Compliance Monitoring Plan
Hamilton Street Bridge Site
Spokane, Washington

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Prepared for

Avista Corporation and
Burlington Northern Santa Fe Railroad Company

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FIGURES

INTRODUCTION

This compliance monitoring plan (CMP) has been prepared by Landau Associates to support cleanup actions at the Hamilton Street Bridge Site (Site). The Site is located at 111 North Erie Street in Spokane, Washington (Figure 1). The Site cleanup is being performed in accordance with the final cleanup action plan (FCAP) prepared by the Washington State Department of Ecology (Ecology; August 2001. The Burlington Northern and Santa Fe Railway Company (BNSF) and Avista Corporation (Avista Corp) (The Companies), and Ecology jointly agreed to conduct the cleanup action on the Site and Consent Decree No. 02205445-0 was recorded on September 12, 2002. The FCAP and Consent Decree stipulate the terms of the cleanup action, and requirement for a CMP to be prepared consistent with the Washington State Model Toxics Control Act (MTCA; chapter 173-340 WAC).

SITE LOCATION

The Site is located on the southern bank of the Spokane River at 111 North Erie Street in Spokane, Washington (Figure 1), and includes the BNSF property [including a portion of which was formerly leased by the American Tar Company (ATC)], the former Spokane Manufactured Gas Plant (SGP), and Chicago Milwaukee & Saint Paul Railroad (CM&SPR) properties which are now owned by Spokane River Properties, Limited (SRP) (Figure 2). Brown Building Materials currently operates a building materials salvage and sales operation on the Site. The Site is transected, roughly north-south, by the James Keefe (Hamilton Street) Bridge which is elevated high above ground surface on pilings with spread footings. A 60-inch diameter sanitary sewer line crosses beneath the Site in a southwest-northeast alignment.

HISTORY

Between approximately 1905 and 1948, manufactured coal gas and carburetted water gas was produced on the former SGP property. On June 3, 1958, Avista Corp (formerly The Washington Water Power Company) merged with the Spokane Natural Gas Company (formerly the Spokane Gas & Fuel Company) and dispensed natural gas from the Site until 1962 or 1963. Mr. Richard Brown established Brown Building Materials on the Site, leasing the former SGP property from Avista Corp from 1963 until March 1978, when he purchased the property. Mr. Brown conveyed the property to SRP, of which Mr. Brown is the general partner, in January 1982.

During the operation of the manufactured gas plant, coal tar, a by-product of coal gas production, reportedly was conveyed to a coal tar processing plant and distribution facility located on a parcel leased from the Northern Pacific Railroad (contemporary BNSF) adjacent to the south side of the former SGP

property. The C.G. Betts Company operated the facility until the early 1930s when the operations were taken over by the ATC. The ATC utilized the facility until 1967, reportedly shipping tar to the Site from Seattle after the SGP was shut down. Mr. Brown leased the ATC property from the BNSF from 1968 to 2001.

The existing riverfront property at the Site was formerly owned by the CM&SPR. The CM&SPR property was purchased by Mr. Brown in 1981, and the title is now held by SRP. The CM&SPR constructed a rail line circa 1911, which extended along the southern riverbank to a railroad tunnel which is located within the basalt embankment on the west side of the Site. The tunnel formerly connected the CM&SPR to the area known as the Milwaukee Trench, which parallels Trent Avenue east of Division Street. Historical records indicate that, during the construction of the CM&SPR, fill materials were deposited into the river, and the Spokane River shoreline was modified to its present configuration. Remnants of a former CM&SPR rail car turntable, consisting of an elevated concrete pad, is still present west of the James Keefe Bridge. The CM&SPR railroad tracks have been removed from the Site.

In 1987, the U.S. Environmental Protection Agency (EPA) completed a preliminary assessment of both the former SGP and ATC properties and several investigations were conducted thereafter. Significant environmental investigations were initiated in 1997 when the Washington State Department of Transportation (WSDOT) initiated exploratory activities on the Site to evaluate the proposed realignment of SR 290 (Trent Avenue). Information from the 1997 investigation indicated the presence of affected soil at the Site containing total petroleum hydrocarbons (TPH), polynuclear aromatic hydrocarbons (PAHs), semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs), metals, and cyanide above detection limits.

Because the WSDOT investigation was limited primarily to an investigation of soil conditions for road design purposes, Avista Corp initiated additional soil and groundwater investigation of the former SGP property in 1997, and BNSF initiated additional soil and groundwater investigation of the ATC property in 1998.

In 1999, The Companies and Ecology jointly agreed to negotiate an Agreed Order to conduct a remedial action (RI) and feasibility study (FS). The RI and FS were completed in early 2001 and late 2000, respectively. Ecology issued the FCAP on August 10, 2001, and Consent Decree No. 02205445-0 was recorded on September 12, 2002 which stipulated the terms of the cleanup action.

PREVIOUS GROUNDWATER MONITORING

Groundwater monitoring programs have been conducted at the Site since 1997, with the most recent program (the interim groundwater monitoring program) being completed in October 2001. The understanding of Site hydrogeology is based on river stage and groundwater level measurements collected

regularly since 1997 from one staff gauge placed in the Spokane River, and up to 28 Site monitoring wells installed in three zones within the uppermost Site aquifer. The understanding of groundwater quality is based on more than 100 samples collected from 28 monitoring wells installed in three aquifer zones, located adjacent to and below the areas of affected soil, and analyzed for PAHs, TPH, SVOCs, VOCs, metals, cyanide, and natural attenuation constituents. Conclusions stated in the RI indicate that:

- The Site appears to be within, but on the southwestern edge of, the Spokane-Rathdrum Prairie Aquifer.

- Groundwater is encountered approximately 10 to 20 ft below the Site surface. Groundwater elevations were observed at the highest levels in the spring (April – May), and at the lowest levels in the late summer to fall (August – November). The high and low groundwater levels correspond with the Spokane River levels.

- The Spokane River surface water level is generally higher in elevation than groundwater. This indicates that the Spokane River locally recharges groundwater, and receives only limited recharge from groundwater during periods of peak runoff in late spring to early summer.

- During most of the year shallow groundwater gradients are from the river to the fill, and from the fill laterally and downward into the native sand and gravel aquifer.

- The horizontal hydraulic gradients in the shallow, intermediate, and deeper zones through much of the year are very low. During some monitoring events only hundredths of a foot difference were observed across the entire Site.

- During most of the year the water level gradients suggest a convergence of river water, shallow groundwater, and deeper groundwater in the intermediate zone of the aquifer.

Relatively few VOCs, SVOCs, PAHs, and inorganic constituents have been detected in the groundwater samples analyzed, and those that were detected have not been detected with any consistency. Because groundwater inside the soil impacted area is considered to be contaminated by the soil. Indicator hazardous substances (IHSs) developed by Ecology for groundwater are identical to the IHSs for soil. The IHSs developed by Ecology consist of six PAHs, total carcinogenic PAHs (cPAHs), TPH, carbazole, cyanide, arsenic, barium, lead, mercury, and selenium. The limited extent of groundwater contamination detected outside of the impacted soil areas indicate that the source material has a low solubility, and any constituents that may be partitioning into groundwater are rapidly attenuating through natural physical, chemical, and biological processes (i.e., natural attenuation).

