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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DRAFT

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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 for Surface Water and Groundwater (Plan). This Plan is proposed 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) for the City of John Day. The specific monitoring parameters, locations, and methods are based on guidance provided by US Fish and Wildlife staff.

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. The primary change from current 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 likely flow path from the proposed SIG through the aquifer and determined that the infiltrated water will eventually discharge back to a downstream reach of the John Day River.

A draft BA was prepared for the City's proposed WPCF system and provided to the US Fish and Wildlife Service and National Marine Fisheries Service (Services) for comment. The Services raised concerns about the potential introduction of heavy metals and petroleum components from municipal wastewater to the John Day River via the anticipated groundwater flow path.

The City's hydrogeologic and groundwater modeling study of the alluvial aquifer system suggests that the risk of heavy metal or petroleum mobilization in subsurface soils and saturate alluvial aquifer due to the City's activities is minimal. As part of the WPCF Permit, the City must continuously monitor effluent quality, monitor upgradient and downgradient groundwater quality, and water quality in the John Day River at an upstream and downstream location for at least three years. The City has formulated this additional conservation measure monitoring Plan to address concerns relayed by the Services specific to heavy metals and petroleum components, and the potential adverse impact of these constituents on sensitive species in 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 and Goals

The purpose of this Plan is to present the water quality monitoring activities proposed by the City to address the finding of the BA and the concerns expressed by the Services with regard to heavy metals and petroleum concentrations in the reach of the John Day River that may potentially be adversely impacted by infiltration of treated effluent to a proposed riverside SIG. 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 heavy metals and petroleum component concentrations for the City's current treated effluent which is currently discharged to the percolation ponds. The assumption is that effluent treated at the future wastewater treatment plan will be of better quality.
- Establish current background heavy metals and petroleum component concentrations in the John Day River Valley alluvial aquifer using existing groundwater monitoring wells.
- Establish current background heavy metals and petroleum component concentrations in the John Day River at sampling locations upstream and downstream of the proposed SIG. Background concentrations will supersede water quality standards.
- Utilize the Biological Ligand Model (BLM) to determine how site-specific surface water quality characteristics impact the toxicity levels of heavy metals to fish in the John Day River.
- Monitor groundwater and surface water quality for the first three years of operation of the City's proposed new wastewater treatment plant and SIG site. Data will be compared to established background levels to assess the impacts of SIG operation on water quality in the John Day River.

These goals will be accomplished through three phases of water sampling and analysis: initial sample analysis, background sampling before SIG operations, and short-term (one to two year) monitoring after SIG operations begin. These phases are described in detail in Section 2 of this Plan. The results of each phase of monitoring may impact the extent of monitoring in following phases. For example, if background groundwater levels do not show elevated concentrations of metals or petroleum components during the background phase, the degree of groundwater monitoring once the SIG is in operation may be reduced. The intent of this Plan is to gather robust water quality data on the impacts of the City's infiltration activities without placing excessive burden on the City.

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 confluence of Davis Creek (flows from the north) and Canyon Creek (from the south) with the John Day River marks the up-gradient end of the section of the alluvial aquifer in which the SIG is situated.

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 generally follows 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 850 m wide (Figure 1) located approximately 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 about a 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.

2 Monitoring Program Sites & Schedule

The proposed monitoring program for heavy metals and petroleum components is separated into two phases, each with their own monitoring locations, schedule, and goals. The two phases, or monitoring periods, described in this section are as follows:

- Phase 1 – Background Monitoring (pre-SIG operations)
- Phase 2 – Monitoring of SIG Operations

2.1 Phase 1 – Background Monitoring (Pre-SIG Operations)

The purpose of Phase 1 monitoring is to observe background water quality conditions in the alluvial aquifer near the SIG facility proposed in the City's WPCF permit, as well as in the John Day River. Operations at the existing wastewater treatment plant and use of the percolation ponds will continue until the proposed new plant and SIG facility are built and become active. Background monitoring will continue quarterly until the SIG facility comes on line, or for a period of 1-year, whichever is shorter. Phase 1 sampling will establish annual and seasonal averages for various water quality parameters including metals of concern.

2.1.1 Sampling Access and Logistics

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. The main stem of the John Day River above Kimberley, Oregon (River Mile 184) is non-navigable, and the riverbed is privately owned land. Access by boat would legally require landowner permission. Due to the increased difficulties and logistics associated with sampling by boat compared to sampling from the bank, both of which require landowner access permission, the City will give preference to riverbank access for sample collection.

