Contractor (Authorized Signature)
Title:	Associate Vice President	Title:	Public Services Director	Title:	General Manager
Date:	March 22, 2021	Date:	3/22/2021	Date:	3/23/2021

Hazen

Hazen and Sawyer, P.C.
620 Green Valley Road, Suite 101
Greensboro, NC 27408
Phone: 336-292-7490

REQUEST FOR PROPOSAL # 003 - REVISED

Project	City of High Point, NC Riverdale Pump Station Vibration Analysis and Remediation
Contractor	Charles R. Underwood, Inc.
Subject	Additional Work Associated with Pump # 3
Reference Spec. Section/Drawing No.	N/A

In accordance with the General Conditions of the Contract Documents, you are hereby requested to submit a cost along with detailed breakdowns to perform / delete the following work.

Due to the recent drive shaft failure experienced by Pump # 3, the Owner would like to inspect and repair (if needed) the pump prior to returning it to service. Therefore, the Contractor is requested to submit a cost for performing the following work:

1. Ship the damaged drive shafts from Pump # 3 to Johnson Power.
2. Request that Johnson Power perform failure analysis on the damaged drive shafts.
3. Perform FEA analysis for all drive shafts installed at the Riverdale PS.
4. Based on results of the FEA analysis, procure appropriately sized drive shafts for the variable speed pumps (Pumps 2 and 3).
5. Pull/inspect/repair the rotating assembly for Pump # 3. (Pay particular attention to the seal.)
6. Pull/inspect/repair the motor for Pump # 3.
7. Reinstall rotating assembly and motor for Pump # 3.
8. Install appropriately sized drive shafts on Pump # 3. Check tightness / torque of all connecting hardware for shaft and bearing assemblies of Pump # 3.
9. Return Pump # 3 to service and perform vibration analysis on the pump.
10. Install appropriately sized drive shafts on Pump # 2. Check tightness / torque of all connecting hardware for shaft and bearing assemblies of Pump # 2.
11. Return Pump # 2 to service and perform vibration analysis on the pump.

Attachments: None

Requested By: Barry F. Bickerstaff
Hazen and Sawyer

Date: January 27, 2021

CC: T. Houk – CoHP, D. Boone – CoHP, N. Shujaa – CoHP, A. Babson – H&S



Charles R. Underwood, Inc.
2000 Boone Trail Rd.
Sanford, NC 27330
919.775.2463

February 23, 2021

Mr. Derrick Boone
City of High Point

RE: Riverdale Pump Station – Pump #2 & #3 VFD Drive Shafts

Mr. Boone,

In response to RFP #003, I am pleased to provide you with this proposal. The price provided below includes the following:

- Remove Pump & Motor #3 from service; install volute blank plate.
- Transport pump and motor to Randall Supply for inspection.
 - At this time, the motor was found to have no issues.
 - The pump upper lip seal snap ring was replaced, and the mechanical seal was pressure tested.
 - Mechanical seal checked good.
 - Transport pump and motor back to High Point.
- Consult with Lisa Johnson and run critical speed analysis of existing drive shafts – **attached**.
 - Found existing drive shafts were operating in critical speed area.
 - Johnson Power designed new drive shafts for VFD operation without having to change pillow block bearing locations – **critical speed analysis attached**.
- Provide new VFD drive shafts for pump #2 & #3
 - Includes companion flanges and new pillow block bearings.
- Reinstall Pump #3.
- Install new VFD drive shafts on Pump #3.
- Reinstall motor #3.
- Terminate motor #3, start up and perform vibration analysis.
- Remove motor #2 and current drive shafts.
- Install new VFD drive shafts on Pump #2.
- Reinstall Motor #2.
- Terminate motor #2, start up and perform vibration analysis.
- ****All fasteners will be torqued to spec.**
- Check fasteners on drive shafts for pump #1 for proper torque, tighten as required.
- Provide vibration analysis report.

Total Price: \$36,500.00 Plus Tax.

****Response to Questions:**

- To the date of this proposal, we have confirmed one of your two questions, regarding acceleration up to 900rpm. This is not an issue. **See attached correspondence from Johnson Power.**
- Regarding your other question on the added weight of the new drive shafts posing a problem to the pump and motor, while we believe this should not be a problem and the thrust capacity of the upper motor bearing can more than accommodate the added weight, we have sent this question to US Motors and are awaiting their response. We will forward this to you as soon as it becomes available.

February 23, 2021

As always, we appreciate the opportunity to work with you on this and future projects. Should you have any questions regarding this proposal, please contact us.

Best regards,

Charles R. Underwood Inc.

A handwritten signature in black ink, appearing to read "Zach C. Hinnant". The signature is fluid and cursive, with the first name "Zach" being more prominent.

Zach C. Hinnant, PE
General Manager