1.0 Introduction and Purpose

The purpose of this Compliance Groundwater Monitoring Plan (hereafter CGWMP or Plan) is to establish policies and procedures for the continuation of groundwater monitoring at AREVA's Richland, Washington nuclear fuel fabrication facility. Groundwater monitoring has been conducted at the AREVA site since 1991 in accordance with Ecology's interim status regulations by virtue of AREVA's operation of a dangerous waste surface impoundment system. The monitoring has also been conducted pursuant to a Washington State Model Toxics Control Act (MCTA) independent action remedial investigation/feasibility study (RI/FS) conducted by Siemens Power Corporation, an AREVA predecessor, over 1991-1994 and submitted to Ecology in October 1994. The RI/FS confirmed the existence of groundwater contamination that, by constituent and location, was linked to operation of the surface impoundment system, specifically to leaks from early-on operations (1970s, 1980s) when certain of the impoundments were single-lined and without leak detection/collection capabilities.

The surface impoundment system has been removed from service in accordance with an Ecology-approved Closure Plan (Ref. 1). The Closure Plan covered processing/disposition of the impoundment system inventory, dismantling and disposal of the impoundment structures and supporting equipment, and characterization/ remediation of associated soil contamination. Cleanup levels for constituents of concern (COCs) were also established in the approved Closure Plan. Ecology officially accepted AREVA's closure certification via Ecology's letter of November 14, 2006 (Ref. 2)

Submittal of this CGWMP is responsive to AREVA's commitment in Reference 1 to replace its existing interim status and RI/FS-related groundwater monitoring programs with a revised program to provide performance monitoring to evaluate COC concentrations in groundwater relative to established cleanup levels (i.e., verify that cleanup levels are attained) and confirmational monitoring to confirm the long-term effectiveness of the surface impoundment cleanup action (WAC 173-340-410) by statistical evaluation of data collected over a longer monitoring period. Performance and confirmational monitoring will consist of identical sample collection and analysis procedures. The CGWMP includes monitoring for the COCs pertinent to the closure/remediation and complies with WAC 173-340-410 and the criteria set forth in WAC 173-340-720(9).

2.0 Organization and Responsibilities

A project engineer from AREVA's Licensing and Compliance organization will be responsible for project oversight, including ensuring that sampling and analyses are performed according to this CGWMP. The project engineer will oversee all activities related to the CGWMP, maintain detailed field notes, and act as the laboratory contact. Field sampling activities will be conducted by the project engineer and/or trained AREVA employees. Analytical services will be provided primarily by AREVA's Analytical Services Laboratory, which has attained Ecology certification for the pertinent program analytes. Appropriately qualified/certified offsite contractor analytical services may also be utilized. Further details on the conduct and control of activities performed under this CGWMP are outlined in subsequent sections of this document.

3.0 Groundwater Monitoring System

This section discusses the groundwater monitoring system in regards to well construction and location, analyte selection, and frequency of sampling by location and analyte.

3.1 *Well Construction and Location*

All wells utilized to provide analytical data directly in support of this CGWMP were installed under the referenced Phase I and Phase II Groundwater Study Work Plans. Phase I included the location/installation of twelve 2-inch diameter groundwater monitoring wells (October 1991); four additional monitoring wells, three 2-inch diameter piezometers, and a single 6-inch diameter aquifer pumping well were added under the Phase II activities (March/April 1992).

A full discussion of the monitoring well installation can be found in the respective work plans, including location rationale, drilling methodology, installation methodology/materials, well completion, and well development. In summary, monitoring well installation was conducted to support the objectives of characterizing the groundwater flow system in the unconfined aquifer, characterizing the distribution of contaminants in the unconfined aquifer, assessing the relative contribution of specific potential contamination source areas to existing groundwater contamination, generating defensible data, and meeting regulatory requirements. In addition to supporting the stated objectives, decisions on monitoring well location considered pre-existing information available to Geraghty and Miller relative to groundwater flow direction and contaminant distribution at the site as well as the on-site locations of potential groundwater contamination sources. Screened intervals for each of the wells were placed in a manner to allow detection of dissolved constituents in the uppermost aquifer. Wells were constructed in accordance with WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells," to provide structurally sound monitoring wells from which representative groundwater samples can be obtained.