If feasible, the City will collect a composite sample from the John Day River at three to four 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 to four 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).

2.1.2 Sampling Locations

Phase 1 sampling will occur at the following locations (Figure 2):

- Alluvial monitoring well upgradient of the current percolation ponds (MW-7).
- Alluvial monitoring wells downgradient of the current percolation ponds (MW-5 and MW-6).
- Alluvial monitoring wells near the proposed SIG facility (CwM-2 and CwM-3).
- A location on the John Day River upstream of the current percolation ponds (SW-1).
- The John Day River downstream of the potential area of discharge of treated effluent from the current percolation ponds and from the proposed SIG facility, as described in Section 2.1.1.

Please note that Phase 1 sampling will occur at existing monitoring locations, while Phase 2 (see Section 2.2) will incorporate new monitoring wells built for the proposed SIG facility. If these new monitoring wells are constructed and available for sampling within the Phase 1 monitoring period, the City can change to monitoring these locations if preferred by the services.

Sampling of the selected groundwater monitoring wells within the alluvial aquifer include locations dominated by recharge from the John Day River (MW-7), areas heavily influenced by historical and ongoing wastewater infiltration (MW-5 and MW-6), and areas of the aquifer that are proposed to receive future infiltration of treated wastewater (CwM-2 and CwM-3). In following with US Fish and Wildlife Service guidance, the samples near the percolation ponds (MW-5 and MW-6) and downgradient of the ponds (CwM-2 and CwM-3) 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 already found in surface water before entering the City wastewater system's area of influence (Figure 2). Background sampling at these locations will inform the City on 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 (Phase 2). Initial values for relevant metals will be entered into the BLM model or other appropriate calculation to determine toxicity limits for fish based on site-specific water characteristics.

The City will also sample effluent from the existing treatment plant in Phase 1 to determine the extent to which heavy 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 the full suite of metals and TPH analytes proposed for surface water monitoring.

2.1.3 Sampling Parameters

The Phase 1 background sample analysis will include the suite of metals of concern as specified by the US Fish and Wildlife Service, petroleum components specified by the Services, as well as other water quality parameters necessary for toxicity calculations or measured in the field (Table 2).

<table>
<tr><th colspan="4">Table 1 – Phase 1 Sampling Parameters</th></tr>
<tr><th>Location</th><th>Metals</th><th>Petroleum Components</th><th>Other Parameters</th></tr>
<tr><td>Groundwater
(MW-6, MW-7, CwM-2, CwM-3)</td><td rowspan="3">Al, As, Cu, Cd, Cr, Ni, Zn</td><td>Polycyclic aromatic hydrocarbons[1]</td><td>Temp., Conductivity, pH</td></tr>
<tr><td>John Day River
(SW-1 and SW-2)</td><td rowspan="2">Total petroleum hydrocarbons[2]</td><td>Temp., Conductivity, pH, nitrate, dissolved organic carbon (DOC), major cations and anions[3], hardness, alkalinity.</td></tr>
<tr><td>WWTP Effluent</td><td>Temp., Conductivity, pH</td></tr>
</table>

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

2.1.4 Toxicity Modeling Analysis

The City will utilize data from the two Phase 1 surface water samples to run the BLM model and other appropriate calculations for fish toxicity of metals. The models will establish toxicity limits for relevant metals based on water quality characteristics such as temperature, pH, alkalinity, and ionic composition. The established toxicity limits will be compared to measured metal concentrations in the River and to limits established for aquatic life in OAR 340-041-8033(Table 30). Metals that the BLM model does not apply to will be evaluated based on alkalinity (see Section 3.2).

2.1.5 Sampling Schedule

Phase 1 background sampling will begin in the summer or fall of 2023. Sampling will then progress on a quarterly basis until the proposed new treatment plant and SIG facility are on-line. This schedule is expected to allow for a maximum of 4 quarterly sampling events between late 2023 and the expected completion of the new facility or the end of the monitoring period.

