CITY OF JOHN DAY – CONSERVATION MEASURE MONITORING PLAN

Evaluation Surface & Groundwater Samples for the U.S. Fish and Wildlife Service and National Marine Fisheries Service

Project No. 2111005
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PREPARED FOR:

City of John Day
450 East Main Street
John Day, OR 97845

CwM-H2O
Complete Water Management

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Introduction

This document presents the City of John Day's (City) proposed Conservation Measure Monitoring Plan (Plan) for Effluent, Surface Water, and Groundwater. This Plan proposes to provide mitigation requirements based on the findings of the City of John Day Wastewater System Improvement Project Biological Assessment (BA) prepared by Mason Bruce and Girard (MBG, 2023). The specific monitoring parameters, locations, and methods are based on guidance provided by US Fish and Wildlife and National Marine Fishery Service (Services).

The City currently infiltrates treated wastewater into the John Day River Valley alluvial aquifer through a system of percolation ponds. The Water Pollution Control Facility (WPCF) system included in the City's new Permit proposes a higher level of initial treatment at a new wastewater treatment facility and infiltration through a subsurface infiltration gallery (SIG) located west of the existing ponds (Figure 1). The primary change from current infiltration conditions is the shift of the point of infiltration to the west and towards the center of the local alluvial aquifer.

In support of the permitting process, the City completed a hydrogeologic investigation and modeling study to understand the movement of groundwater through the alluvial aquifer that will continue to receive treated effluent via infiltration. The study identified the approximate flow path from the proposed SIG through the aquifer and predicted that the infiltrated water will eventually discharge back to a downstream reach of the John Day River. The City has formulated this additional Conservation Measure Monitoring Plan (Plan) to address concerns relayed by the Services specific to heavy metals and petroleum components in treated effluent infiltrated to the alluvial aquifer and the potential adverse impact these metals and petroleum products might have on surface water conditions in the John Day River and subsequently on the sensitive fish species that potentially inhabit or pass through this stretch of the John Day River.

The sections of this Plan are as follows:

- **Section 1** – Purpose and Goals
- **Section 2** – Monitoring Program Sites & Schedule
- **Section 3** – Sample Collection and Analysis Program
- **Section 4** – Data Analysis and Reporting Procedures

1 Purpose

The purpose of this Plan is to present a water quality monitoring protocol to assess the concentrations of metals and petroleum products at the current concentrations in treated City effluent, groundwater, and potentially effected surface water of the John Day River as background conditions, then monitor the same locations post construction of the new WWTP to assess potential changes in water quality conditions. The proposed monitoring activities are separate from and in addition to those activities proposed as part of the City's required WPCF monitoring plans (CwM, 2023), though some monitoring locations and monitoring schedules will be shared between the two programs.

The goals of the proposed additional water quality monitoring program are as follows:

- Establish baseline target metals and petroleum component concentrations for the City's current treated effluent which is currently discharged to the percolation ponds.

- Establish current groundwater background target metals and petroleum component concentrations in the alluvial aquifer along the John Day River Valley using a monitoring well network required by the WPCF Permit.
- Establish current low-flow surface water background concentrations of target metals and petroleum products in the John Day River at sampling locations upstream and downstream of the proposed SIG.
- Post-construction monitoring of effluent, groundwater, and surface water quality. Data will be compared to established background levels to assess the impacts of SIG operation on water quality in groundwater and in the John Day River.
- Utilize the Biological Ligand Model (BLM) to determine how site-specific surface water quality characteristics impact the fish toxicity criteria for target metals measured in the John Day River.

The monitoring criteria and schedules are presented in Section 2 Monitoring and Program Schedule.

1.1 Affected Aquifer and River Systems

The proposed SIG system will introduce treated wastewater effluent to the uppermost aquifer system, the shallow alluvial aquifer of the John Day River Valley, at a location just west of the City's current percolation ponds (Figure 1). The alluvial aquifer is the only impacted aquifer system identified in the CwM-H2O, LLC (CwM) hydrogeologic investigation report (CwM, 2021). The alluvial aquifer ranges from just a few feet thick along the John Day valley walls to up to 50-ft thick in some areas at the center of the valley. Native alluvial deposits in the John Day Valley consist of relatively compacted silts and sands interspersed with gravels and cobbles. Large-scale dredging in the late 19th and early 20th centuries transformed the alluvial aquifer around the City by washing away most of the fine sediment and redepositing the rest. Dredged areas now consist primarily of sandy gravel and cobbles. Patches of silty sand are found where dredge ponds were constructed or where finer sediments settled out of the tailings.

The permitted SIG facility is located in an oblong section of the alluvial aquifer, bounded on the north by bedrock of the valley wall and to the south by the John Day River. The river's channel flows up against the valley wall to the west and east of the WWTP, pinching out the alluvial aquifer and creating a flow-through groundwater system (Figure 1). The up-gradient end of the alluvial aquifer (eastern end) is marked by the confluence of Davis Creek (flows from north to south) and Canyon Creek (from the south to north).

The John Day River acts as a hydrologic divide in the shallow alluvial aquifer. Because of the hydraulic influence of the river on local groundwater flow, only the alluvial aquifer north of the river will be impacted by the activities performed under the WPCF Permit. The John Day River recharges the alluvial aquifer in its losing reach upstream (east) of the proposed WWTP. Groundwater flows through the alluvial aquifer from east to west. The groundwater gradient in the aquifer approximates the gradient of the river and the gradual slope of the valley to the west. Groundwater discharges from the aquifer back to the John Day River channel towards the western terminus of the alluvial deposits north of the river (CwM, 2021).

Treated wastewater that is infiltrated into the alluvial aquifer will percolate downward to the saturated zone before flowing down-gradient to the west (Figure 1). Groundwater modeling of the SIG system indicated that the infiltrated water will potentially discharge to the river over a diffuse portion of riverbank up to approximately 2,800 ft (850 m) wide (Figure 1) located approximately 3,300 ft (1 km) downstream of the SIG under average river conditions (CwM, 2021). Modeling suggests that when river levels are very low, infiltrated water may discharge to the river over a more up-stream reach. Conversely, when river levels are very high, such as in the spring snowmelt season, infiltrated water is pushed further downgradient before discharging to the river. The core flow path from the SIG to the River reaches the riverbank over approximately a 500-ft (150-m) wide primary discharge zone (Figure 1). The monitoring sites proposed in this Plan will monitor the aquifer near the SIG, along the flow path, and above and below the expected discharge area to the River.

Access to the private lands along the John Day River downstream of the proposed SIG site is uncertain. The City will identify all private land ownership and request access to the monitoring locations proposed in this Plan. This is discussed further in Section 2.3.

1.2 Sampling Access and Logistics

Access to areas potentially impacted by dispersed groundwater and effluent entering the John Day River are difficult to reach due to the need for private access agreements with landowners.