CLEANUP LEVELS

Within the FCAP, Ecology established that the highest beneficial use of the Site groundwater to be drinking water, and that the MTCA Method B cleanup levels are the appropriate criteria for use at the Site. The MTCA method B cleanup levels for groundwater are shown on Table 1.

TABLE 1

GROUNDWATER CLEANUP LEVELS (µg/l)

Indicator	Cleanup Level
TPH-total	1,000
Non-cPAHs	
Acenaphthene	643
Anthracene	4,800
Fluoranthene	90.2
Fluorene	640
Naphthalene	320
Pyrene	480
Total cPAHs	0.1(a)
Carbazole	10
Cyanide	10
Metals	
Arsenic	6
Barium	1,120
Lead	2.5
Mercury	0.2
Selenium	5

(a) FCAP Ecology 2001.

POINTS OF COMPLIANCE

Ecology established a conditional point of compliance for groundwater that shall be as close as practicable to the source of hazardous substances, not to exceed the property boundary. The conditional points of compliance are located at MW02-20, MW04-20, MW04-40, ATC07-20, and MW07-90.

GROUNDWATER MONITORING

Within the FCAP, Ecology established that a CMP shall be prepared in accordance with the requirements of WAC 173-340-410 and shall address:

- Protection monitoring, to confirm that human health and the environment are adequately protected during construction, and the operation and maintenance of the cleanup action.
- Performance monitoring, to confirm that the cleanup action has attained cleanup standards and any other performance standards.
- Confirmational monitoring, to confirm the long-term effectiveness of the cleanup action once the cleanup standards and other performance standards have been attained.

PROTECTION MONITORING

Monitoring for protection of human health addresses worker safety for activities related to construction, operation, and maintenance of the cleanup action, and as described above, will be addressed through the project HSP. The project HSP will address potential physical and chemical hazards associated with Site activities, consistent with the requirements of WAC 173-340-810. Anticipated potential physical hazards include working in proximity to heavy equipment and water. Anticipated exposure to Site contaminants through various exposure pathways (i.e., direct contact, ingestion, inhalation) include potential contact with contaminated soil or groundwater. These exposure pathways are addressed in the HSP.

PERFORMANCE MONITORING

SCOPE OF THE PROGRAM

Performance groundwater monitoring will include:

- Collection of groundwater quality samples from select groundwater monitoring wells located outside the contaminated soil areas
- Collection of groundwater and river stage levels to assess groundwater flow directions and gradients
- Evaluation and preparation of groundwater summary reports.

The scope described in this CMP, in conjunction with the attached field sampling plan (FSP), and quality assurance project plan (QAPP), are intended to provide the methods and scope of work which will be performed during the performance groundwater monitoring program as needed to fulfill elements of

the Consent Decree and MTCA requirements. The FSP is presented in Appendix A and the QAPP is presented in Appendix B.

DESCRIPTION OF PROTECTION MONITORING ACTIVITIES

Water Level Measurement

During each groundwater sampling event, depth to water will be measured in the shallow and deeper monitoring wells. Shallow wells will include MW02-20, MW04-20, MW08-20, MW09-20, and ATC07-20. Deeper wells will include MW07-90, MW08-90, and MW09-100.

Measurements of the Spokane River stage also will be collected in conjunction with all groundwater level measurements. The procedures for measuring water levels are provided in Appendix A. The monitoring well locations are shown on Figure 2. The measured water level data and calculated elevations will be tabulated and summarized in the CMP report.

GROUNDWATER SAMPLING LOCATIONS

The performance groundwater monitoring program will include collection of groundwater samples from shallow (20 ft), intermediate (40 ft) and deep (90 ft) monitoring wells on the south side of the river. Groundwater sampling will be performed at MW02-20, MW02-40, MW04-20, ATC07-20, and MW07-90. The monitoring wells locations are shown on Figure 2. Details of the sampling procedures are presented in Appendix A.

SAMPLE ANALYSES

Groundwater samples will be analyzed for PAHs, cyanide, arsenic, and mercury. These are the only constituents that have exceeded a groundwater cleanup level in Site groundwater samples. The groundwater samples will be analyzed by an Ecology-accredited laboratory in accordance with chapter 173-50 WAC using EPA Method 8270 SIM for PAH constituents, EPA Method 6010 for arsenic, EPA Method 7470A for mercury, and SM4500-CN I for weak acid dissociable (WAD) cyanide. Groundwater samples will also be tested in the field for temperature, pH, and conductivity.

MONITORING FREQUENCY

Performance groundwater monitoring will be conducted after completion of the construction and associated cleanup actions. The performance groundwater monitoring program will consist of collecting groundwater samples and depth to water measurements from the identified monitoring wells twice per

year. After 2 years the performance monitoring program will be evaluated to determine if modifications to the sampling program are appropriate.

HANDLING OF INVESTIGATION-DERIVED WASTES

Investigation-derived wastes, such as water purged from the wells, waste decontamination liquids, and solid residuals (e.g., Tyveks, gloves, etc.) will be collected and stored in a temporary staging area until proper disposal methods are determined. These investigation-derived wastes will be disposed of appropriately, in a manner consistent with the analytical results and in accordance with local, state, and federal regulations. Water purged from the wells will be handled pursuant to applicable law.