Quarterly sampling will generally occur in the following months:

- Second week of September (end of dry season sampling)
- Second week of December (early wet season sampling)
- Second week of March (high surface water flow sampling)
- Second week of June (early dry season sampling)

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

2.2 Phase 2 – Monitoring of SIG Operations

Phase 1 sampling will document the current background range of metal and petroleum component concentrations in the river and the alluvial aquifer (both in areas influenced by and free of influence from the percolation ponds), as well as the current WWTP effluent over multiple seasons. The goal of Phase 2 monitoring is to understand if and how operations of the proposed SIG facility may change the existing water quality regime in the alluvial aquifer-river system.

2.2.1 Sampling Locations

The sampling locations for Phase 2 will be the same monitoring locations as proposed in the City's WPCF Groundwater and Surface Water Monitoring Plans (Figure 3). The new treatment and SIG facilities will require the construction of new groundwater monitoring wells (some existing wells used in Phase 1 monitoring may be abandoned and demolished during treatment plant construction), which will be utilized in Phase 2. The same two surface water sampling sites as Phase 1 will be utilized (Figure 3).

- 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.

The City will also sample effluent from the new WWTP facility to the SIG in Phase 2 to determine the extent to which heavy metals and petroleum components are potentially present in the City's municipal wastewater. Effluent samples will be tested for the full 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

Phase 2 monitoring of SIG operations will include the same suite of field- and lab-measured parameters as the background sampling in Phase 1. In following with US Fish and Wildlife Service request, the downgradient groundwater samples (CJD-3, CJD-4, and CJD-5) will 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 each event (Table 2).

Table 2 – Phase 2 Sampling Parameters

Location	Metals	Petroleum Components	Other Parameters
Groundwater (CJD-1 through CJD-5)	Al, As, Cu, Cd, Cr, Ni, Zn	Polycyclic aromatic hydrocarbons[1]	Temp., Conductivity, pH
John Day River (SW-1 and SW-2)		Total petroleum hydrocarbons[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

Phase 2 monitoring will occur following the same general quarterly sampling schedule as Phase 1. Sampling events for this Plan will 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 will generally occur in the following months:

- Second week of September (end of dry season sampling)
- Second week of December (early wet season sampling)
- Second week of March (high surface water flow sampling)
- Second week of June (early dry season sampling)

Sampling of surface water at the upstream and downstream locations will be limited to two events per year during low-flow periods, as suggested by the Services. These events will correspond with the June and September quarterly sampling events for groundwater sites (see above). Phase 2 monitoring of metals, both in groundwater and in the John Day River, will continue for **2 years** (8 quarterly sampling events) after operations of the City's new WWTP begins. Phase 2 monitoring of petroleum components, both in groundwater and in the John Day River, will continue for **1 year** (4 sampling quarters) after operations of the City's new WWTP begins. These periods also apply to WWTP effluent sampling.

2.3 Downstream River Access

The shoreline of the John Day River is privately owned for many miles downstream from the City's proposed new WWTP. The John Day River is not a navigable water way in this reach, so the river bottom is also private property. The sampling location proposed in the City's WPCF Surface Water Monitoring Plan is on private property. Owner permission to access the site was contingent upon the sampling parameters being limited to a small group of nutrients and related constituents. The inclusion of metals and petroleum components in this monitoring plan precludes access to this originally proposed site.

The City will send out written requests for sampling access to private landowners along the river bank in the reach of interest for downstream sampling (Attachment 1). The goal is to obtain formal agreements to allow quarterly access to the three to four dispersed locations within or downstream of the potential discharge reach of the river (sampling locations SW-2A).

If all landowners decline to allow river access to the City for sampling, or if insufficient access is granted to complete the proposed composite sampling from the river, then the City will collect samples at a single downstream location (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 their 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.

3 Sample Collection and Analysis Program

The following section describes the Sampling and Analysis Program (SAP) procedures to be used for both monitoring and 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 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. 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

Several general water quality parameters will be regularly measured in the field 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 10 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 10 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 (Phase 2 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,
- Sample ID number,
- Date and time of collection,
- Sampler’s initials,
- 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 3 through 5.

Table 3 – 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 4 – 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 5 – 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.

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 6). The concentration criteria listed in Table 6 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 6.

Surface water sampling results from the John Day River will be compared to aquatic health standards for fish as determined by the Phase 1 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 6. 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 6 – 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.			
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.			
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.			
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.*			
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.*			
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.*			
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.			
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.			
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.			