As described above, monitoring wells were installed to monitor groundwater in the vicinity of the surface impoundments and elsewhere at the site to support the site-wide RI/FS. Construction details for all the monitoring wells installed per References 3 and 4 (water quality and water level monitoring wells) selected to support this CGWMP are provided in Table 1. Included is information on screened interval, boring depth, elevation, and construction material. Locations of these wells are depicted in Figure 1. Site monitoring wells will be utilized under the CGWMP as follows:

- Water level monitoring wells. All wells and piezometers used for collection of water level data during each semiannual sampling event are shown on Figure 1. These wells include Phase I/Phase II wells and piezometers (designated "GM") as well as certain on-site wells that pre-dated the Phase I/Phase II installations (designated "TW").
- Upgradient wells. Wells GM-1 and GM-2 are upgradient of the former surface impoundment area and will be included as sampling locations in all groundwater sampling events.
- Point-of-compliance wells. As discussed in Section 5.1.3, wells GM-5, GM-6, GM-7, GM-8, GM-10, and GM-12 will be sampled as point-of-compliance wells during performance and confirmational monitoring.

3.2 *Analyte Selection*

Groundwater analytes for this CGWMP have been selected to demonstrate the effectiveness of the surface impoundment closure and remediation in achieving groundwater cleanup levels established in the Closure Plan. Groundwater cleanup levels have been established for fluoride and total uranium; as such, groundwater samples collected under the CGWMP will be analyzed for these two constituents.

Monitoring will also be conducted for nitrates. As discussed in the closure plan (Sec. 3.1.5.1), nitrate was considered to be a constituent of concern (COC) for the same reasons as was fluoride, i.e., prevalence in the historic lagoon inventories, presence in the chemical compounds responsible for the WT02 state-only toxicity designation of the lagoon inventories, and detection in groundwater underlying the lagoons at concentrations above background. However neither a nitrate groundwater cleanup level nor a nitrate soil cleanup level for the protection of groundwater were established in the closure plan due to the presence of nitrate in oncoming upgradient groundwater at concentrations significantly exceeding MTCA groundwater cleanup levels and federal/state drinking water Maximum Contaminant Levels for nitrates. Therefore the nitrate monitoring will be for informational purposes only. Consistent with the approved closure plan, site remediation effectiveness will be evaluated based on performance and confirmational monitoring for the other groundwater COCs, namely uranium and fluoride.

The Closure Plan also established groundwater cleanup levels for three organic constituents, namely trichloroethylene, acetone, and Freon 113. These constituents will not be monitored for under this plan in that cleanup levels have been fully achieved. Demonstration of compliance for these organic constituents is being provided to Ecology in separate correspondence being submitted in conjunction with this CGWMP.

Groundwater samples will also be analyzed initially for gross alpha. Although not a COC for the surface impoundment closure/remediation project, gross alpha has been included in the previous groundwater monitoring program as a general indicator of total uranium contamination. Since AREVA's past groundwater program included gross alpha but not uranium, analysis for gross alpha will continue for four successive sampling events in order to establish a correlation with total uranium, thereby preserving the continuity of the data set. From that point on, radionuclide monitoring will be limited to total uranium, the radioactive COC for the surface impoundment closure and the constituent with an approved cleanup level.

4.0 Sampling and Analysis

During performance monitoring, groundwater samples will be collected on a semiannual basis; sampling events will be conducted in approximately April and October each year. Water level measurements will also be made on a semiannual basis on all AREVA site monitoring wells, including those that are not sampled as part of this CGWMP (see Section 3.1).

During confirmational monitoring, the sampling frequency may be increased to collect sufficient data for statistical analysis over a shorter period of time. It is expected that the frequency would increase to quarterly and it will not be more frequent than monthly. All other aspects of sample collection and analysis during confirmational monitoring are the same as during performance monitoring.

The following procedures will be used by all field personnel when conducting sampling activities at the AREVA facility.

