

# EXHIBIT A

## SCOPE OF WORK

### **Pilot Testing for Arsenic, Iron, and Manganese Removal, Plumas Pines Public Golf Course Wells 1B and 2 Plumas Eureka Community Service District**

#### **Background**

The Plumas Eureka Community Service District (District) owns and operates two (2) wells designated as Well 1B and Well 2 that produce 300 and 450 gallons per day (gpd), respectively. The wells were drilled around 1982 and are connected to the residential distribution system and storage tanks. The District has been in compliance with the Environmental Protection Agency's (EPA's) regulations governing arsenic levels in drinking water but recent water quality testing indicates that the District will no longer be able to meet EPA's Maximum Contaminant Limit (MCL) for arsenic going forward. The most recent testing indicates that Well 2 is above the MCL at 16 parts per billion (ppb), and blending water is no longer a feasible option.

The EPA also has guidance for recommended levels for the secondary contaminants of iron and manganese, both currently considered "nuisance contaminants" due to their effect on the water quality aesthetics. Recent water quality testing indicates that the levels of both iron and manganese exceed secondary maximum contaminant limits (SMCLs) in both wells. The District has therefore expressed a desire to remove iron and manganese, in addition to arsenic, to maintain health-related and aesthetic water quality standards set forth by the EPA.

Both wells were pilot tested for the removal of arsenic, iron, and manganese. The results were, according to the District, "marginal." Therefore, the District asked Murraysmith to determine if the three (3) contaminants of interest could be removed, or at least reduced to below the EPA's MCL for arsenic and the SMCLs for iron and manganese.

This scope of work is for pilot testing of the existing groundwater source(s) for arsenic, iron, and manganese removal. A multimedia filtration process will be used and is described in more detail below.

#### **Scope of Services**

Murraysmith will perform the following services.

## Task 1 - Project Management

Provide project management for the Pilot Testing and Pilot Testing Report. Project management will include Murraysmith personnel coordination, coordination with the District, up to three (3) virtual meetings, each one (1) hour in length, with District personnel, travel coordination, and coordination of analytical testing. Murraysmith will issue invoices and status reports monthly.

### *Task Deliverables*

- Murraysmith shall deliver an electronic monthly invoice, including subconsultant invoicing, with progress and budget reports covering work on the project performed during the previous month, issues encountered, and potential impacts to project schedule and/or budget.
- Meeting agendas, materials, and meeting notes when required

## Task 2 – Pilot Testing

Murraysmith will provide pilot testing services for a potential water treatment train. A schematic of the pilot system is shown in **Figure 1**. The proposed system uses an integrated filter system that removes iron, manganese, and arsenic in a single process. Chlorine is used to oxidize the arsenic in the water and maintain the adsorptive capacity of the media. Ferric chloride is added to coagulate the oxidized arsenic. This system is similar to the system previously pilot tested with some modifications that may improve performance.

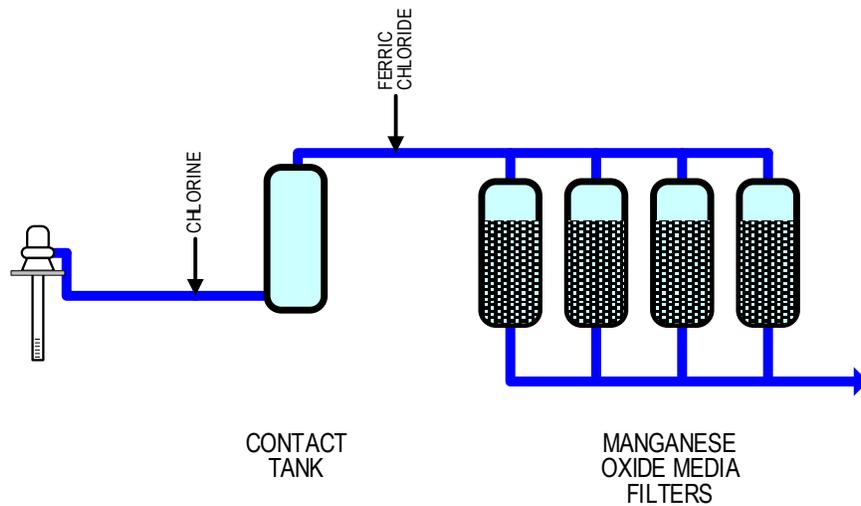
During the previous pilot test, iron oxidation was not optimized. This is problematic as the basic principle of the process being tested was to oxidize arsenic from As(III) to As(V) to allow it to adsorb and coprecipitate with ferric hydroxide.

Murraysmith will provide the following.

- A portable, automated pilot testing trailer for the test. The equipment will include a booster pump, filter, chemical feed system, flow meters, valves, and pressure gauges. The pilot testing equipment will be used at the District's well site.
- Pilot testing will be conducted using 42 inches of Pyrolox Advantage filter media with varying doses of chlorine, ferric chloride, and raw water loading rates.
- Field testing equipment will be provided to test for pH, iron, nitrogen, ammonia, sulfide, manganese, and free and total chlorine.
- Laboratory testing will be provided for arsenic, silica, iron, and manganese.
- Chemical feed for chlorine and ferric chloride will be provided.