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 6 during Phase 2 operations will be compared to background levels observed in Phases 1. 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 Phase 2 quarterly sampling event will be compared to the mean or median (dependent on normality) and overall range of Phase 1 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 Phase 2 quarter's data will be compared to Phase 1 background and earlier Phase 2 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 Phase 1 background data,
- Comparing the value to all previous Phase 2 sampling values across all sites,
- Comparing the value to all previous Phase 2 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

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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

Proj#: 2111005
CJD Monitoring Plans

City of John Day

CwM-H2O
Complete Water Management

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Portland, Oregon 97214
(503) 954-1326

Figure 2
Phase 1 Background Monitoring Sites

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
- Phase 2 Monitoring Locations

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Portland, Oregon 97214
(503) 954-1326

Figure 3
Phase 2 SIG Operation Monitoring Sites

1	DATE	AUTH	DRAFT
No.	Date	By	Revisions

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
Phase 3 Monitoring Locations

July 27, 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,

Aaron Lieuallen, *Senior Project Manager*
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
lieuallena@grantcounty-or.gov

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), DO GRANT 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), DO NOT GRANT 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: _____________________________

ADDITIONAL INFORMATION

Navigability:

Department of State Lands
503-986-5200
www.oregonstatelands.us

Boating Regulations:

Oregon State Marine Board
503-378-8587
www.boatoregon.com

Hunting and Fishing Regulations:

Oregon Department of Fish and Wildlife
503-947-6000 / 800-720-6339
www.dfw.state.or.us

State Parks and Scenic Waterways:

Oregon Parks and Recreation Department
503-986-0707 / 800-551-6949
www.oregonstateparks.org

OREGON DEPARTMENT OF STATE LANDS

Public Use of Oregon's Rivers and Lakes

Your rights to use the surface, bed and banks of Oregon's rivers and lakes.

OREGON DEPARTMENT OF STATE LANDS

Ownership and Public Rights

This brochure provides a brief introduction to the activities allowed on the surface, bed and banks of Oregon's rivers and lakes.

What you can do on a waterway, or along the waterway below the line of ordinary high water, depends in part on whether land underlying the waterway is publicly or privately owned.

This issue has become very important as the state's population has increased, and as more people are living next to waterways and using them for recreation and other activities.

The History of Oregon's Waterways

When Oregon became a state in 1859, all the land underlying waterways that were used, or could have been used, in their natural condition to transport people and goods, became state-owned.

However, specific waterways, or portions, that met this navigability standard were not identified. State law (ORS 274.040) authorizes the State Land Board to determine if a waterway is navigable for title.

The state also became the owner of all land underlying water affected by the tide, as well as many lakes.

"....all the navigable waters of [the] State, shall be common highways and forever free, as well as to the inhabitants of said State as to all other citizens of the United States...."

Section 2., Act of Congress Admitting Oregon into the Union, February 14, 1859

Navigability

State-owned waterways are commonly termed "navigable." The following definitions will help you understand what this and other navigability concepts mean.

Line of Ordinary High Water means the line on the bank or shore to which the high water ordinarily rises annually in season. It is ***not*** the flood line.

Line of Ordinary Low Water means the line on the bank or shore to which the low water ordinarily recedes annually in season.

Submerged Land or **Bed** is land that lies below the line of ordinary low water.

Submersible Land is land that lies between the line of ordinary high water and the line of ordinary low water.

Navigable for Title means the ownership of the waterway or lake, including its submerged and submersible land, passed from the federal government to Oregon at statehood.

On a Navigable River or Lake:

You may use any navigable waterway, as well as the submerged and submersible land along it, for any legal activity. For example, you may pull your canoe or kayak up on the land below the line of ordinary high water for a short period of time. Similarly, below the line of ordinary high water, you may picnic, walk, fish, play or sunbathe on the land.

However, you are not allowed to go above the line of ordinary high water, unless it is necessary to travel up or down the waterway, nor may you cross privately owned land to get to the river or lake. To do so constitutes a trespass for which law enforcement officers may cite you.

In addition, you are not allowed to use the land in a way that you would if you owned it. That is, you cannot build a structure, place a dock, operate a business, put up fencing or prevent other people from entering the area you are using on submerged or submersible land.

You may only use the submerged and submersible land underlying the segment indicated as navigable in the ways described in this brochure.

Oregon Navigable Rivers*

The following table lists some of the tidally affected and non-tidal portions of rivers in Oregon that have been determined to be navigable for title through legislative, judicial or administrative proceedings. None of the waterways listed has been determined to be navigable over its entire length.