CwM assessed the potential for sampling from two bridge crossings of the John Day River near the estimated area of impact along the north shore of the river. Both bridges are known as Patterson Bridge Road. Relative to one another, the downstream bridge (west) is a private access bridge to an industrial site. The upstream bridge (east) has a public road crossing but is not sufficiently downstream from the SIG to capture the anticipated discharge area to the river.

Sampling by boat or other floatation device may be physically impractical in this section of the John Day River in both low- and high-flow periods and private ownership. The main stem of the John Day River above Kimberley, Oregon (River Mile 184) is non-navigable, and the riverbed is privately owned land above this point. At the City of John Day (River Mile 27), access by boat might legally require landowner permission. Due to the increased difficulties and logistics associated access to private land and with sampling by boat compared to sampling from the bank, the City's preference is for riverbank access for sample collection.

If the City can obtain permission from landowners, the City will collect a composite sample from the John Day River at three locations within or downstream of the potential area of discharge of treated effluent (option SW-2A). In this case, samples will be collected at dispersed locations by wading into the river at least 3 ft from the shoreline and/or in at least 2 ft of water. Grab samples will be collected in a manner that integrates water from various depths within the river. A sample splitter or similar method will be used to homogenize the various grab samples into one representative sample of sufficient volume for all analyses. If this composite method is used, the same three sampling sites will be used for each sampling event. GPS coordinates will be collected at the sampling entry point at the riverbank for later reference.

The City will submit written sampling access requests to private land owners along the downstream reach of the John Day River (see Section 2.4, Attachment 1). If access is not permitted in a sufficient number of locations to perform the composite sampling procedure described above, then a single depth integrated sample will be collected at the Grant County Roads Department facility along the south side of the river (option SW-2B). The City has obtained provisional approval from the Grant County Roads Department to access the southern bank of the John Day River at this facility. This location is about 1.75 miles downstream from the City's proposed infiltration point and about 0.75 miles downstream from the potential discharge reach of the river.

2 Monitoring Program & Schedule

The proposed monitoring program for heavy metals and petroleum components is separated into pre-construction and operational phases. The two monitoring periods, described in this section are as follows:

- Preconstruction Phase – Background Monitoring (pre-SIG operations). Start in Year 1 of the monitoring plan approximately one year prior to the new plant operations.
- Operational Phase – Monitoring of SIG Operations. Start post construction of new wastewater facility. Quarterly for two years.

2.1 Preconstruction Phase – Background Monitoring (Pre-SIG Operations)

The purpose of preconstruction monitoring is to document current background water quality conditions in:

- Current treated wastewater effluent (Effluent)
- The alluvial aquifer near the SIG facility proposed in the City's WPCF permit (Groundwater)
- The John Day River (Surface Water).

Operations at the existing wastewater treatment plant and use of the percolation ponds will continue until the proposed new plant and SIG facilities are built and commissioned. The background monitoring proposed by this plan is scheduled to start in 2024 (Year 1) and will continue quarterly until the SIG facility comes on line, or for a period of 1-year, whichever is shorter, unless formal modification of this plan is required. Preconstruction sampling will document annual and seasonal variability for various water quality parameters including metals and petroleum products of concern.

2.1.1 Sampling Locations

Preconstruction Phase sampling will occur at the following locations (Figure 2):

- Alluvial monitoring well upgradient of the proposed SIG (CJD-1, new).
- Alluvial monitoring well immediately downgradient of the proposed SIG (CJD-2, new).
- Alluvial monitoring wells further down the groundwater flow path from the proposed SIG facility (CJD-3, CJD-4, and CJD-5, all new).
- A location on the John Day River upstream of the current percolation ponds (SW-1).
- A location(s) on the John Day River downstream (SW-2A or SW-2B) of the potential area of discharge of treated effluent from the current percolation ponds and from the proposed SIG facility.
- The effluent from the current wastewater treatment plant before discharge (Ponds).

The City will construct the proposed new monitoring wells (CJD-1 through CJD-5). Preconstruction Phase sampling and monitoring will not begin until the complete groundwater monitoring well network is complete.

Sampling of the selected groundwater monitoring wells within the alluvial aquifer include locations dominated by recharge from the John Day River (CJD-1), areas which will be heavily influenced by the proposed wastewater infiltration (CJD-2), and areas of the aquifer that will experience more limited effects from future infiltration of treated wastewater (CJD-3, CJD-4, and CJD-5). The samples collected from the three downgradient wells (CJD-3, CJD-4, and CJD-5) will be split into single representative composite samples for each area to limit the overall number of samples for analysis (Figure 2).

Upstream and downstream sampling in the river will determine what quality changes already occur in that reach of the river and if metals are currently present in surface water before entering the City wastewater system's area of influence (Figure 2). Background sampling at these locations will inform the City of the potential impacts of the current percolation ponds on groundwater and surface water quality and will establish a range of values to compare future water quality to under the operation of the SIG (Operational Phase).

The City will also sample effluent from the existing treatment plant in the Preconstruction Phase to determine the extent to which the targeted metals and petroleum components are potentially present in the City's municipal wastewater. It is important to characterize the current effluent in order to understand current conditions and potential future changes to groundwater and surface water quality. Effluent samples will be tested for targeted metals and TPH analytes proposed for surface water monitoring.

2.1.2 Sampling Parameters

Preconstruction Phase background sample analysis will include the suite of targeted metals and petroleum components specified by the Services, as well as other water quality parameters necessary for toxicity calculations or measured in the field (Table 1).

Table 1 – Preconstruction Phase Sampling Parameters			
Location	Metals	Petroleum Components	Other Parameters
Groundwater CJD-1, CJD-2, CJD-3, CJD-4, CJD-5	As, Cu, Cr	Polycyclic Aromatic Hydrocarbons (PAH)[1]	Temp., Conductivity, pH
John Day River (SW-1 and SW-2A or SW-2B)	Al, Cu, Cd, Ni, Zn	Total Petroleum Hydrocarbons (TPH)[2]	Temp., Conductivity, pH, nitrate, dissolved organic carbon (DOC), other major cations and anions[3], hardness, alkalinity.
WWTP Effluent			Temp., Conductivity, pH

1. *Indicators of the presence of wood-treating chemicals.*
2. *Gasoline and diesel range organics.*
3. *Ca, Mg, Na, K, SO_4, Cl.*

2.1.3 Sampling Schedule

Preconstruction background sampling is scheduled to begin in 2024. Sampling will then progress on a quarterly basis until the proposed new treatment plant and SIG facility are on-line or four quarterly sample events are completed. This schedule is expected to allow for four concurrent quarterly sampling events. However, more than one calendar year may pass between the start of monitoring and the start of operations at the new facility. The conceptual three year schedule for both Preconstruction and Postconstruction is Presented in Table 3. This schedule is subject to change based on the results of the monitoring and schedule of construction.

