

**HIGHLINE WATER DISTRICT  
KING COUNTY, WASHINGTON**

**RESOLUTION 15-5-6C**

**RESOLUTION AUTHORIZING AMENDMENT #1 TO CONTRACT #15-50-02 WITH RH2 ENGINEERING, INC. RELATING TO THE 2015 TYEE WELL ANALYSIS (PHASE 1)**

**WHEREAS**, the District entered into Contract #15-50-02 with RH2 Engineering, Inc. to evaluate alternatives to increase production from the Tyee Wellfield, and

**WHEREAS**, the District requested RH2 Engineering, Inc. submit a Scope of Work and Budget Proposal to assist the District with the Tyee Well Analysis and Preliminary Design of Dosing System (Phase 2), which includes the following tasks: (1) Project Management; (2) Specify New Pump and Well Components; (3) Research to Determine Methods of Iron Bacteria Reduction and (4) Preliminary Design of Dosing System; and

**WHEREAS**, the General Manager and District Engineer have reviewed the April 2015 Scope of Work (Exhibit A) and the Estimate of Time and Expense (Exhibit B) submitted by RH2 Engineering, Inc. (attached and incorporated herein by this reference) for assistance with the Tyee Well Rehabilitation and recommend approval of this resolution.

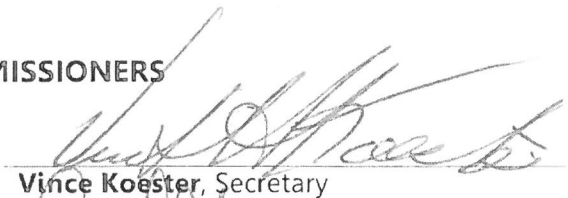
**NOW THEREFORE, BE IT RESOLVED:**

1. The Board of Commissioners approves Contract Amendment No. 1 for a not-to-exceed amount of \$44,363.00 (excluding sales tax).
2. The General Manager or Designee is authorized to execute Amendment No. 1 (referenced as Attachment 1 and incorporated herein) for the 2015 Tyee Well Analysis and Preliminary Design of Dosing System.

**ADOPTED BY THE BOARD OF COMMISSIONERS** of Highline Water District, King County, Washington, at an open public meeting held this **6th** day of **May 2015**.

**BOARD OF COMMISSIONERS**

  
George Landon, President

  
Vince Koester, Secretary

Gerald R. Guite, Commissioner

  
Daniel Johnson, Commissioner

  
Kathleen Quong-Vermeire, Commissioner

**EXHIBIT A**  
**Scope of Work**  
**Highline Water District**  
**Tyee Well - Well Pump Analysis**  
**Amendment No. 1**  
**2015 Tyee Well Analysis and Preliminary Design of Dosing System**  
**April 2015**

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## **Background**

Highline Water District (District) owns and operates a drinking water well, the Tyee Well, located to the south of Sea-Tac Airport in the old Tyee Golf Course. The well was originally designed to produce 830 gpm, but production has dropped to approximately 350 gpm. In April 2015, the well pump was removed and iron bacteria slime was found to be constricting pump intake, well pump, pump column, and water main to the treatment plant. The well pump had lost capacity and was found to have wear in the bowls, impellers, and motor insulation, and was determined to be unsalvageable based on an inspection by Pumptech, Inc., of Bellevue, Washington. It is also assumed that the aquifer formation and the well-screen have been fouled with the iron bacteria since the well's hydrogeologic performance has diminished. The Tyee Well's specific capacity (flow rate divided by feet of drawdown) has fallen from 16 gallons per minute per foot (gpm/ft) in 2001 to approximately 5 gpm/ft as of February 2015. Diagnosis of the well's condition and redevelopment efforts will be managed by Robinson-Noble over the next three to four months. It is anticipated that the hydrogeologic capacity of the well will be partially restored through chemical and mechanical well redevelopment efforts. Past redevelopments in 2006 and 2008 brought the specific capacity back to 11 gpm/ft using chemical and mechanical redevelopment. After each redevelopment, the specific capacity declined to previous levels within 6 months. Methods to slow the production rate decline after redevelopment is the one of the primary objectives of this scope of work.

