



EXHIBIT A

WORK ORDER NO. 8

CITY OF BAY CITY

Arsenic Removal Study Project No. 22W09060

This WORK ORDER (“Work Order”) is made by and between the **City of Bay City** (hereinafter referred to as “Owner”) and **Garver, LLC**, (hereinafter referred to as “Garver”) in accordance with the provisions of the MASTER AGREEMENT FOR PROFESSIONAL SERVICES executed on October 27, 2020 (the “Agreement”).

Under this Work Order, the Owner intends to make the following improvements for **Arsenic Removal Evaluation at 6th & Katy Water Plant and 6th and Avenue I Water Plant**:

Generally, the scope of services includes performing an evaluation of applicable arsenic treatment technologies and developing a conservative constituent model to assess if blending water from one or more of the lower arsenic level wells with water from the higher arsenic level wells can reliably produce finished water with arsenic levels below the MCL. Results of the overall study and model analysis will be presented in a Summary of Findings Memorandum with a construction cost estimate of the final recommended alternative or approach.

Garver will provide professional services as described herein. Terms not defined herein shall have the meaning assigned to them in the Agreement.

1. SCOPE OF SERVICES

1.1. Refer to APPENDIX A – SCOPE OF SERVICES.

2. PAYMENT

2.1. The lump sum amount to be paid under this Agreement is \$137,786.00. For informational purposes, a breakdown of Garver’s estimated costs is included in APPENDIX B – FEE SUMMARY.

3. APPENDICES

3.1. The following Appendices are attached to and made a part of this Work Order:
Appendix A – Scope of Services
Appendix B – Fee Summary



This Work Order may be executed in two (2) or more counterparts each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

The effective date of this Work Order shall be the last date written below.

CITY OF BAY CITY

GARVER, LLC

By: _____
Signature

By: D. Nelson
Signature

Name: Robert K. Nelson
Printed Name

Name: Daniel N. Olson, P.E.
Printed Name

Title: Mayor

Title: Vice President

Date: _____

Date: 5/27/22

Attest: _____

Attest: Brianne JS

Appendix A

SCOPE OF SERVICES

CITY OF BAY CITY, TEXAS Arsenic Removal Study

I. Background

Garver visited the Bay City 6th Street & Avenue I WTP in response to an arsenic maximum contaminant level (MCL) violation for this facility. Compliance with the Arsenic Rule requires maintenance of arsenic levels below the maximum contaminant level (MCL) at all entry points to the distribution system on a running annual average basis. Arsenic levels can be controlled by blending source waters prior to the entry point, implementing arsenic removal processes at individual wells, or in a centralized treatment facility.

The well at 6th Street & Avenue I is currently not in production due to the arsenic MCL exceedance. During a previous arsenic exceedance, the City implemented a blending plan to blend water from the water plants prior to entry point to the distribution system. Generally, blending is a preferred alternative to arsenic removal treatment. However, blending was not found to be effective during this latest violation due to the generally elevated arsenic concentrations occurring at other facilities (while still below the MCL), resulting in higher arsenic concentrations overall in the distribution system water.

There are a total of six production wells for the City. Two of the wells are located on one site and the other wells are located individually and distributed across the system. Currently, the only treatment performed at the existing water plants is free chlorine application and polyphosphate dosing as an iron sequestering agent. Pursuant to the site visit, the City provided recent arsenic water quality results from the other water plants, these facilities included: 6th Street & Katy Avenue, Mockingbird, Grace, and 4th Street & Avenue B.

Garver proposes to develop a Summary of Findings Memorandum with recommendations, criteria, and costs for a proposed permanent arsenic removal treatment system.

II. Scope of Work

The following scope of work describes the services to be provided.

Task I – Project Administration

1. Garver will participate in one kick-off meeting to discuss project objectives, requisite action items, and schedule.
2. Garver will prepare and facilitate one progress meeting with the City to maintain coordination with all stakeholders as well as update schedule and action items.
3. Professional Service Provider will prepare monthly progress/status report sufficient to support monthly billings.

Task II - Water Quality Modeling (Blending Optimization)

1. Challenges to implementing blending or centralized treatment include the potential impacts on the chemical stability of the water as well as the need to convey sufficient volumes of water with low arsenic levels to existing well sites or new treatment facilities for blending. Water quality modeling can help with this assessment, noting that traditional distribution system water quality software models are generally limited to tracking the dynamics of a single constituent as the selected component is transported throughout the distribution system network.

Garver will perform a el using a spreadsheet-based blending model to determine if blending water from one or more of the lower arsenic level wells with the water from the two higher arsenic level

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wells (6th Street & Avenue I and 6th Street & Katy Avenue) could reliably produce finished water with arsenic levels below the MCL. If the overall system has enough low arsenic sources available, and these sources can consistently be operated in conjunction with the high arsenic sources, then the water system may be able to produce finished water below the MCL by blending these sources. In order for blending applications to be appropriate, the wells with low arsenic levels must be reliable on a continuous basis.