Quarterly sampling events will generally occur in the following months:

- Second week of March – Effluent and Groundwater only

- Second week of June – Effluent, Groundwater and Surface Water (early dry season sampling)
- Second week of September – Effluent, Groundwater and Surface Water (end of dry season sampling)
- Second week of December – Effluent, Groundwater only.

Sampling of surface water at the upstream and downstream locations will be limited to two events per year during low-flow periods. These events will correspond with the June and September quarterly sampling events for groundwater sites (Table 3).

2.2 Operational Phase – Monitoring of SIG Operations

The goal of the Operational Phase monitoring is to understand if and how operations of the proposed SIG facility may change the existing water quality regime in the alluvial aquifer and John Day River system. The effluent from the new WWTP will also be monitored to compare with the previous treatment system results.

2.2.1 Sampling Locations

The sampling locations for the Operational Phase will be the same groundwater and surface water monitoring locations as proposed in the City's WPCF Groundwater and Surface Water Monitoring Plans and in the Preconstruction Phase of the Plan (Figure 2). The same two surface water sampling sites be utilized (Figure 2):

- Alluvial monitoring well upgradient of the proposed SIG (CJD-1, new).
- Alluvial monitoring well immediately downgradient of the proposed SIG (CJD-2, new).
- Alluvial monitoring wells further down the groundwater flow path from the proposed SIG facility (CJD-3, CJD-4, and CJD-5, all new).
- The same location on the John Day River upstream of the current percolation ponds (SW-1).
- The same location(s) on the John Day River from Phases 1 and 2 downstream (SW-2A or SW-2B) of the potential area of discharge of treated effluent from the current percolation ponds and from the proposed SIG facility.
- Effluent from the new wastewater treatment plant before discharge to the SIG for infiltration (SIG).

The City will also sample effluent from the new WWTP facility delivered to the SIG in the Operational Phase to determine the extent to which target metals and petroleum components are potentially present in the City's municipal wastewater (Figure 2). Effluent samples will be tested for the targeted suite of metals and TPH analytes proposed for surface water monitoring. Characterization of the new facility's effluent and how it differs from the current effluent to the percolation ponds is critical to understand potential impacts of groundwater and surface water quality.

2.2.2 Sampling Parameters

Monitoring of SIG operations will include the same suite of field- and lab-measured parameters as the background sampling. This Plan calls for the downgradient groundwater samples (CJD-3, CJD-4, and CJD-5) to be combined and split into a single representative composite sample to limit the overall number of samples for analysis. This will result in a total of three groundwater samples and two surface water samples for each event (Table 2). A sample of treated effluent will be collected at the SIG before infiltration.

Table 2 – Operational Phase Sampling Parameters

Location	Metals	Petroleum Components	Other Parameters
Groundwater (CJD-1 through CJD-5)	As, Cu, Cr	Polycyclic Aromatic Hydrocarbons (PAH)[1]	Temp., Conductivity, pH
John Day River (SW-1 and SW-2A or 2B)	Al, Cu, Cd, Ni, Zn	Total Petroleum Hydrocarbons (TPH)[2]	Temp., Conductivity, pH, nitrate, dissolved organic carbon (DOC), major cations and anions[3], hardness, alkalinity.
WWTP Effluent to SIG			Temp., Conductivity, pH

1. *Indicators of the presence of wood-treating chemicals.*
2. *Gasoline and diesel range organics.*
3. *Ca, Mg, Na, K, SO_4, Cl.*

2.2.3 Sampling Schedule

Monitoring will occur following a quarterly sampling schedule. Sampling events for this Plan correspond with sampling events required by the City's WPCF Groundwater and Surface Water Monitoring Plans. Quarterly sampling will begin after the proposed SIG facility begins operations.

Quarterly sampling events will generally occur in the following months:

- Second week of March – Effluent and Groundwater only
- Second week of June – Effluent, Groundwater and Surface Water (early dry season sampling)
- Second week of September – Effluent, Groundwater and Surface Water (end of dry season sampling)
- Second week of December – Effluent, Groundwater only.

Sampling of surface water at the upstream and downstream locations will be limited to two events per year during low-flow periods.

Post construction monitoring of metals in the John Day River will continue for **2 years** (4 quarterly sampling events, two per year during the low-flow season) after operations of the City's new WWTP begins, while monitoring of metals in groundwater will continue for only **1 year** (4 quarterly sampling events). Post construction monitoring of petroleum components, both in groundwater and in the John Day River, will continue for **1 year** (4 sampling quarters for groundwater, 2 for surface water) after operations of the City's new WWTP begins. These periods also apply to WWTP effluent sampling. A conceptual sampling schedule is presented in Table 3.

Table 3 - Sampling Schedule

Sample Source	Sample Location	Sample Type	Constituents	Year-1 Background				Year 2- Post Construction				Year 3 - Post Construction			
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Effluent	After Treatment	Surface Water	pH, Cond., Temp.	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
			Metals: Al, Cd, Cu, Ni, Zn	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
			Total Petroleum Hydrocarbons (TPH)	◆	◆	◆	◆	◆	◆	◆	◆				
Upstream Surface Water	Upstream of Lagoons	Surface Water	Standard[1]		◆	◆			◆	◆			◆	◆	
			Metals: Al, Cd, Cu, Ni, Zn		◆	◆			◆	◆			◆	◆	
			Total Petroleum Hydrocarbons (TPH)		◆	◆			◆	◆					
Downstream Surface Water	Downstream of SIG	Surface Water	Standard[1]		◆	◆			◆	◆			◆	◆	
			Metals: Al, Cd, Cu, Ni, Zn		◆	◆			◆	◆			◆	◆	
			Total Petroleum Hydrocarbons (TPH)		◆	◆			◆	◆					
CJD MW-1	Upgradient of SIG	Groundwater	pH, Cond., Temp.	◆	◆	◆	◆	◆	◆	◆	◆				
			Metals: Ar, Cu, Cr	◆	◆	◆	◆	◆	◆	◆	◆				
			Petroleum Aromatic Hydrocarbons (PAH)	◆	◆	◆	◆	◆	◆	◆	◆				
CJD MW-2	Upgradient of SIG	Groundwater	pH, Cond., Temp.	◆	◆	◆	◆	◆	◆	◆	◆				
			Metals: Ar, Cu, Cr	◆	◆	◆	◆	◆	◆	◆	◆				
			Petroleum Aromatic Hydrocarbons (PAH)	◆	◆	◆	◆	◆	◆	◆	◆				
CJD MW-3, 4, 5	Downgradient of SIG	Composite Groundwater (Three Monitoring Wells)	pH, Cond., Temp.	◆	◆	◆	◆	◆	◆	◆	◆				
			Metals: Ar, Cu, Cr	◆	◆	◆	◆	◆	◆	◆	◆				
			Petroleum Aromatic Hydrocarbons (PAH)	◆	◆	◆	◆	◆	◆	◆	◆				

Footnotes:

[1] Temp., Conductivity, pH, nitrate, dissolved organic carbon (DOC), other major cations and anions (Na, Mg, K, Ca, SO4, Cl) , hardness, alkalinity.