Waterway	Segment
Chetco River	RM 0 to "at least" RM 11 (about one mile upstream from the mouth of Elk Creek)
Columbia River	RM 0 to RM 309 (Oregon-Washington border)
Coos River	RM 0 to RM 4.5 (mouth of the Millicoma River)
Coquille River	RM 0 to RM 36.3 (confluence of the North Fork and South Fork)
John Day	RM 10 (Tumwater Falls) to RM 184 (Kimberly)

Waterway	Segment
Klamath River	RM 208 to RM 233 (California border to Keno)
McKenzie River	RM 0 to RM 37 (Dutch Henry Rock)
Rogue River	RM 0 to RM 68.5 (Grave Creek)
Sandy River	RM 0 to RM 37.5 (confluence of the Salmon River)
Snake River	RM 176 to RM 409 (Oregon-Idaho border)
Umpqua River	RM 0 to RM 111.5 (confluence of the North and South Forks)
Willamette River	RM 0 to RM 187 (confluence of the Coast and Middle Forks)

RM = River Mile

**This list is current as of 12/07; other waterways may be declared navigable in the future.*

A complete list of the tidally affected segments of rivers and navigable lakes in Oregon is available on the Department of State Lands' Web site: www.oregonstatelands.us (click on Waterway Navigability).

On a Non-Tidal River or a Lake, Where No Navigability Determination Has Been Made:

Many of Oregon's waterways have not yet had a navigability determination. In 2005, the Oregon Attorney General issued a formal opinion describing what public rights exist to use waterways, even if they are not title navigable (not owned by the state).

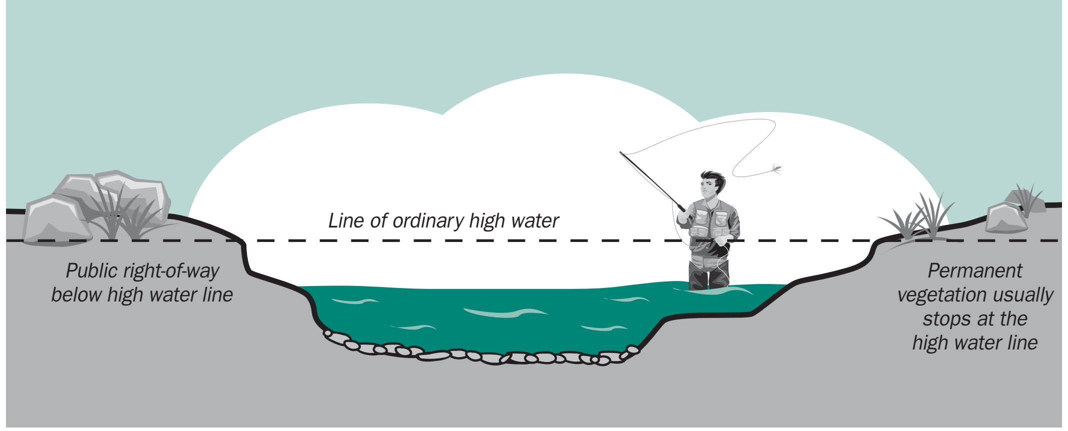
This opinion relied on numerous Oregon Supreme Court rulings between 1869 and 1936, and states that the public is allowed to use the surface of a waterway in Oregon for any activity unless the waterway isn't wide, deep or long enough for a boat to pass along it, or unless the activity is illegal. Allowed uses include fishing, navigation, recreation and other activities requiring the use of water.

For example, this means you may swim in a waterway that is large enough to boat in. It also means that if the waterway is large enough to boat in, you may fish. However, be sure to check the Oregon Department of Fish and Wildlife's regulations to see when and how you may fish from a boat on any waterway or lake.

> **Remember:** *This opinion reflects the Attorney General's advice to the Department of State Lands. It has not been fully tested in the courts. If you decide to use a waterway that has not been determined to be navigable, you risk a possible citation for trespass.*

Additionally, the opinion states that you may have the right to walk on the land above the line of ordinary high water in the least disruptive or damaging way possible, using the shortest and most direct route available, if it is necessary to travel up or down the waterway.