QUALITY ASSURANCE/QUALITY CONTROL

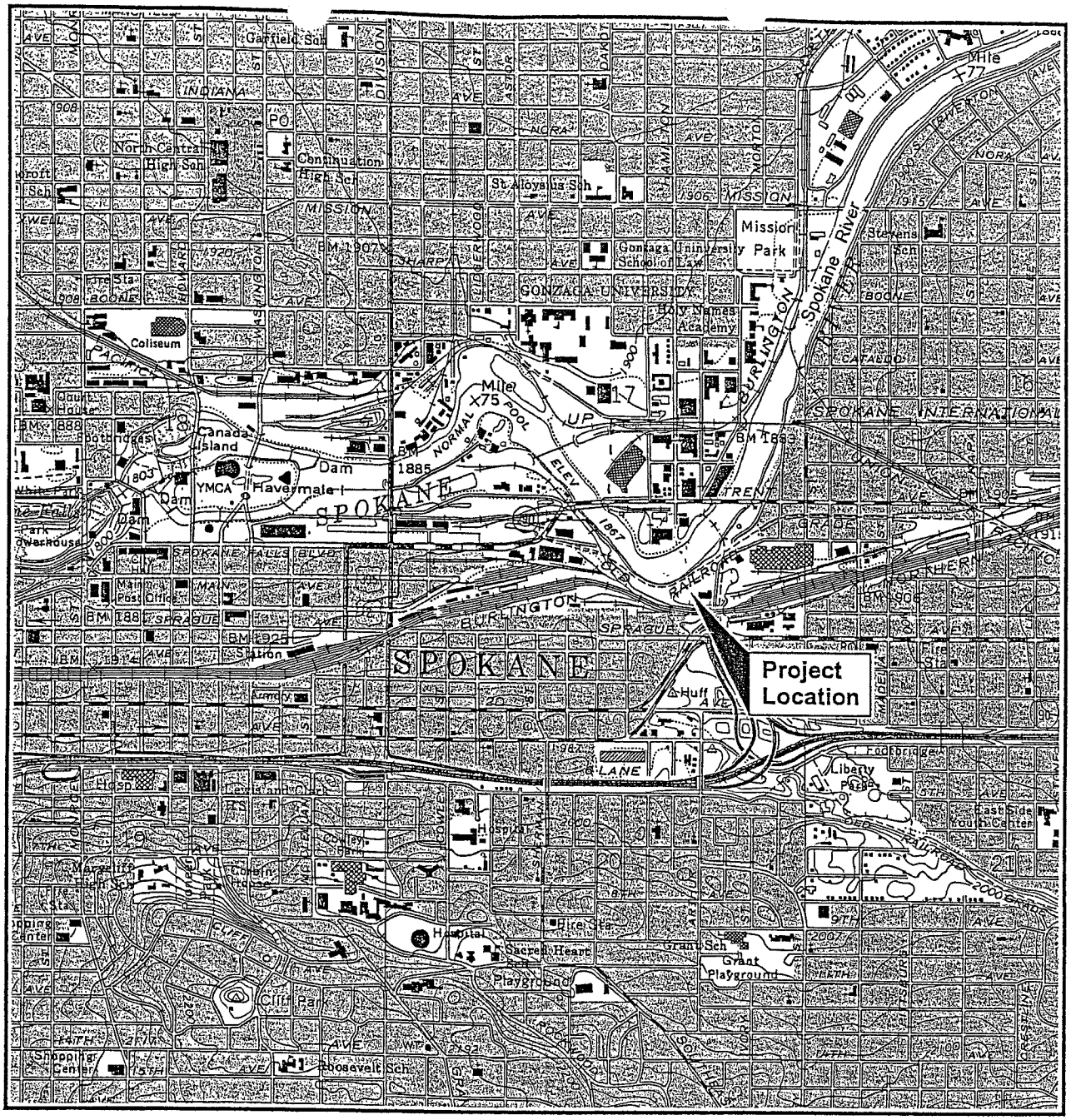
The compliance groundwater data will be collected in a manner that both provides for, and documents, an acceptable level of precision and accuracy. A quality assurance/quality control (QA/QC) program designed to provide the necessary level of precision and accuracy, as well as completeness, representativeness, and comparability is presented in detail in the QAPP. The QA/QC program includes, among other things, identification of data quality objectives, specific QA/QC procedures for sample collection and handling, analytical protocols for the analytical laboratories, the use of QC samples, and data validation procedures.

REPORTING

Groundwater monitoring summary reports will be prepared following validation, compilation, and evaluation of the field and laboratory data. The monitoring reports will contain a summary of the field methods, tabulated field and laboratory data, groundwater elevation data, and identification of any detections that exceed appropriate cleanup levels. The monitoring reports will be submitted to Ecology within 60 days of sample collection.

CONFIRMATIONAL MONITORING

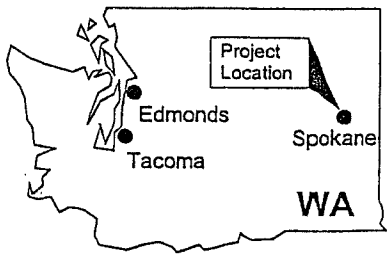
The performance monitoring report prepared in 2008 will contain recommendations for either continuing the performance monitoring program or initiating confirmational monitoring. The Companies will meet with Ecology at that time to discuss these recommendations and establish the type of monitoring program to be continued in the future.



Source: USGS Spokane NW, WA Quad, 1974: PR 1986

0 2000' 4000'

Approximate Scale in Feet



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Hamilton St. Bridge Site Spokane, Washington	**Site Location Map**	Figure 1

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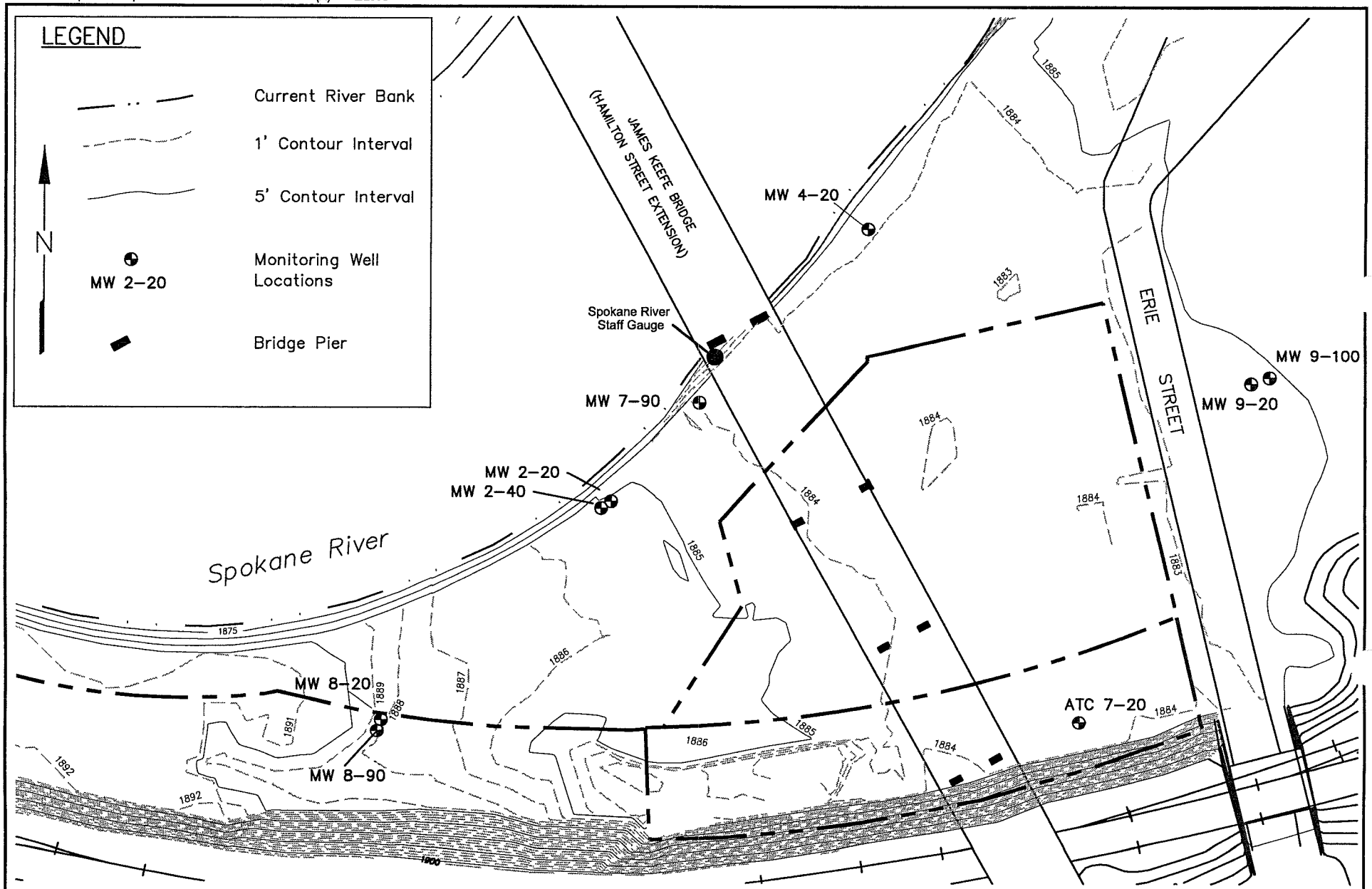