3 Sample Collection and Analysis Program

The following section describes the Sampling and Analysis Program (SAP) procedures to be used for both sampling phases. The goal of the SAP is to produce accurate, reliable, and robust water quality data by defining procedures involved with the following processes:

- Surface water and Effluent sampling procedures,
- Groundwater sampling procedures,
- Composite sampling procedures,
- Equipment decontamination procedures,
- Sample packing and shipping,
- Analytical laboratory procedures,
- Record keeping and chain of custody (COC),
- Quality assurance.

3.1 Monitoring and Sample Collection Methods

The following section outlines the procedures that will be used to record water quality conditions in the field, collect surface water and groundwater samples, and transport the samples to the lab for testing.

3.1.1 Field Recording and Documentation

Observations and actions during quarterly monitoring and sampling events will be recorded in daily activity logs and sampling logs. As part of the WPCF Monitoring Plans, example field forms have been prepared for use by City staff during sampling events (Attachment 2). These forms will also be used for this Conservation Measure Monitoring Program. Forms will be duplicated and stored in digital and physical copies at the City WWTP office.

3.1.2 Instrument Care and Calibration

Field water quality parameters will be measured in the field at the time of sampling using portable field meters: temperature, pH, and conductivity. Field thermometers do not require regular calibration. The probes used to measure pH and conductivity will be calibrated within no more than 48 hours of the sampling event. Calibration of field meters will follow the manufacturer's recommendations and frequencies and will be used in compliance with operating instructions and decontamination procedures.

All field measurement and sampling equipment will be decontaminated after each use.

3.1.3 Equipment Decontamination Procedures

In order to minimize the chances of cross-contamination, equipment must be appropriately cleaned in between sampling events and well sites. Non-dedicated water quality monitoring equipment should be decontaminated before and after monitoring using the following procedure:

- Wipe with a clean paper towel,
- Rince with potable water,
- Wash with a lab-grade detergent such as Alconox,
- Rince with distilled or filtered water.

Non-dedicated equipment used for groundwater sampling (submersible pump, tubing, sample splitter, etc.) will be decontaminated between sampling events using the following procedure:

- Wipe with a clean paper towel,
- Rince with potable water,
- Cycle water with a lab-grade detergent, such as Alconox through the pump and sample tubing,
- Scrub to remove dirt and debris,
- Rince with distilled or filtered water,
- Cycle distilled water through the pump and tubing.

3.1.4 Surface Water Sampling

Grab samples will be collected by directly filling sample bottles from the river. A depth integrated sampling device may be used. Samples will be collected in at least 2 ft of water (unless low-flow conditions do not exceed this depth) and at least 3 ft from the river bank. Sample bottles will be lowered into the river while angled downstream until water begins to flow into the bottle. If the staff collecting the sample must wade into the river, the sample bottle will be filled on the upstream side of where the sampler is standing. The sampler will attempt to incorporate water from a variety of depths within the water column.

Care will be taken to avoid stagnant water (at low-flow periods) and disturbed sediment when collecting grab samples. Field parameters such as temperature, pH, and conductivity will be measured in the river at the time of sampling and recorded on a sampling data sheet.

In the case that a composite sample is required (SW-2A), multiple 1 liter samples will be collected in the manner described above. A churn splitter or similar device will be used to mix and split the samples into one representative sample bottle.

3.1.5 Monitoring Well Purging and Sampling

Field personnel will complete a general inspection of each monitoring well before each sample event. The visual inspection will generally consist of checking the above-ground casing for weather damage, evidence of tampering, deterioration, or entry of animals into the casing. The results of the inspection will be recorded on a Well Inspection form.

A minimum of ten well volumes will be purged from the well casing before groundwater samples are collected. Field personnel will determine the well volume before each sampling event by taking a depth measurement accurate to 0.01 ft and applying the formula below with the known well construction details.

$$V = 0.041 \times D^2 \times H$$

V is one well volume in gallons
D is the well diameter in inches

H is the length of the water column in feet *(depth of well + measurement point height – depth to water)*

Given the shallow depth of the alluvial aquifer and the proposed monitoring well depths, a well volume will generally be between 1.0 and 3.0 gallons. The wells will be purged before sampling at a low rate of <2 gpm if possible. During purging, the field personnel will measure temperature, pH, and electrical conductivity regularly to determine when groundwater quality stabilizes. A depth-to-groundwater measurement will be collected each time field parameters are recorded.

The volume purged from each well, the water quality parameters, and the depth to groundwater in the well will be recorded on a well purging sheet accompanying each groundwater sample data sheet. Samples will be collected after at least ten well volumes have been pumped and parameters have stabilized. The same pump will be used for both purging the well and collecting groundwater samples. A final temperature, pH, and conductivity reading will be collected at the time of sampling.

3.1.6 Sample Measurement and Collection

Care should be taken not to splash water into the sample bottles or introduce air into the sample during collection. Samples should not be transferred from one sample container to another to avoid cross-contamination and aeration of the sample. Samples will be collected in a manner that reduces the risk of sample contamination, including:

- Opening the sample bottles only immediately before the sample is collected.
- Minimizing agitation of the sample bottles once placed in the transport container.

In the case that a composite sample is required (Operational Phase downgradient wells, for example), multiple 1 liter samples will be collected in the manner described above. A churn splitter or similar device will be used to mix and split the samples into one representative sample bottle.

Each sample bottle will have a label containing the following information in permanent marker:

- Sample site number and sample ID number,
- Date and time of collection,
- Analytical lab receiving the samples.

The personnel collecting the samples will enter matching information on a sampling field form and a chain-of-custody (COC) form. A lab-provided COC form will also be filled out and included with the samples in the transport container.

3.2 Analytical Methods

The City has not determined which laboratory facility will be used for sample analysis. Due to the very low detection limits required for some parameters (such as metals), specialized lab services are necessary. All analyses may not be performed at the same lab. For example, metals and petroleum analytes may have to be sent to separate specialty labs. The selected labs will be nationally certified and Oregon Certified if possible.

3.2.1 Laboratory Methodologies

The proposed analytical methods for laboratory-tested water samples are listed in Tables 4 through 6.