A replacement well pump must be specified, the pump column replaced, and the water main to the treatment plant cleaned to restore its flow-area and transmission capacity. Additionally, in order to preserve the well's production rate and reduce the chances of iron bacteria slime constricting and damaging pumping equipment and piping, the iron bacteria in the well must be controlled. An in-well injection of the chemical 1-bromo-3-chloro-5,5-dimethylhydantoin (BCDMH) dosing system has shown success in disrupting the growth of iron bacteria in drinking water wells. This scope of work will investigate use of BCDMH or chlorine as a biocide to control the growth of iron bacteria in the Tyee Well.

## **Task 1 – Project Management**

**Objective:** Coordinate with District staff; monitor scope, budget, and schedule; review and issue invoices; and maintain project files and records.

**Approach:**

- 1.1 Coordinate with District on schedule, progress, and design issues.
- 1.2 Prepare invoices. Review for consistency and monitor budget spent. Provide monthly status updates.
- 1.3 Maintain project records and project files.

- 1.4 Prepare project schedule and manage RH2 design team by conveying tasks to team members, monitoring progress, and editing work.

**RH2 Deliverables:**

- Monthly invoices
- Project schedule, updated monthly.
- Weekly status phone calls.

## Task 2 – Specify New Pump and Well Components

**Objective:** Recommend new well pump and new well components.

**Approach:**

- 2.1 Select Pumping Rate and Duty Point for New Well - Based on the information gathered to date on the well's specific capacity and the system hydraulics, recommend a suitable replacement well pump for the Tyee Well. At this time, it is assumed that the well's specific capacity will be restored to approximately 11gpm/ft. *It is further assumed that the specific capacity will decline over time, and that additional energy will be needed to overcome increasing static head if the desired flowrate is to be maintained. For this reason, RH2 recommends decreasing the flow capacity for the replacement pump to 400 to 500 gpm. By equipping the pump with a lower flowrate rating, more of the 100 horsepower rating of the motor control center can be used to overcome additional static head caused by lost well efficiency. The surplus power can also be used to overcome the dynamic head-losses that are estimated to increase if the iron-bacteria slime builds up again in the pump and piping.* Recommend duty point (flowrate and total dynamic head) that can enable the District to increase output from the well and pumping equipment as iron bacteria fouling degrades capacity over time.
- 2.2 Recommend material type for replacement well column and develop a pigging/cleaning plan to clear constrictions from the water main between the well and the treatment plant.
- 2.3 Recommend pump materials and coatings resistant to chemicals recommended for iron-bacteria control.

**RH2 Deliverables:**

- Recommendation of a replacement well pump.
- Recommendation of replacement well column material.
- Pigging/cleaning plan to clear constrictions from water main between well and treatment plant.

## Task 3 – Research to Determine Methods of Iron Bacteria Reduction

**Objective:** Determine a method of reducing iron bacteria growth using a biocide in the Tyee Well, and obtain preliminary approval from the Washington State Department of Health (DOH) for implementation of a biocide system.

**Approach:**

- 3.1 Research biocide applications in drinking water. Determine dosing strategies, acceptable disinfection by-product (DBP) concentrations, possible chemical interactions with well equipment materials, and other parameters regarding use of the biocide.

- 3.2 Contact water purveyors using biocides for the control of iron bacteria to learn of effectiveness and constraints in the use of the biocide.
- 3.3 Attend one (1) preliminary meeting with DOH to discuss implementation of biocide in the Tyece Well.

**RH2 Deliverables:**

- Summary of proposed biocide dosing strategy, proposed DBP monitoring strategies, and DOH response to proposed biocide application.