0 120' 240'

Scale in Feet

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Hamilton St. Bridge Site
Spokane, Washington

Compliance Groundwater Monitoring Well Location Map

Figure 2

APPENDIX A

Field Sampling Plan

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1.0 INTRODUCTION

This field sampling plan (FSP) describes procedures for conducting field activities during the compliance groundwater sampling program for the Hamilton Street Bridge Site (Site). The Site is located at 111 North Erie Street in Spokane, Washington. The Site cleanup is being performed in accordance with the final cleanup action plan (FCAP) prepared by the Washington State Department of Ecology (Ecology; August 2001). The Burlington Northern and Santa Fe Railway Company (BNSF) and Avista Corporation (Avista Corp) (the Companies) and Ecology jointly agreed to conduct the cleanup action on the Site and Consent Decree No. 02205445-0 was recorded on September 12, 2002. The FCAP and Consent Decree stipulate the terms of the cleanup action, and requirement for a compliance monitoring plan to be prepared consistent with the Washington State Model Toxics Control Act (MTCA; chapter 173-340 WAC).

The primary objective of this FSP is to provide sampling and analysis methodologies, consistent with accepted procedures, that will maximize accuracy, reproducibility, and comparability of data between sampling events. The sampling methods described in this plan are based on procedures outlined in U.S. Environmental Protection Agency (EPA) guidance documents (EPA 1987, 1988).

This FSP is divided into the following sections:

- Section 2 Water Level Measurements
- Section 3 Groundwater Sampling
- Section 4 Sample Handling, Documentation, and Custody Procedures
- Section 5 Equipment Decontamination Procedures
- Section 6 References.

2.0 WATER LEVEL MEASUREMENTS

Water levels will be measured prior to sample collection during each groundwater sampling event. Water levels will be measured using an electronic water level indicator and recorded to the nearest 0.01 ft. Measurements will be taken from a marked survey point at the top of each well casing, or, if no mark is available, from the northern edge of the casing. To avoid cross contamination between wells, the indicator probe and affected cable will be cleaned with soap and water and rinsed with deionized water before each measurement. Water level information will be recorded on a water level measurement form and sample collection form when appropriate.

Also at the time of all groundwater level measurements, the level of the Spokane River will be recorded from the established river measurement point. The level will be measured to the nearest 0.1 ft.

3.0 GROUNDWATER SAMPLING

This section presents the procedures for groundwater sample collection during the compliance monitoring program. Sample analytical methods and procedures are provided in the quality assurance project plan (QAPP), presented in Appendix B.

Groundwater samples will be collected from monitoring wells MW02-20, MW04-20, MW04-40, ATC07-20 and MW07-90.

The following procedures will be used to collect the groundwater samples:

- Before sampling, depth to water will be measured to the nearest 0.01 ft and recorded on the sample collection form. From this, the water column height in the well will be calculated.

- Specific conductivity, and pH meters will be calibrated according to manufacturer's specifications at the beginning of each sample day. Calibration data will be recorded in a log maintained for each instrument. Meter calibration will be checked if meter drift is suspected, and data will be recorded in the calibration log or sample collection form. The meters will be calibrated with solutions buffered closest to known field parameters.

- Before sampling, the well will be purged using a purge pump with dedicated tubing. Purging will continue until at least three casing volumes of water have been removed, the specific conductance and temperature has stabilized (when the replicate sample measurements vary by no more than 10 percent), or until the well is dry. Purge volume will be calculated based on the following formula:

  1 well volume (gallons) = $\pi r^2 h$ x 7.48 gal/ft^3,
  where π = 3.14, r = inside radius of well casing in feet, h = height of water column from the bottom of the well, in feet.

  - The wells will be purged so that the entire water column above the screen has been removed prior to sampling.

  - The well will not be purged at a rate that allows formation water to vigorously cascade down the sides of the screen.

  - Purge data will be recorded on the sample collection form, including purge volume, time of beginning and termination of purging, and observations regarding color, turbidity, or other factors that may be important in evaluation of sample quality.

  - Purge and decontamination water will be contained in drums or in a storage tank located in a temporary staging area at the Site for proper disposal.

- Groundwater sampling will begin immediately following purging or, if the well purges dry, as soon as enough water is available in the well for sampling. Sample data will be recorded on the sample collection form, including sample number and time collected, the observed physical characteristics of the sample (e.g., color, turbidity, etc.), field parameters (pH, specific conductance, and temperature), and other data that may be important in the evaluation of sample quality.

The following procedures will be used to obtain the four replicate field measurements of temperature, pH, and specific conductance:

- A plastic beaker will be rinsed with sample water.
- The electrodes and temperature compensation probe will be rinsed with sample water.
- The beaker will be filled with sample water; the probes will be placed in the beaker until the reading stabilizes. Temperature, pH, and specific conductance measurements will be recorded on the sample collection form.
- The above step will be repeated to collect remaining replicates.
- Problems or significant observations will be noted in the comments section of the sample collection form.

- Groundwater samples will be collected for all parameters using a disposable bailer or a peristaltic pump with dedicated tubing for each well. Clean gloves will be worn when collecting each sample.
- The sample water will be discharged slowly and carefully into appropriate sample containers to minimize aeration.
- The sample water will not be filtered unless turbidity is observed. Filtered water will be filtered in the field through a 0.45-micron, in-line, disposable filter. A note will be made on the sample label, sample collection form, and chain-of-custody record to indicate the sample has been field filtered. Samples will be preserved as recommended by the analytical laboratory. Samples will be placed on ice immediately after sample collection.
- Duplicate samples will be collected, if required, by alternately discharging the pump or bailer into duplicate sample bottles. Duplicate samples will be labeled with a separate sample number and the number will be noted on the sample collection form. Duplicate samples will receive a designation unrelated to the primary sample and traceable to the sample location only through sample collection forms and log notation.

All sampling will be conducted in accordance with the appropriate provisions of the project health and safety plan.