Table 4 – Proposed Analytical Methods for Metals and TPH		
Required Parameter	Analytical Method Proposed	Detection Limit[1]
Aluminum	EPA 200.8	4.51 ppb
Arsenic		0.35 ppb
Copper		0.08 ppb
Cadmium		0.10 ppb
Chromium III (as Total-Cr)		0.21 ppb
Nickel		0.10 ppb

Zinc		0.26 ppb
TPH-Dx	NWTPH-Dx	80 ppb (diesel) 200 ppb (lube oil)
TPH-Gx	NWTPH-Gx	100 ppb

1. *Based on information provided by specialty analytical labs in the region.*

Table 5 – Proposed Analytical Methods for Polycyclic Aromatic Hydrocarbons

PAH Component	Analytical Method Proposed	Detection Limit[1]
Acenaphthene	EPA 8270 E[2]	0.032 ppb
Acenaphthylene		
Anthracene		
Benz(a)anthracene		0.016 ppb
Benz(a)pyrene		
Benzo(b)fluoranthene		
Benzo(k)fluoranthene		
Benzo(g,h,I,)perylene		0.032 ppb
Chrysene		0.016 ppb
Dibenz(a,h)anthracene		
Fluoranthene		0.032 ppb
Fluorene		
Indeno(1,2,3-cd)pyrene		0.016 ppb
1-Methylnaphthalene		0.064 ppb
2- Methylnaphthalene		
Naphthalene		
Phenanthrene		
Pyrene		0.032 ppb
Carbazole		
Dibenzofuran		

1. *Based on information provided by specialty analytical labs in the region.*
2. *An alternative method is EPA 625.1, which has detection limits below 0.05 ppb for all components.*

Table 6 – Proposed Analytical Methods for Other Parameters

Required Parameter	Analytical Method Proposed	Detection Limit[1]
Calcium	EPA 200.7	0.012 ppm
Magnesium		0.012 ppm
Sodium		0.028 ppm
Potassium		0.128 ppm
Sulfate	EPA 300.0	0.020 ppm
Chloride		0.020 ppm
Nitrate-N	SM 4500-NO3 D EPA 9056	0.14 ppm <0.1 ppm
Hardness	SM 2340 B	1.0 ppm
Alkalinity	SM 2320 B	2.0 ppm
Dissolved organic C	SM 5310 C	0.100 ppm

1. *Based on information provided by specialty analytical labs in the region.*

3.2.2 Establishment of Toxicity Limits

The metals and petroleum components specified in Tables 1 and 2 will be monitored in groundwater and surface water as part of this program. However, the analysis results from these two water sources will be compared to different concentration standards for toxicity. Background concentrations measured at the proposed monitoring sites supersede established water quality standards.

The groundwater quality in the alluvial aquifer is not directly comparable to the aquatic environment in the John Day River. The results of groundwater sampling and analyses will be compared to established Human Health Water Quality Criteria for Toxic Pollutants (OAR 340-041-8033(Table 40)) (Table 7). The concentration criteria listed in Table 7 are those for "water + organism", which are intended to protect drinking water, fish, and shellfish where domestic water supply is of concern. For parameters not included in OAR 340-041-8033(Table 40), such as Arsenic, Cadmium, and Chromium, the EPA primary or secondary drinking water standards are included in Table 7.

Surface water sampling results from the John Day River will be compared to aquatic health standards for fish as determined by the Preconstruction Phase sampling and BLM model analysis. Established Aquatic Life Water Quality Criteria for Toxic Pollutants for freshwater (OAR 340-041-8033(Table 30)) are hardness-dependent and are calculated based on the formulas presented in Table 7. Because many of the metals are hardness- or pH-dependent, the toxicity limits will change for each sampling event. The toxicity levels for copper are only obtainable with the BLM model, which will be run based on the water quality data from each sampling event.

Table 7 – Toxicity Limits for Metals and Petroleum Components

Metal	Human Health Criteria (OAR 340-041-8033 Table 40)	Freshwater Aquatic Health Criteria (OAR 340-041-8033 Table 30)	
		Acute	Chronic
Aluminum (Al)	200 ppb[1]	*See below.*	
Bioavailability is affected by pH, dissolved organic carbon, and total hardness. The Aluminum Criteria Calculator will be used to determine values based on site data. Surface water only.			
Arsenic (As)	2.1 ppb	340 ppb	150 & 10 ppb
The criterion is expressed in terms of dissolved concentrations in water column and is applied as total inorganic arsenic (arsenic (III) + arsenic (V). A chronic value of 10 ug/L dissolved will be used to evaluate the dietary pathway for protection of fish. Groundwater only.			
Copper (Cu)	1300 ppb	*See below.*	
The freshwater CMC and CCC criteria for this metal is expressed as dissolved with two significant figures. Criteria are calculated using the Biotic Ligand Model (BLM) and are a function of multiple parameters. Surface water only.			
Cadmium (Cd)	5 ppb[2]	*See below.*	
For acute, use the formula CMC = (exp(mA[ln(hardness)] + bA)) * CF where mA = 0.9789, bA = -3.866, CF =1.136672-[(ln hardness)(0.041838)].* *For chronic, use the formula CCC = (exp(mC*[ln(hardness)] + bC))*CF where mC = 0.7409, bC = -4.719, CF = =1.101672-[(ln hardness)(0.041838)].*			

"CF" is the conversion factor used for converting a metal criterion expressed as the total recoverable fraction in the water column to a criterion expressed as the dissolved fraction in the water column. <u>Surface water only.</u>			
Chromium (Cr) III	100 ppb[2,3]	*See below.*	
For acute, use the formula CMC= (exp(mA[ln(hardness)] + bA))*CF where mA = 0.8190, bA = 3.7256, CF= 0.316.* *For chronic, use the formula CCC = (exp(mC*[ln(hardness)] + bC))*CF where mC = 0.8190, bC = 0.6848, CF= 0.860.* *"CF" is the conversion factor used for converting a metal criterion expressed as the total recoverable fraction in the water column to a criterion expressed as the dissolved fraction in the water column. <u>Groundwater only.</u>*			
Nickel (Ni)	140 ppb	*See below.*	
For acute, use the formula CMC= (exp(mA[ln(hardness)] + bA))*CF where mA = 0.8460, bA = 2.255, CF=0.998.* *For chronic, use the formula CCC = (exp(mC*[ln(hardness)] + bC))*CF where mC = 0.8460, bC = 0.0584, CF=0.997.* *"CF" is the conversion factor used for converting a metal criterion expressed as the total recoverable fraction in the water column to a criterion expressed as the dissolved fraction in the water column. <u>Surface water only.</u>*			
Zinc (Zn)	2100 ppb	*See below.*	
For acute, use the formula CMC= (exp(mA[ln(hardness)] + bA))*CF where mA = 0.8473, bA = 0.884, CF= 0.978.* *Cor chronic, use the formula CCC = (exp(mC*[ln(hardness)] + bC))*CF where mC = 0.8473, bC = 0.884, CF= 0.986.* *"CF" is the conversion factor used for converting a metal criterion expressed as the total recoverable fraction in the water column to a criterion expressed as the dissolved fraction in the water column.*			
TPH-Dx	-	2.12 ppm[4] / *NA*[5]	3.14 ppm[6] / 0.64 ppm
Northwest total petroleum hydrocarbons, diesel range organics. Petroleum products applicable for this include jet fuels, kerosene, diesel oils, hydraulic fluids, mineral oils, lubricating oils and fuel oils. Total TPH-Dx is not included in Table 40 or in EPA drinking water standards. <u>Surface water only.</u>			
TPH-Gx	-	1.0 ppm[4] / *NA*[5]	2.1 ppm[6] / 0.44 ppm
Northwest total petroleum hydrocarbons, gasoline range organics. Petroleum products applicable for this method include aviation and automotive gasolines, mineral spirits, Stoddard solvent and naphtha. Total TPH-Gx is not included in Table 40 or in EPA drinking water standards. <u>Surface water only.</u>			
PAHs	N/A	*N/A*	
PAH (polyaromatic hydrocarbon) analysis consists of low and high molecular weight PAHs and would be analyzed only on select groundwater samples. Toxicity levels were not provided by the Services for PAHs. Only select PAH compounds have established aquatic or human health criteria. PAH samples from groundwater will be used primarily for comparison of operations to background conditions. <u>Groundwater only.</u>			