Garver will develop three optimized blends, assuming blending of water from multiple wells occurs without additional arsenic removal treatment at a centralized blending facility or at the individual well sites with highest arsenic levels. Garver will also determine the percentages of water that would need to be treated using an arsenic removal process at the two individual higher-arsenic well sites before blending with untreated water to produce finished water with arsenic levels below the MCL, resulting in two additional optimized blends. For each of the five blends, Garver will use a spreadsheet-based model to predict finished water pH, alkalinity, calcium, magnesium, chloride, and sulfate concentrations to identify any concerns related to the chemical stability of the blends.

Garver will also use the City's existing network hydraulic model to identify the required conveyance improvements for blending at the centralized blending facility and the two individual well sites. Garver will document the results of the blending assessment in a Summary of Findings Memorandum.

Task III – Arsenic Treatment Alternatives Evaluation

1. Garver will analyze up to three permanent arsenic treatment system alternatives. The treatment alternatives will be evaluated for location at individual water treatment plant sites, as appropriate, and also as a centralized treatment facility. For a centralized treatment system, Garver will identify and review available sites with City staff with anticipation that chlorinated water will be available to be pumped from applicable water treatment plant sites to the centralized facility location. Permanent arsenic treatment alternatives are expected to comprise:
 - a. Iron Adsorption Media Vessel
 - b. Ion Exchange
 - c. Reverse Osmosis
2. A cost comparison will be performed for each treatment alternative and for comparison of individual treatment sites and a centralized facility to support a recommendation.
3. Iron Adsorption Media Vessel: Perform 3rd Party Raw Water Testing
 - a. Garver will engage a third party (previously worked with) to perform Rapid Small Scale Column Tests (RSSCT) on Bay City's raw water to help ascertain optimal iron adsorption vessel media usage. The RSSCT will be performed with two different adsorbent media types to assess arsenic breakthrough profiles (e.g. media life assessment) and the effects of pre-treatment. Test will be performed using Bayoxide E33 and Granular Ferric Hydroxide (GFH). Tests typically require collection of two 55-gallon drums of raw water to be shipped to testing facility.
4. Garver will provide an ion exchange vendor with requisite water quality parameters so the vendor can perform intrinsic water quality modeling to help with optimal media selection for the given well site(s).

Task IV – Additional Water Quality Sampling

1. To help further assess the various treatment alternatives' feasibility, and optimize the water quality modeling analysis, Garver recommends that the City perform additional raw water

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sampling for each water plant. The parameters recommended for testing include:

- a. Phosphates
- b. Silica
- c. Vanadium
- d. Arsenic speciation

Task V – Summary of Findings Memorandum

1. Garver shall prepare and submit a Draft Summary of Findings Memorandum with recommendations for a permanent arsenic treatment system and location.
2. Garver will prepare an AACE Class 5 cost estimate for the final recommended alternative.
3. Review Draft Memorandum with the City in a workshop.
4. Address resolved comments and issue a Final Memorandum in electronic format (PDF).

Summary of Project Deliverables

1. Draft Summary of Findings Memorandum in electronic format (PDF).
2. Final Summary of Findings Memorandum in electronic format (PDF).

III. Schedule

Garver shall begin work under this Agreement within ten (10) days of a Notice to Proceed and shall complete the work in accordance with the schedule below:

Task Description	Calendar Days
Kick-Off Meeting	7 days from Notice to Proceed
Subtask: Perform Additional Water Quality Sampling	7 days from Kick-Off Meeting
Subtask: Initiate 3rd Party Raw Water Testing (RSSCT)	7 days from Kick-Off Meeting
Subtask: Commence Blending Optimization Model	3 days from Additional Water Quality Sampling Results
Subtask: Ion Exchange Water Quality Modeling (by Vendor)	7 days from Additional Water Quality Sampling Results
Deliver DRAFT Summary of Findings Memorandum	60 days from all completed subtasks
DRAFT Summary of Findings Memorandum Deliverable Review Workshop	10 days from delivery of DRAFT Summary of Findings Memorandum
Deliver FINAL Summary of Findings Memorandum	10 days from receipt of DRAFT Summary of Findings Memorandum Workshop Comments from City

Appendix B

City of Bay City, Texas Arsenic Removal Study

SUMMARY

Task	Cost
TASK I - Project Administration	\$ 7,792.00
TASK II - Water Quality Modeling (Blending Optimization)	\$ 29,064.00
TASK III - Arsenic Treatment Alternatives Evaluation	\$ 46,068.00
TASK IV - Additional Water Quality Sampling	\$ 8,062.00
TASK V - Summary of Findings Memorandum	\$ 46,800.00
Total Cost	\$ 137,786.00