Figure 1



Determining the Line of Ordinary High Water

The ordinary high water line is defined by Oregon state law as a line on the bank made by the water when it rises to its highest level each year to the limit of upland vegetation. It is not the flood line. Figure 1 shows how the line of ordinary high water is established.

Be Respectful!

If you use Oregon's rivers or lakes for recreational purposes, be respectful of landowners and their private property rights.

- Get the landowner's permission to use private property or water structures such as docks.
- Never cross private property with a "No Trespassing" sign.
- Never leave your litter behind or damage private property – clean up!
- Obey all laws concerning the use of publicly owned land, fire, firearms and alcohol consumption.

City of John Day - Water Quality Monitoring Plan Comparison

Proposed Draft Cost Estiamte and Schedule

Conservation Measure Monitoring Plan													
Test Parameter	Approx. Analysis Cost Per Sample	Phase 1 - Background (1-Year Quarterly)				Phase 2 - SIG Operation Phase (2-Year Quarterly)							
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Aluminum	$ 20.00	6	4	4	6	6	4	4	6	6	4	4	6
Arsenic	$ 20.00	6	4	4	6	6	4	4	6	6	4	4	6
Copper	$ 20.00	6	4	4	6	6	4	4	6	6	4	4	6
Cadmium	$ 20.00	6	4	4	6	6	4	4	6	6	4	4	6
Chromium (total)	$ 20.00	6	4	4	6	6	4	4	6	6	4	4	6
Nickel	$ 20.00	6	4	4	6	6	4	4	6	6	4	4	6
Zinc	$ 20.00	6	4	4	6	6	4	4	6	6	4	4	6
TPH-Dx	$ 108.00	3	3	3	3	6	4	4	6	-	-	-	-
TPH-Gx	$ 108.00	3	3	3	3	6	4	4	6	-	-	-	-
PAH	$ 240.00	3	3	3	3	3	3	3	3	-	-	-	-
Calcium	$ 20.00	2	-	-	2	2	-	-	2	2	-	-	2
Magnesium	$ 20.00	2	-	-	2	2	-	-	2	2	-	-	2
Sodium	$ 20.00	2	-	-	2	2	-	-	2	2	-	-	2
Potassium	$ 20.00	2	-	-	2	2	-	-	2	2	-	-	2
Sulfate	$ 43.00	2	-	-	2	2	-	-	2	2	-	-	2
Chloride	$ 43.00	2	-	-	2	2	-	-	2	2	-	-	2
Nitrate-N	$ 40.00	2	-	-	2	2	-	-	2	2	-	-	2
DOC	$ 26.00	2	-	-	2	2	-	-	2	2	-	-	2
Hardness	$ 33.00	2	-	-	2	2	-	-	2	2	-	-	2
Alkalinity	$ 27.00	2	-	-	2	2	-	-	2	2	-	-	2
Est. Cost per Quarter		**$ 2,792**	**$ 1,928**	**$ 1,928**	**$ 2,792**	**$ 2,792**	**$ 1,928**	**$ 1,928**	**$ 2,792**	**$ 1,424**	**$ 560**	**$ 560**	**$ 1,424**

WPCF Permit Monitoring Plans - Groundwater and Surface Water																	
Test Parameter	Approx. Analysis Cost Per Sample	Phase 1 - Background (1-Year Quarterly)				Phase 2 - SIG Operation Phase (3-Year Quarterly)											
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Nitrate-Nitrite-N	$ 45.00	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
TKN	$ 45.00	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Total-P	$ 37.00	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
BOD5	$ 53.00	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
TSS	$ 27.00	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
TDS	$ 27.00	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
E. coli	$ 49.00	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Est. Cost per Quarter		**$ 2,439**	**$ 2,439**	**$ 2,439**	**$ 2,439**	**$ 2,439**	**$ 2,439**	**$ 2,439**	**$ 2,439**	**$ 2,439**	**$ 2,439**	**$ 2,439**	**$ 2,439**	**$ 2,439**	**$ 2,439**	**$ 2,439**	**$ 2,439**

Est. Total Cost Per Quarter	**$ 5,231**	**$ 4,367**	**$ 4,367**	**$ 5,231**	**$ 5,231**	**$ 4,367**	**$ 4,367**	**$ 5,231**	**$ 3,863**	**$ 2,999**	**$ 2,999**	**$ 3,863**	**$ 2,439**	**$ 2,439**	**$ 2,439**	**$ 2,439**