1. *EPA Secondary Drinking Water Standard*
2. *EPA Primary Drinking Water Standard or Action Level*
3. *Concentration limit for total Chromium*
4. *No Observed Effect Concentration for growth of topsmelt*
5. *Acute limits are not established for TPH-diesel range (Dx) or for TPH-gas range (Gx).*
6. *Lowest Observed Effect Concentrations for growth of topsmelt*

3.2.3 Determination of Background Levels

Measured concentrations of all parameters listed in Table 7 during operations will be compared to background levels. The USFWS defined background level as 95% of the upper confidence level (UCL) for the first year of quarterly sampling (n=4). For this analysis, samples will be grouped by source (groundwater vs surface water) and also by location (up- vs down-gradient, etc.). Background levels will be established after the first year of background monitoring.

3.3 Quality Assurance and Quality Control

The following section outlines the steps taken in the surface water and groundwater monitoring program to ensure data quality from samples delivered to the analytical laboratory.

3.3.1 Sample Handling and Chain of Custody

Possession and transport of surface water samples will be traceable from the time of sample collection in the field to the receiving laboratory. Documentation begins at sample collection with proper labeling on sampling containers, annotation on field forms, and by filling out a laboratory-supplied COC form. The COC forms will be included with the sample bottles in the transport container.

Surface water samples that are sent to an analytical laboratory for analysis will be placed in a cooler containing ice or ice packs to maintain a maximum sample temperature of 4°C, or will be preserved otherwise in a manner consistent with sampling procedures. Once sample bottles are sealed in the field, they will not be reopened until they are received at the lab and are processed for analysis. The sample cooler will be transported or shipped to the receiving laboratory on the same day as the samples are collected.

3.3.2 Laboratory Quality Assurance

The laboratory selected and used for analytical testing will follow the current National Environmental Laboratory Accreditation Program standards and carry accreditation from the State of Oregon, or other state, through their environmental laboratory accreditation program.

4 Data Analysis and Reporting

The City will submit surface water and groundwater monitoring reports to the lead agency for the BA, the United States Department of Agriculture (USDS) on an annual schedule and within 60-days following January 1st of each year. Each monitoring report shall present the water quality monitoring activities performed as prescribed by this Plan. All reports will be prepared in compliance with this Plan. The reports will be submitted to the USDA or other agency contact person provided by the lead agency, in an appropriate digital format.

4.1 Statistical Analysis

Quarterly data collection will include information on the condition of the monitoring points, parameters measured in the field and analyzed in the lab, notes on sample collection and handling activities, and a map of the monitoring network. Annual reports will also include numerical and graphical presentations of water quality data. Copies of the original lab reports will be included in annual reports as appendices.

Statistical methods applied to surface water reporting will change over time as more data points become available. For example, performing most statistical analysis will not be possible until at least four quarters of data are collected. However, early monitoring data will be compared to available background data collected from the river prior to WWTP operations and will be discussed in the context of establishing baseline water quality ranges for each parameter.

4.1.1 Analytical Methods

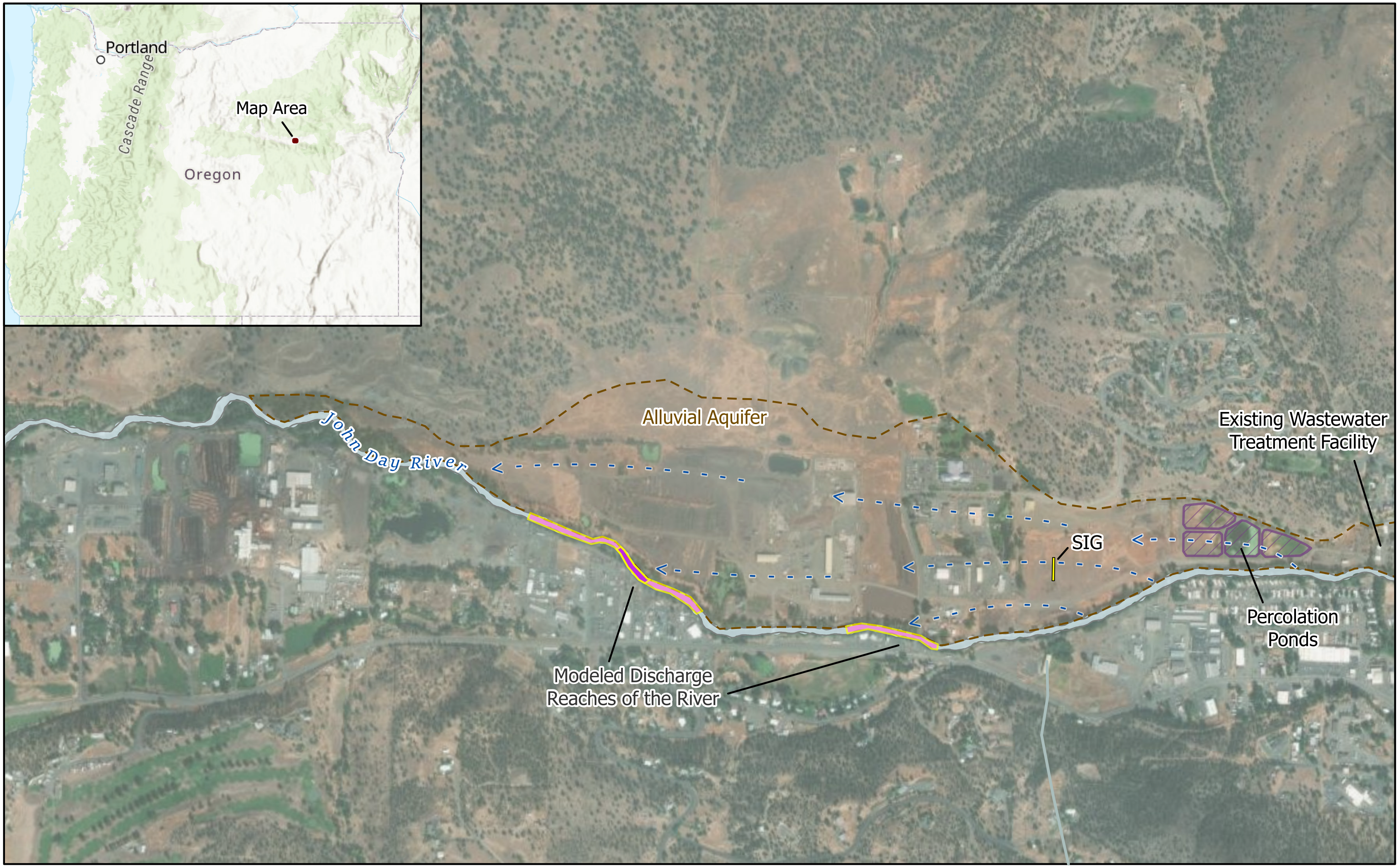
The water quality values measured in the field and laboratory during each Operational Phase quarterly sampling event will be compared to the mean or median (dependent on normality) and overall range of Preconstruction Phase background values for that parameter. After at least four quarters of data are available, a ***Shapiro-Wilkes*** analysis will be used to determine if sampling data are normal. Parameters exhibiting a normal distribution will be compared by mean, while non-parametric datasets will be compared by median. Early sampling data is assumed to be nonparametric and will be compared by median. Each Operational Phase quarter's data will be compared to Preconstruction Phase background and earlier Operational Phase quarterly data in multiple ways. For example, the value for a given parameter and sampling site and event will be evaluated by:

- Comparing the value to all Preconstruction Phase background data,
- Comparing the value to all previous Operational Phase sampling values across all sites,
- Comparing the value to all previous Operational Phase sampling values at the same sampling site,
- Comparing the value to all previous data from that sampling quarter (seasonal comparison),
- Comparing the value to value from other sites during that sampling event.

Evaluating the data as stated above will allow the City to identify continuous trends, seasonal trends, spatial trends, and outlier events in water quality. Outlier events will be identified by performing a ***one sample t-test*** or similar statistical analysis to determine if a value is significantly different than the previously measured values. Simple linear regression or similar statistical analyses may be applied to determine if there are long-term temporal trends.

4.2 Reporting

Quarterly water sample analysis data and statistical analyses will be presented to the Services through the designated lead agency on a yearly basis in an annual monitoring report. The report will be due within 60 days following the receipt of the complete fourth quarter laboratory analysis results.



CwM-H2O
Complete Water Management

1319 SE MLK Jr. Blvd, Suite 204
Portland, Oregon 97214
(503) 954-1326

Figure 1
City Wastewater Treatment Plant & GW Flow in the Alluvial Aquifer System

No.	Date	By	Revisions
1	DATE	AUTH	DRAFT

N

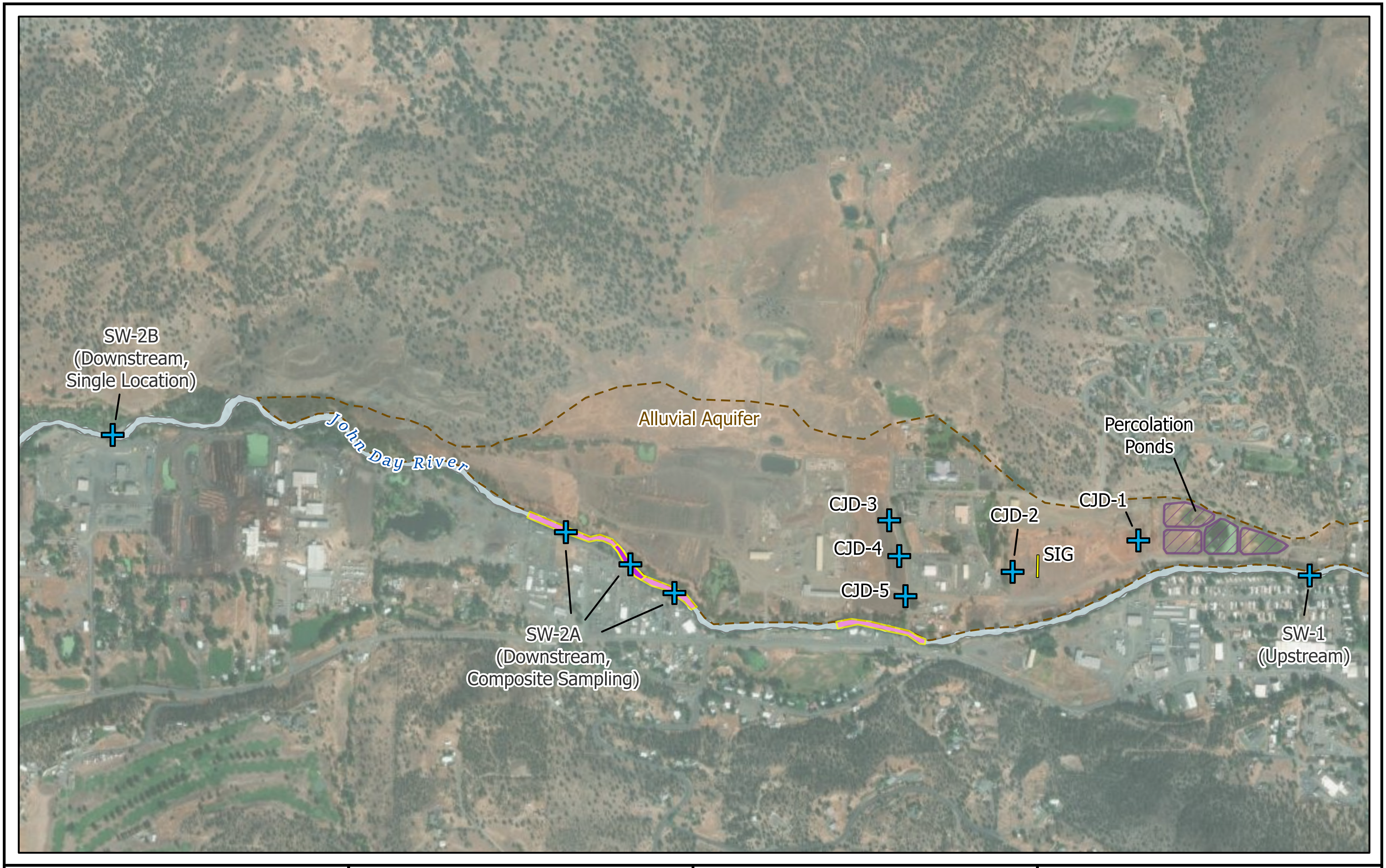
0 500 1,000 2,000 ft

1" = 1,170'

Proj#: 2111005
CJD Monitoring Plans

City of John Day

Percolation Ponds
Alluvial Aquifer Model Boundary
Possible Discharge Reaches
Primary Discharge Zone
General Groundwater Flow Paths