4.0 SAMPLE HANDLING, DOCUMENTATION, AND CUSTODY PROCEDURES

Sample handling and documentation procedures are summarized in this section. These procedures and protocols for sampling activities were developed to meet the data quality objectives (Appendix B) of the compliance monitoring program, and are based on proven and acceptable sampling methods as established by EPA guidance documents, Washington State regulations, and professional judgment.

4.1 SAMPLE HANDLING AND TRANSPORT

4.1.1 SAMPLE COLLECTION AND HANDLING

Sample collection procedures, and protocols for each sampling activity, are described in Sections 3, 4, and 5 of this appendix.

Sample containers, preservatives, and holding times will vary according to the type of sample collected and the analytical method to be used. Strict precautions will be taken to adhere to maximum sample holding times. Each sample will be documented, labeled, and identified as noted below.

4.1.2 SAMPLE PACKAGING AND SHIPPING

Samples will be packaged and transported in a manner that protects the integrity of the sample and prevents detrimental effects due to the possible hazardous nature of samples. Regulations for packaging, marking, labeling, and shipping hazardous materials are promulgated by the U.S. Department of Transportation (DOT) in the Code of Federal Regulations (CFR), 49 CFR 171 through 177.

The water samples will be placed on sealed, reusable ice packs or double-bagged ice in lined coolers immediately after collection. At the end of each day, samples will be inventoried. In preparation for transportation of samples to the analytical laboratory, the drain plug of the cooler will be taped shut, and a large plastic bag may be used as a liner. When appropriate, approximately 1 inch of packing material will be placed in the bottom of the liner or cooler.

Samples will be packaged carefully to avoid breakage or cross contamination using sufficient packing material. The large liner bag, when used, will be taped shut and the chain-of-custody records accompanying the samples to the laboratory will be placed inside a separate plastic bag and taped inside the cooler lid.

The shipping container, will be taped shut with strapping tape and custody seals, and will be delivered or shipped by an overnight courier to the laboratory.

4.2 SAMPLE CUSTODY AND DOCUMENTATION

4.2.1 SAMPLE CUSTODY

The primary objective of sample custody is to create an accurate record that can be used to trace the possession and handling of samples so their quality and integrity can be documented and maintained from collection until completion of all required analyses. Adequate documentation of sample custody will be achieved by means of the chain-of-custody record initially completed by the sampler, and thereafter signed by each individual who accepts custody of the sample. A sample will be considered to be in custody under the following conditions:

- Someone has the sample in physical possession
- Someone has the sample in view
- The sample is locked or secured in a locked container or otherwise sealed so that tampering will be evident
- The sample is kept in a secured area, restricted to authorized personnel only.

Sample control and chain-of-custody in the field and during transport to the laboratory will be conducted in general conformance with the procedures described below.

4.2.1.1 Field Custody Procedures

The following field custody procedures will be followed:

- As few persons as possible will handle samples.
- Sample bottles will be obtained new or precleaned from the laboratory performing the analyses.
- The person collecting the sample will be responsible for completing the chain-of-custody record and for the care and custody of collected samples until they are transferred to another person under chain-of-custody procedures.
- The field representative will oversee field custody procedures during the fieldwork and in the event of noncompliance, will determine if corrective action is required.

4.2.1.2 Sample Transportation Custody Procedures

The following sample transportation custody procedures will be followed:

- The coolers in which the samples are transported will be accompanied by the chain-of-custody record identifying their contents. The original record and laboratory copy will be sealed inside the cooler. The other copy will be distributed, as appropriate, to the quality assurance officer.

- Coolers will be sealed with custody seals for transport to the laboratory. The method of shipment, name of courier, and other pertinent information will be entered in the remarks section of the chain-of-custody record if the samples are transported by a commercial courier.

4.2.1.3 Transfer of Custody

When samples are transferred, the individual(s) relinquishing and receiving the samples will sign the chain-of-custody record and document the date and time of transfer. The person who collected the samples will sign the record in the first signature space. If the samples are shipped via commercial couriers, the chain-of-custody records will be sealed inside the sample container before delivery and the custody signature will be from the person who receives the samples from the courier at its final destination. Each person taking custody will evaluate the integrity of the shipping container seal and note any observations on the chain-of-custody record. Project documentation of sample custody will be verified during regular review of the data validation package.

4.2.1.4 Laboratory Custody Procedures

A designated sample custodian at the laboratory will accept custody of the shipped samples, verify the integrity of the custody seals, and certify that the sample identification numbers match those on the chain-of-custody record. The custodian will log the sample identification numbers and requested analyses in accordance with laboratory quality assurance/quality control (QA/QC) protocols. If containers arrive with broken custody seals, the laboratory will note this on the chain-of-custody record and will immediately notify the project manager so that the potential for sample tampering can be evaluated. The laboratory will maintain sample security and custody throughout the analytical process.

4.2.2 DOCUMENTATION

Documentation necessary to meet the field QA objectives for this project includes:

- Field notebooks (logbooks) in which general field observations and activities are recorded

- Field sampling forms specific to sampling (sample collection form, chain-of-custody, etc.)

- Sample container labels.

If an error is made on any field documentation, corrections will be made by drawing a single line through the error and entering the correct information. Whenever possible, errors will be corrected by the person who made the entry. Corrections will be initialed, dated, and, if necessary, a footnote explaining the correction will be included. The erroneous information will not be discarded. All field documentation and project records will be filed to prevent loss, damage, or alteration. Access to any archived project files or laboratory data will be controlled to maintain integrity of the documentation.

4.2.2.1 Field Notebook

Daily field documentation of individual field tasks will be recorded to provide sufficient data and observations to enable participants to reconstruct events that occurred during the project and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings. Corrections will be made as explained above. Information documented on field sampling forms need not be repeated in the field notes; however, reference must be made in the field notes to the field forms.

4.2.2.2 Sample Container Labels and Identification Format

Each sample container will be labeled, chemically preserved if required, and sealed immediately after collection. Sample container labels will be filled out using waterproof ink and will be firmly affixed to the sample containers. Sample label information also will be recorded on the appropriate field sampling forms.

The sample container label will contain the following information:

- Sample number
- Project name
- Date and time of collection
- Name of sampler(s)
- Analysis required
- Preservation (if applicable).

Additional identifiers may be added, as necessary, based on the specific sampling activity. Actual sample locations and other identification information will be recorded in the field notes and on the appropriate sample collection forms. Field QC (duplicate) samples will be coded as individual samples and identified in the field notes and on sample collection forms.

5.0 EQUIPMENT DECONTAMINATION PROCEDURES

Sampling equipment will be decontaminated before collecting each sample to avoid cross contamination between samples. Decontaminated sampling equipment will be handled in a manner that minimizes contact with potentially contaminated surfaces. Between sampling events, all nondedicated pumps and tubing will be stored in a manner (e.g., in a plastic bag) that protects them from inadvertent contamination.