## Task 4 – Preliminary Design of Dosing System

**Objective:** Develop a preliminary design for a dosing system to apply biocide in the Tyece Well, using the dosing strategy developed in Task 3.

**Approach:**

- 4.1 Prepare conceptual drawings of a biocide in-well dosing system, showing chemical storage quantity and locations, dosing equipment, and other components. Estimate dosing concentration, volume of dosing flow and the potential for disinfectant byproduct formation.
- 4.2 Develop a pilot program to test the efficacy of the proposed system.
- 4.3 Attend one (1) meeting with the District and DOH to discuss conceptual drawings of system and results of pilot program.
- 4.4 Prepare a draft DOH Project Report for the dosing system.
- 4.5 Meet with the District to receive comments and edits to recommendations made in the project report.
- 4.6 Prepare final DOH Project Report for the dosing system.

**Assumptions:**

- *Final construction plans, specifications, and engineer's estimate will be prepared under an additional authorization. At this time, it is uncertain whether a biocide to control iron-bacteria will be permissible by DOH. Final design of any improvements will be scoped after DOH approval of the design concept set forth in the Project Report.*

**RH2 Deliverables:**

- Conceptual graphics showing preliminary design of dosing system.
- Copy of a proposed pilot program for District review and implementation.
- Draft and final DOH Project Reports.

**EXHIBIT B**

Highline Water District

Tyee Well - Well Pump Analysis

Amendment No. 1

2015 Tyee Well Analysis and Preliminary Design of Dosing System

Estimate of Time and Expense

Description		Total Hours	Total Labor	Total Expense	Total Cost
<b>Task 1 Project Management</b>					
1.1	Coordinate with District	4	\$ 796	\$ 20	\$ 816
1.2	Prepare invoices	2	\$ 398	\$ 12	\$ 410
1.3	Maintain project records and project files	2	\$ 398	\$ 32	\$ 430
1.4	Prepare project schedule	3	\$ 597	\$ 35	\$ 632
<b>Subtotal</b>		<b>11</b>	<b>\$ 2,189</b>	<b>\$ 98</b>	<b>\$ 2,287</b>
<b>Task 2 Specify New Pump and Well Components</b>					
2.1	Select pumping rate and duty point for new well	10	\$ 1,566	\$ 171	\$ 1,737
2.2	Provide recommendations for other well components	10	\$ 1,566	\$ 171	\$ 1,737
2.3	Recommend pump materials and coatings	6	\$ 982	\$ 84	\$ 1,066
<b>Subtotal</b>		<b>26</b>	<b>\$ 4,114</b>	<b>\$ 426</b>	<b>\$ 4,540</b>
<b>Task 3 Research to Determine Methods of Iron Bacteria Reduction</b>					
3.1	Research biocide applications; develop dosing strategy	28	\$ 4,636	\$ 408	\$ 5,044
3.2	Contact water purveyors using biocides for control of iron bacteria	8	\$ 1,380	\$ 90	\$ 1,470
3.3	Attend preliminary meeting with DOH	18	\$ 3,264	\$ 249	\$ 3,513
<b>Subtotal</b>		<b>54</b>	<b>\$ 9,280</b>	<b>\$ 747</b>	<b>\$ 10,027</b>
<b>Task 4 Preliminary Design of Dosing System</b>					
4.1	Prepare conceptual drawings	53	\$ 8,580	\$ 840	\$ 9,420
4.2	Develop pilot program	27	\$ 4,451	\$ 353	\$ 4,804
4.3	Attend meeting with District and DOH	16	\$ 2,866	\$ 264	\$ 3,130
4.4	Prepare draft DOH Project Report	30	\$ 4,550	\$ 593	\$ 5,143
4.5	Attend meeting with District to receive comments and edits	11	\$ 1,977	\$ 294	\$ 2,271
4.6	Prepare final DOH Project Report	15	\$ 2,422	\$ 320	\$ 2,742
<b>Subtotal</b>		<b>152</b>	<b>\$ 24,846</b>	<b>\$ 2,663</b>	<b>\$ 27,509</b>
<b>Subtotal 2015 Tyee Well Analysis and Preliminary Design of Dosing System Tasks</b>		<b>243</b>	<b>\$ 40,429</b>	<b>\$ 3,934</b>	<b>\$ 44,363</b>
<b>PROJECT TOTAL</b>		<b>243</b>	<b>\$ 40,429</b>	<b>\$ 3,934</b>	<b>\$ 44,363</b>