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Portland, Oregon 97214
(503) 954-1326

Figure 2
Phase 1 and Phase 2
Monitoring Locations

1	DATE	AUTH	DRAFT
No.	Date	By	Revisions

Proj#: 2111005
CJD Monitoring Plans

City of John Day

September 20, 2023

RE: Riverbank Access for Quarterly Surface Water Quality Sampling – City of John Day

Dear Resident or Business of the City of John Day,

The City of John Day (City) has been working for several years to develop an updated wastewater treatment facility to replace the aging treatment infrastructure and percolation ponds currently in service. The new wastewater treatment facility is part of the City's larger Innovation Gateway project, which aims to develop recreational areas, community spaces, and locations for the growing hospitality economy and small businesses along the John Day River. In parallel with the Innovation Gateway redevelopment plan, the City has developed a non-potable "purple pipe" water reuse program. Water that is not reused for industrial or irrigation purposes will be infiltrated to the subsurface through infiltration trenches, which requires a Water Pollution Control Facility (WPCF) permit. In May 2022, the City successfully obtained approval of a new WPCF permit from the Department of Environmental Quality and is moving forward with pre-construction planning and water quality monitoring work.

Approval conditions of the City's new WPCF permit require quarterly monitoring of water quality in the John Day River upstream and downstream of the facility. The City does not have direct access to the riverbank from City property west (downstream) of Patterson Bridge Road. At the request of the regulating agencies, the City is seeking permission from private landowners to access the riverbank for quarterly water sampling. Specifically, the City is approaching landowners along the south side of the John Day River between Patterson Bridge Road and the Malheur Lumber facility.

Sampling would be conducted by City staff or environmental consultants on a quarterly basis (likely in March, June, September, and December). The City would provide advanced notice ahead of staff arriving on your property. Sample collection would likely require less than 30 minutes and would involve wading a short distance into the river to gather water in sample bottles.

The City will be monitoring the river for a variety of water quality parameters. These include things like temperature, pH, dissolved oxygen, nutrients, heavy metals, and petroleum products. Monitoring is crucial for ensuring the persistence of a healthy stream environment for fish and other wildlife, as well as human health.

Please review this information and contact the City at the address, email, or phone number below if you are willing to permit the City quarterly access to the river through your property.

Sincerely,

Casey Myers, *Public Works Director*
City of John Day Public Works Department

City of John Day – Public Works
450 East Main Street
John Day, OR 97845
(541) 575-0028
cityofjohnday@grantcounty-or.gov
myersc@grantcounty-or.gov

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Attachment 1
City of John Day Water Quality Monitoring Program
Riverbank Access Authorization

City of John Day Public Works Department

ACCESS REQUEST

As described in the attached cover letter, the City of John Day is seeking willing private landowners to grant access to the John Day River for quarterly water quality sampling. The water quality sampling is related to the City's proposed water treatment plant upgrade and the corresponding WPCF permit.

SCHEDULE

Access would be limited to four site visits per year by City staff or an environmental consultant technician. Site visits would likely take less than 30 minutes to complete and advanced notice would be provided. Monitoring is not expected to continue for a period of more than three years from the first sample collection.

I, ______________________________ (private landowner, print name), <u>DO GRANT</u> the City of John Day quarterly access to the John Day River via my property located at ______________________________ (address) based on the information and conditions described here.

I, ______________________________ (private landowner, print name), <u>DO NOT GRANT</u> the City of John Day quarterly access to the John Day River via my property located at ______________________________ (address) based on the information and conditions described here.

Sign: _________________________ Date: ___________________________

ATTACHMENT 2 - EXAMPLE FIELD LOGS

WELL SAMPLING LOG

Client: ______________________________

Project: ______________________________

Site: ______________________________

Project Number: ______________________________

Field Personnel: ______________________________

Date: ______________________________

WELL ID: ______________________________

GENERAL INFORMATION				
Term	Description	Units	Derivation	Value
SI	Screened Interval	ft	SI = Interval of well screen	
SU	Stickup Height	ft	SU = Hight of well box/stickup from ground surface	
DP	Depth of Pump	ft	DP = Depth of pump from top of port	

WELL PURGE VOLUME INFORMATION				
Equation for 1 Well Volume: WV = [(WC x PV) + (WC x AV) x FP x 7.48]				
Term	Description	Units	Derivation	Value
TD	Total Well Depth	ft	TD = Initial depth of well	
DTW	Depth to Water	ft	DTW = Initial depth to water	
WC	Water Column Height	ft	WC = TD - DTW	
PV	Pipe Volume	ft^3	PV = $(\pi/4)$ x (pipe diameter feet)^2 x WC	
AV	Annular Volume	ft^3	AV = [$(\pi/4)$ x (annular diameter feet)^2 x WC] - PV	
FP	Filter Pack Porosity	%	FP = varying; (generally 30% for sand)	
WV	Well Volume	gal	WV = [(WC x PV) + (WC x AV) x FP x 7.48]	

1 Well Volume : ____________ gal

FIELD INSTRUMENT CALIBRATION			
Parameter	Standard Value	Units	Calibration Value
pH	7	-	
Conductivity		mS/cm	
ORP		mV	
DO		mg/L	
Other			

Field Instrument Type: ______________________

PURGE DATA											
TIME	DTW (ft)	Volume (gal)	Flow Rate (gpm)	Temp. (^{o}F/C)	Ph	Conductivity (mS/cm)	Turbidity (NTU)	Color	ORP (mV)	DO (mg/L)	Particulates

Total Volume Purged : __________ gal

Purged Dry? : yes / no

Type of Pump : ____________________

Field Parameters Stable? : yes / no

Initial TD : ________________

Final TD : ________________

SAMPLE INFORMATION			
Sample ID		Date	Time
Primary			
Duplicate			
Other			

NOTES

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST

Page _____ of _____ COC # _______________________

Client: ____
Project: ____
Site: ____
Project Number: ____
Sampled By: ____
Receiving Lab: ____
P.O.#: ____

Requested Analytical Method

Turnaround Time

____ Standard

_____ 24 hr. _____48 hr. _____ 3-5 day
_____ 7 day _____14 day _____ day

EDD Data Required?

Yes_____ No_____

Send To: _________________________________

Sample ID	Date	Time	Matrix	Lab ID	No. Containers																Comments

Relinquished by: Name: Firm: Signature: Date: Time:	**Received by:** Name: Company: Signature: Date: Time:	**Shipping Details** Method of shipment: Airbill #:
Relinquished by: Name: Firm: Signature: Date: Time:	**Received by:** Name: Company: Signature: Date: Time:	**Additional Remarks/Comments:** Report to:

Daily Activity Log

Client: ____

Project: ____

Site: ____

Project Number: _______________________________________

Field Personnel: _______________________________________

Date: ____

Date	Time	Description of Activity