5.1 SAMPLING EQUIPMENT

Decontamination procedures for sampling equipment will be used to minimize the possibility of cross contaminating samples. Sampling equipment that comes in contact with potentially contaminated material will be decontaminated before and after each use. Decontamination of sampling equipment which has not been in contact with non-aqueous phase liquid (NAPL) will consist of the following steps and will be documented on the sample collection form:

1. Initial tap water rinse to remove large particles, if applicable
2. Alconox, Simple Green® (or similar) and tap water wash
3. Tap water rinse
4. Deionized or distilled water rinse.

Decontamination of sampling equipment which has been in contact with NAPL will consist of the following steps and will be documented on the sample collection form:

1. Initial tap water rinse to remove large soil particles, if applicable
2. Hexane and/or hot water pressure wash
3. Alconox, Simple Green® (or similar) and tap water wash
4. Tap water rinse
5. Deionized or distilled water rinse.

6.0 REFERENCES

EPA. 1988 *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA.* EPA/540/G-89/004. OSWER Directive 9355.3-01. U.S. Environmental Protection Agency, Washington, D.C. October

EPA. 1987. *A Compendium of Superfund Field Operations Methods.* 540/P-87/001. U.S. Environmental Protection Agency. December.

APPENDIX B

Quality Assurance Project Plan

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TABLES

1.0 INTRODUCTION

This quality assurance project plan (QAPP) establishes the quality assurance (QA) objectives for the compliance monitoring program for the Hamilton Street Bridge Site (Site) located at 111 North Erie Street in Spokane, Washington. This plan also presents the QA organization and quality control (QC) procedures developed to meet project QA objectives. These QA/QC procedures are intended to facilitate meeting project data quality objectives [DQOs, developed in accordance with U.S. Environmental Protection Agency (EPA) guidance documents (EPA 1983; 1987a,b; 1989)] and generating data that are representative of actual conditions at the site. The goal of the project QA program is to provide a reasonable degree of confidence in project data and results by establishing a system of quality and performance checks on data collection, analysis, and reporting activities, as well as to provide for appropriate and timely corrective action to achieve compliance with established performance and quality criteria.

2.0 PROJECT QA ORGANIZATION AND RESPONSIBILITIES

The project QA organization for evaluation of QA during the sampling activities are outlined on Table B-1, along with the associated QA responsibilities. The project manager will serve as the QA officer, and will be responsible for overall implementation of this QAPP including directing/conducting data validation and for confirming that the QA objectives of the project are met. The QA/QC task leader will be responsible for QA oversight during the sampling activities and will assist the project manager in quality control activities. Chemical analyses will be performed by an accredited laboratory in accordance with chapter 173-50 WAC. The laboratory shall have the facilities, equipment, staff, and QA/QC program and procedures to perform sample analyses in support of this QAPP.

3.0 DATA QUALITY OBJECTIVE

The overall objective of the QA/QC program is to establish confidence that project data are of known and appropriate quality and sufficient to support their intended use. To accomplish this goal, project data should be technically sound, statistically valid, and properly documented (EPA 1988), having been evaluated against established criteria for precision, accuracy, representativeness, completeness, and comparability (PARCC), as defined in EPA guidance (1988).

The QA procedures presented in this QAPP are based on DQOs that were developed in accordance with EPA guidance documents (EPA 1987a,b) and reflect the intended use of project data. The project DQOs (summarized in Table B-2) prescribe the sampling program design (e.g., type of analysis, sampling protocols) and the level of quality, PARCC of data to be collected and analyzed for the compliance monitoring program activities.

The data objectives for the compliance monitoring program are to collect surface water and groundwater level data in the vicinity of the site, and collect groundwater analytical data that will provide information to confirm that the cleanup action has attained cleanup standards and any other performance standards. These data objectives will be accomplished by collection of water level measurements and conducting analyses on groundwater samples using standard analytical laboratory methods (EPA 1986, updated 1995).

The analytical level DQO for data generated will be Level III (EPA 1987a) or non-Contract Laboratory Program (CLP)-RAS. Level III non-CLP-RAS refers to the use of standard EPA-approved methods (EPA 1986, updated 1995) with the level of data quality comparable to that obtained from the use of CLP methods (EPA 1994a,b), with the exception of the level of documentation required with submittal of the analytical results from the laboratories. The documentation and validation procedures established in this QAPP are sufficient to achieve non-CLP-RAS data quality and, therefore, sufficient to support the appropriate conclusions about the data and support the objectives of the investigation.

Target control limits will be used to evaluate data acceptability as noted in Section 9. The control limits listed in these tables are considered to be QC goals for data acceptance. Laboratory accuracy will be determined through the use of laboratory spiked samples. In field duplicates, both field variability and laboratory variability are potential sources of error; therefore, both will be considered in any investigation of relative percent difference (RPD) values outside the target control limits. Data acceptability will be determined on the basis of the results of this qualitative review of error sources and, therefore, will be case specific.

The QA objective for representativeness, completeness, and comparability will be achieved by:

- Implementing standardized, uniform field procedures (see Appendix A)
- Analyzing laboratory method blanks to verify that the analytical results are representative of the sampled item and not influenced by cross contamination
- Reporting data in conventional and standard units.

PARCC parameters are defined and discussed further in Section 9.

Quantitation limits will generally equal those listed in the standard EPA methods (EPA 1986, updated 1995) or those currently achievable for laboratory data depending on effects by matrix interferences. The quantitation limit goals are presented in Table B-3. Project quantitation limits will generally be low enough to accommodate comparison of the data to human health and environmental risk-based concentrations; however, for some constituents the risk associated with the quantitation limit will still exceed $1x10^{-6}$ screening level.

4.0 SAMPLING, DOCUMENTATION, AND CUSTODY PROCEDURES

Sampling procedures and protocols for each sampling activity were developed to meet the project data quality objectives and are based on proven and acceptable sampling methods as established by EPA guidance documents and professional judgment.

Sampling, documentation, and custody procedures include the following elements:

- Sampling methods, including identification of sampling equipment, purging procedures, and decontamination procedures to be used.
- Sample containers, preservation, and holding times.
- Measures to be taken to prevent contamination of the sampling equipment and cross contamination between sampling points.
- Sample preservation methods.
- Chain-of-custody procedures.

A description of sampling, documentation, and custody procedures for the compliance monitoring program activities are presented in Appendix A.

5.0 PREVENTIVE MAINTENANCE/CALIBRATION PROCEDURES

Laboratory and field instruments will be properly operated, calibrated, and maintained by qualified personnel according to the manufacturer's guidelines and recommendations, as well as criteria in the analytical method. Documentation of routine and special preventive maintenance and calibration information will be maintained in a field or laboratory logbook or reference file and will be available upon request. Each maintenance and calibration logbook entry will include the date and supplementals of the individual performing the activity. The subsections below summarize preventive maintenance and calibration procedures for field and laboratory instruments.

5.1 FIELD INSTRUMENTS

Periodic schedules for preventive maintenance of field instruments, including equipment testing, parts replacement, and general cleaning will be followed according to the manufacturer's instructions. Field equipment performance will be evaluated against check standards and calibration blanks, as appropriate, for each parameter before use and at least once during a sampling day or when meter drift is suspected. Field instruments used during groundwater sampling activities requiring calibration will include water level indicators, pH, and conductivity meters.