- The pilot plant will be run for a continuous period of 10 hours per day for up to five days.
- Testing will be conducted on raw and treated water.
- A sample of backwash water will be collected and tested for settling time, suspended solids, and iron and manganese concentration.
- The pilot system will require a 1-inch female or male pipe thread stub out and at least 10 gpm and 30 psig.
- An electrical outlet (115 VAC, 10 amp) will also be required.
- Treated and backwash water disposal conforming to the District’s requirements.

Figure 1 | Pilot Testing Schematic



### Sampling Plan

Pilot tests will be conducted with the pilot equipment operating 10 hours per day for a week by Murraysmith staff. A proposed Murraysmith pilot staffing schedule is provided in **Table 1**. Staffing for subsequent weeks of operation is not within the scope of this project.

Initial testing conditions will include optimizing the chemical feed dose and filter loading rates. Once optimal conditions are defined, the plant will be operated at a constant operating condition for the remainder of the test.

Table 1 | Pilot Testing Staffing Schedule for First Operating Week

	M	T	W	Th	F	S	S	Total
Senior Process Engineer	10	10	5	5	5	-	-	<b>35</b>
Principal	4				4	-	-	<b>8</b>

Process Engineer I	10	10	5	5	5	-	-	<b>35</b>
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\*Includes mobilization and demobilization

\*Pilot will not be staffed by Murraysmith on weekends.

Samples are normally collected at intervals of roughly 60 or 120 minutes, as indicated in **Table 2**.

**Table 2 | Sampling Analytes, Locations, and Frequency**

Field Testing Parameter	Filter Inlet	Filter Outlet	Typical Frequency
pH	X	X	60 minutes
Temperature	X	X	60 minutes
Free and Total Chlorine Residual	X	X	60 minutes
Ammonia	X	X	As needed
Hydrogen Sulfide	X	X	As needed
Iron, Total	X	X	60 minutes
Manganese, Total	X	X	60 minutes
Arsenic, Total and Speciated	X	X	120 minutes
Chlorine Solution Strength	(in solution tank)		Daily or more frequently, if concentration is changed.

Backwash effluent samples will also be collected and analyzed to help in the preparation of any backwash water treatment, disposal, or recycling recommendations.

Results of the pilot testing will be analyzed to determine the efficiency of the filters at removing arsenic, iron, and manganese from the source water. The data will be presented in tabular and graphical form showing operating conditions, removal efficiencies and chlorine dose and residual levels.

### *Task Deliverables*

- PDF and Excel file(s) of pilot test results presented in tabular and graphical form.

### *Assumptions*

- The District’s operation staff will run the pilot the duration of the time Murraysmith staff are not on site.
- The District will provide the required connections for testing and divert or collect discharged finished water and backwash water appropriately.
- Pilot testing will be conducted over a one five day period by Murraysmith staff. Any further pilot testing will require an amendment to this scope.
- An equipment rental costs of \$100/per day on-site will be applied (5 days total).

## Task 3 – Pilot Testing and Preliminary Design Report

Murraysmith will prepare a Pilot Testing and Preliminary Design Report detailing the results of the pilot testing and an analysis of the variables used in the pilot test. The report will include an evaluation of the technical feasibility of using an upscaled treatment process on the source water, development of a basis of design, and cost estimates for a full-scale facility with the identified design capacities for the District's groundwater. The Report will be provided as a draft for review by operations staff and management, for presentation to the District and for submission to the Regional Water Quality Control Board. A final version will incorporate comments from the District's reviews. The report will include the following information.

- Source water background and source water quality information
- Pilot testing and analytical methodologies
- Pilot testing results, discussion, and recommendations
- A basis of design for treatment modifications including:
  - Treatment vessel sizing and design criteria
  - Media requirements
  - Backwashing requirements
  - Site planning requirements with a site plan drawing
  - Backwash water disposal, or recycling requirements
  - Piping requirements
  - Electrical and SCADA requirements
  - Building requirements
  - Process monitoring and analytical equipment recommendations
- A schedule for design, permitting, approval construction and start-up
- A preliminary cost estimate for completion of the project

### *Task Deliverables*

- Draft Pilot Test Report (pdf)
- Final Pilot Test Report with comments and revisions incorporated from the Draft report (pdf)

## Budget

Payment will be made at the Billing rates for personnel working directly on the project, which will be made at Murraysmith's Hourly Rates, plus Direct Expenses incurred. Billing rates are as shown in Exhibit B. Subconsultants, when required by Murraysmith, will be charged at actual costs plus a

10 percent fee to cover administration and overhead. Direct expenses will be paid at the rates shown below. The initial estimated maximum total fee to be invoiced under this Agreement is \$54,815 which shall not be exceeded without written authorization from the District. A breakdown of the costs by tasks is attached (See Exhibit B).

## Direct Expenses

Expenses incurred in-house that are directly attributable to the project will be invoiced at actual cost. These expenses include the following.

Computer Aided Design and Drafting	\$18.00/hour
GIS and Hydraulic Modeling	\$10.00/hour
Mileage	Current IRS Rate
Postage and Delivery Services	At Cost
Printing and Reproduction	At Cost
Travel, Lodging and Subsistence	At Cost

## Project Schedule

Murraysmith is available to begin work immediately. Pilot testing (consultant operated time period) and the draft report will be completed within 60 days of notice to proceed.

Description	Schedule (7-8 Weeks)
Notice To Proceed	-
Pilot Testing, including setup	1-2 Weeks
Draft Report	3 Weeks
Review Workshop	1 Day
Final Report	2 Weeks