**AMENDMENT #1 TO CONSULTANT AGREEMENT FOR SERVICES**

**HIGHLINE WATER DISTRICT  
TYEE WELL PUMP ANALYSIS  
RH2 ENGINEERING, INC. - CONTRACT NO. 15-50-02**

RH2 Engineering, Inc. submitted a Scope of Work (Exhibit A) and Estimate of Time and Expense (Exhibit B) dated April 2015 as requested by Highline Water District for assistance with the Tyee Well Analysis and Preliminary Design of Dosing System (Phase 2): The additional work includes the following:

<b>Task</b>	<b>Description</b>	<b>Cost</b>
1.	Project Management	\$2,287.00
2.	Specify New Pump and Well Components	\$4,540.00
3.	Research to Determine Methods of Iron Bacteria Reduction	\$10,027.00
4.	Preliminary Design of Dosing System	\$27,509.00
Total Request		\$44,363.00
Current Contract Amount		\$5,300.00
<b>REVISED CONTRACT AMOUNT</b>		<b>\$49,663.00</b>

RH2 Engineering, Inc. will undertake the above-referenced additional work on a time-and-expense basis. The estimated cost for these additional services is \$44,363.00. The current contract amount is \$5,300.00. The revised contract amount is \$49,663.00. The same standard general terms and conditions will apply as agreed to in Contract #15-50-02 dated 2/20/15.

**Effective Date.** The effective date of this Amendment shall be the date signed by an authorized representative of the District.

**HIGHLINE WATER DISTRICT**

**RH2 ENGINEERING, INC.**

By: \_\_\_\_\_  
 Matt Everett  
 Title: General Manager  
 Date: \_\_\_\_\_

By: \_\_\_\_\_  
 Tony V. Pardi, P.E.  
 Title: President, Principal in Charge  
 Date: \_\_\_\_\_

Agenda Item No.: 5.2  
 Agenda Date: 05/06/15  
 Reviewed By: BD/m.e.

**Subject:** Authorize Amendment #1 – RH2 Engineering, Inc. - Contract #15-50-02  
Add Phase 2 – 2015 Tye Well Analysis and Preliminary Design of Dosing System

CATEGORY	
<i>Executive</i>	<input type="checkbox"/>
<i>Administrative</i>	<input type="checkbox"/>
<i>Engineering/Operations</i>	<input checked="" type="checkbox"/>

FINANCIAL						
<i>Expenditures?</i>	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>	N/A	<input type="checkbox"/>
<i>Budgeted?</i>	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>	N/A	<input type="checkbox"/>
<i>Estimated Amount:</i>		\$	<u>44,363.00</u>		Excludes sales tax	

**ATTACHMENTS:**

1. Resolution: 15-5-6C
2. Exhibit A: RH2 Engineering, Inc. – April 2015 Scope of Work
3. Exhibit B: RH2 Engineering, Inc. – Estimate of Time and Expense
4. Attachment 1 – Amendment 1

**COMMENTS:**

RH2 Engineering, Inc. submitted a proposal for additional costs relating to Phase 2 - 2015 Tye Well Analysis and Preliminary Design of Dosing System.

The General Manager and District Engineer have reviewed the April 2015 Scope of Work and Budget Proposal for Phase 2 – 2015 Tye Well Analysis and Preliminary Design of Dosing System (Amendment No. 1) from RH2 Engineering, Inc. and recommend approval of this resolution.