5.2 LABORATORY INSTRUMENTS

The analytical laboratory project manager is responsible for maintaining laboratory instruments in proper working order, including routine maintenance and calibration and training of personnel in maintenance and calibration procedures. Laboratory instruments will be properly calibrated with appropriate check standards and calibration blanks for each parameter before beginning each analysis. Instrument performance check standards, where required, and calibration blank results will be recorded in a laboratory logbook dedicated to each instrument. At a minimum, the preventive maintenance schedules contained in the EPA methods and in the equipment manufacturer's instructions will be followed. Laboratory calibration procedures and schedules will be as described in the laboratory QAPPs.

6.0 ANALYTICAL PROCEDURES

Groundwater samples collected during the compliance monitoring program will be analyzed for polynuclear aromatic hydrocarbons (PAHs), cyanide, arsenic, and mercury. Laboratory chemical analyses for all constituents will be conducted by an accredited laboratory. The laboratory shall be qualified to perform the analyses using standard, documented laboratory analytical procedures. The laboratory QAPP and standard operating procedures (SOPs) provide data quality procedures according to the protocols for the analytical method and cleanup steps. Analytical methods are listed in Table B-3.

The quantitation limits listed are only goals because instances may arise where high sample concentrations, nonhomogeneity of samples, or matrix interferences preclude achieving the desired quantitation limits and associated QC criteria. If this occurs, the laboratory will report the reason(s) for deviations from these quantitation limits or noncompliance with QC criteria.

7.0 DATA REDUCTION, VALIDATION, AND REPORTING

Analytical reports from the laboratory for this project will be accompanied by QC results and any other necessary analytical information to enable reviewers to determine the quality of the data. The project manager will be responsible for conducting checks for adherence to the QC elements specified in this QAPP. If significant nonconformities are found, additional laboratory data may be evaluated.

Analytical data for the specific tasks will be reported in the units specified by the quantitation limits as listed in Table B-3. These units have been selected to provide for comparability of the data with previously generated relevant data.

The analytical laboratory will provide reports that will include the following elements:

- Case narrative, including adherence to prescribed protocols, nonconformity events, corrective measures, and/or data deficiencies
- Sample analytical results
- Surrogate recoveries
- Matrix spike/matrix spike duplicate results
- Laboratory control sample/laboratory control sample duplicate results
- Laboratory duplicate results
- Blank results
- Sample custody (including signed, original chain-of-custody records, and documentation of condition of custody seals)
- Analytical responsibility.

Data validation will be performed based on data in analytical laboratory report packages obtained as part of the Compliance groundwater monitoring program. Validation will be performed according to portions of the EPA guidelines on data validation (EPA 1994a,b) and will include evaluations of the following QA components:

- Chain-of-custody records
- Holding times
- Laboratory method blank results
- Surrogate spike recoveries
- Laboratory matrix spikes and matrix spike duplicate results

- Laboratory control sample and laboratory control samples duplicate results.
- Laboratory duplicate results
- Field duplicate results
- Corrective action records
- Completeness and overall data quality.

Section 9 presents statistical tests used to determine data precision, accuracy, and completeness during data evaluation and validation. If a portion of the data is outside the normal limits, or if sample collection and/or documentation practices are deficient, corrective action(s) will be initiated. Corrective action, as described in Section 11, will be determined by the project manager and may include any of the following responses:

- Rejection of the data and resampling
- Qualification of the data
- Modification of field and/or laboratory procedures.

Data qualification arising from data validation activities will be described in a data quality evaluation technical memorandum , rather than in individual corrective action reports.

8.0 INTERNAL QUALITY CONTROL

Internal QC will be accomplished through specific QC samples collected and/or measurements taken in the field and laboratory. The QC samples are used to evaluate PARCC of the analytical results for this project (see detailed discussion of these parameters in Section 9). Analytical methods specify routine procedures required to evaluate if data are within proper QC limits. Additional internal QC includes collection and analysis of a number of field and laboratory QC samples, which are described in the following subsections.

Field and laboratory QC samples will be used to evaluate data validity and representativeness. Field and laboratory QC samples may include blind field duplicates, field equipment blanks, field trip blanks, laboratory matrix spikes, laboratory matrix spike duplicates, laboratory control samples, laboratory control sample duplicates, laboratory duplicates, and laboratory method blanks.

A sampling event, as defined for the purpose of QC sample frequency, consists of a set of samples of similar matrix, collected within a regularly scheduled event or within a 14 (calendar) day period. The following sections describe the types of field and laboratory QA samples.

8.1 BLIND FIELD DUPLICATE

Blind field duplicates for groundwater will be collected by alternately filling sample containers for both the original and the corresponding duplicate sample at the same location to decrease variability between duplicates. Blind field duplicates will be collected at a frequency of one per 20 samples, not including QC samples, but not less than one duplicate per sampling event per matrix. The duplicates will be given a separate sample number that is not likely to be associated by the laboratory to the specific sample location.

9.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA

Analytical laboratory data will be reviewed to confirm that the QA/QC objectives for the PARCC parameters are met. The PARCC parameters and the associated statistical tests used in their evaluation are included in the following sections.

9.1 PRECISION

Precision is a measure of "the reproducibility of analyses under a given set of conditions" (EPA 1988). Precision is best expressed in terms of the standard deviation or RPD. QA/QC sample types that test precision include field and laboratory duplicates matrix spike duplicates, and laboratory control sample duplicates. The estimate of precision of duplicate measurements will be expressed as an RPD, which is calculated:

$$RPD = \left| \frac{D_1 - D_2}{(D_1 + D_2)/2} \right| x\ 100$$

where: D_1 = first sample value and

D_2 = second sample value (duplicate).

The RPDs for laboratory duplicates and matrix spike duplicates will be routinely calculated and compared with DQO control limits. For field duplicates, RPD control limits will be 20 percent for water and 35 percent for soil or sediment. If duplicate sample values are within five times the quantitation limit, then the control limit interval will be plus or minus the quantitation limit for water, and plus or minus two times the quantitation limit for soil or sediment.

9.2 ACCURACY

Accuracy is a measure of "the bias in a measurement system" (EPA 1988). Numerically, accuracy can be described as an average of measurements of the same property X, with an accepted reference or true value T, usually expressed as the difference between the two values (X-T), the difference as a percentage of the reference or true value [100 (X-T)/T], or as a ratio (X/T). Accuracy is expressed as the percent recovery of spiked (matrix, laboratory control sample, and surrogate spikes) samples:

$$\frac{Percent}{Recovery} = \frac{(Total\ Analyte\ Found)}{Analyte\ Added} x\ 100$$

The percent recovery will be routinely calculated and checked against DQO control limits.

9.3 REPRESENTATIVENESS

Representativeness expresses "the degree to which data accurately and precisely represent selected characteristics" (EPA 1988). Representativeness can be evaluated using replicate samples, additional sampling locations, and blanks. Representativeness for the project will be monitored as outlined in Section 3.

9.4 COMPLETENESS

Completeness is a measure of "the amount of valid data obtained from a measurement system compared to the amount that could be expected to be obtained under normal "conditions" (EPA 1988). Completeness is calculated as the number of valid (i.e., nonrejected) data points divided by the total number of data points requested. Completeness will be routinely determined and compared to the DQO acceptable percentage of 95 percent, as listed in Table B-2.

9.5 COMPARABILITY

Comparability is the "degree of confidence with which one data set can be compared to another" (EPA 1988). QA procedures in this plan will provide for measurements that are consistent and representative of the media and conditions measured. All sampling procedures and analytical methods used for the compliance monitoring program activities will be consistent to provide comparability of results for samples and split samples.

10.0 PERFORMANCE AND SYSTEM AUDITS

Internal performance and/or system audits will not be conducted as part of the sampling activities.

11.0 CORRECTIVE ACTION

Corrective action will be required if there are deviations from the methods or QA requirements established in this QAPP or if there are equipment or analytical malfunctions. Corrective action procedures will be implemented based on the type of unacceptable data and will be developed on a case-by-case basis. The following corrective actions may be included:

- Altering procedures in the field
- Using a different batch of sample containers
- Performing an audit of field or laboratory procedures
- Reanalyzing samples (if holding times allow)
- Resampling
- Evaluating sampling and analytical procedures to determine possible causes of the discrepancies
- Accepting the data with no action, acknowledging the level of uncertainty
- Qualification of the data
- Rejecting the data as unusable.

During field operations and sampling procedures, the field personnel will be responsible for conducting and reporting required corrective action. A description of any corrective action taken will be entered in the daily field notebook. If field conditions do not allow for conformance with this QAPP, the project manager will be consulted immediately. For any corrective action or field condition resulting in a revision of this QAPP, the project manager will authorize changes or exceptions to the QAPP, as necessary and appropriate.

During laboratory analysis, the laboratory QA officer will be responsible for taking required corrective actions in response to equipment malfunctions. If an analysis does not meet data quality goals outlined in this QAPP, corrective action generally will follow the guidelines in the EPA analytical methods noted in this QAPP and the EPA guidelines for data validation (EPA 1994a,b). If analytical conditions are such that nonconformance with this QAPP is indicated, the project manager will be notified as soon as possible so that any additional corrective actions can be taken.

Data quality evaluation technical memorandum will be used in most cases in lieu of corrective action reports to document responses to reported nonconformances. These memorandums will be generated from internal audits or from informal reviews of project activities. Data quality evaluation

technical memorandums will be reviewed initially for appropriateness of recommendations and actions. The project manager will define responsibilities for scheduling, performing, documenting, and assessing the effectiveness of the required action. The project manager ultimately is responsible for implementation of appropriate corrective action and maintenance of a complete record of QC issues and corrective actions.

12.0 REPORTING

QA reports will include analysis reports from the laboratory and corrective action reports. All reports required under this QAPP will be submitted to the project manager.

12.1 LABORATORY REPORTS

The laboratory project manager from each laboratory will transmit written reports that summarize the test procedures and provide test results and QC data required for validation, as well as the elements listed in Section 7. Laboratory reports and analysis results will be signed by the laboratory project manager and submitted in data packages to the project manager.

12.2 QUALITY ASSURANCE REPORTS

Reports of significant QA deficiencies will be provided immediately to the project manager upon discovery. Verbal notice will be followed with written documentation through a technical memorandum.

All reported data will include results of the QA data validation review and conclusions containing information regarding data accuracy, precision, completeness, and any corrective action and sampling procedure alteration documentation.

13.0 REFERENCES

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Ecology. 1997. *Analytical Methods for Petroleum Hydrocarbons.* Washington Department of Ecology Publication No. ECY97-602.

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EPA. 1987a. *Data Quality Objectives for Remedial Response Activities, Development Process.* EPA/540/G-87/003a. U.S. Environmental Protection Agency. March.

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EPA. 1983. *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans.* National Technical Information Service (NTIS). EPA-600/4-83-004. U.S. Environmental Protection Agency. February.

TABLE B-1

QUALITY ASSURANCE RESPONSIBILITIES
COMPLIANCE MONITORING PROGRAM

Personnel	Responsibilities
PLP Project Manager	Provides project direction and coordinates project-agency communication or liaison; reviews project QA needs and approves appropriate QA corrective actions as required.
Consultant Project Manager	Directs and supervises project technical team activities to successfully accomplish technical and QA project objectives; reviews project QA requirements and activities; and reviews and approves appropriate QA corrective actions and data validation results.
QA/QC Task Leader	Provides technical QA assistance; directs implementation of QAPP; prepares QA reports; and provides corrective action response.
Laboratory Project Manager	Directs and supervises laboratory analytical activities; verifies adherence to project specifications and QA objectives; confirms that technical, financial, and scheduling objectives are achieved.

TABLE B-2

DATA QUALITY OBJECTIVES
COMPLIANCE MONITORING PROGRAM

Data users	Avista Corporation, BNSF, others
Data use/decision	Aquifer protection/End use
Data type	Water levels and concentrations of constituents of concern
Data quality objectives(1)	
Analytical level	Level III (non-CLP-RAS)(2)
QA Goals	
Precision(3)	Matrix spike duplicates, laboratory duplicates, field duplicates
Accuracy(3)(4)	Matrix spikes, laboratory control samples, surrogate spikes
Representativeness(3)	Field and laboratory blanks(4) Sampling protocols
Completeness(3)	95 percent
Comparability	Sampling protocols and use of consistent units in reporting
Quantitation limits(5)	As presented in Table B-3

1 Developed in accordance with the U.S. Environmental Protection Agency (1987a, b; 1989a) guidance documents.
2 The Level III analytical level is discussed in Section 3 of this QAPP.
3 Criteria for the evaluation of precision, accuracy, representativeness, and completeness are discussed in Section 9 of this QAPP.
4 Blank concentrations will be monitored and corrective action determined on a case-by-case basis, as describe in this QAPP.
5 Quantitation limits may be affected by matrix interferences. Values are based on current laboratory data.

TABLE B-3

QUANTITATION LIMITS FOR GROUNDWATER SAMPLES
COMPLIANCE MONITORING PROGRAM

Analysis	Analytical Method	Quantitation Limits (µg/l)(1 Water
Polynuclear Aromatic Hydrocarbons	EPA 8270 SIM	0.1
Total Arsenic	EPA 6020	1
Total Mercury	EPA 7470	0.1
WAD Cyanide	SM4500-CN^-	10.0

1 Quantitation limits are based on current laboratory data and may be modified as methodology is refined. Laboratory quantitation limits will be based on the lowest standard on the calibration curve. Instances may arise where high sample concentrations, nonhomogeneity of samples, or matrix interferences preclude achieving the desired quantitation limits and associated QC criteria.