All field activities will be documented in a bound field notebook using a permanent, water-proof pen. The field notebook will be signed by a member of the sampling team at the end of each day of field work, and will include the following:

- Date
- Weather conditions
- Names of the field team members
- Times of site arrival and departure
- Documentation of all field activities
- Equipment malfunction
- Equipment calibration
- Odd or unusual occurrences
- Sampling site visitors

4.1 *Sampling Preparation*

Prior to sampling, field personnel will assemble the equipment identified in Table 2. All equipment will be checked to ensure that it is in proper working order. Equipment that will come into contact with groundwater will be decontaminated before use (see Equipment Decontamination, Section 4.8). Field testing equipment (i.e., pH meter, conductivity meter, thermometer) will be tested and calibrated at the beginning of each sampling event (see Equipment Calibration, Section 4.2).

Sample containers will be provided by the project engineer. AREVA's analytical laboratory will add the appropriate preservatives (Table 3) immediately prior to the sampling event. To ensure preparedness in the field, sample bottles will be counted before the sampling event and extra sample bottles will be included in anticipation of possible breakage or spillage.

Samples will be collected first from upgradient wells GM-1 and GM-2 and then from applicable downgradient wells to reduce the potential for cross-contamination between wells and samples. Upon arrival at the sampling location, the field vehicle will be parked downwind of the well. Field personnel will avoid handling any objects not necessary for performing sampling procedures. Clean nitrile or vinyl gloves will be worn when handling any field equipment or samples. Gloves will be changed or decontaminated as necessary to prevent cross-contamination or external contamination.

4.2 *Equipment Calibration*

All field equipment requiring calibration will be calibrated to known standards prior to use in the field. Instruments and standards to be used while conducting field work at the AREVA facility are the following:

Instrument	Calibration Standards
pH meter	pH 7.0, and 10.0 buffer solutions (a two-point calibration will be performed with two standards which bracket the groundwater pH).
Specific conductance meter	Dry air to zero the instrument, 1,413 micromhos per centimeter (umhos/cm) solution of potassium chloride for slope adjustment (a similar standard potassium chloride solution, e.g., 2,000 umhos/cm, may be substituted).
Temperature meter/Thermometer	Electronic thermometer will be compared to mercury filled manual thermometer to assess proper calibration.

The manufacturer's instructions for calibration of the pH/specific conductance meter will be followed during calibration. An entry in the field notebook will be completed each time the instruments are calibrated. If equipment cannot be calibrated or becomes inoperable, its usage will be discontinued until the necessary repairs are made. In the interim, a calibrated replacement will be obtained and used. It is the responsibility of the project engineer to ensure that all instruments are properly maintained and in working order prior to use in the field.

4.3 *Well Inspection*

All monitoring wells utilized for this Plan will be inspected prior to sampling for damage from maintenance vehicles or due to weathering. The well head will be inspected for damage to the security casing, lock, and identification number. Any damage will be noted in the field notebook. Any corrective action required will be detailed on a work order request form and submitted to plant maintenance.

4.4 *Groundwater Level Measurement*

The static water level in all monitoring wells will be measured with an electric probe prior to sampling. Water levels in all wells will be measured on the same day, if possible, to obtain the most accurate representation of the water table. A minimum of two consistent measurements will be taken at each well to confirm the accuracy of the measurement. Measurements will be considered consistent if they are identical when rounded to the nearest 0.01 feet.

Each well has a clearly and permanently marked measuring point at the top of its casing. The measuring point on each well has been surveyed to determine its elevation with reference to an established datum. Depth-to-water measurements will be measured relative to this point.

To measure depth-to-water, the water-level meter probe will be lowered slowly into the well. When the electric probe registers contact with the groundwater, the reading on the tape at the measuring point will be noted to the nearest 0.01 feet. The electric probe and down-hole portion of the tape will be decontaminated before the first measurement and between wells (see Equipment Decontamination, Section 4.8).

For each water-level measurement, the following information will be recorded on a Groundwater-Level Measurement Form (Figure 2): water-level measurement, date and time of the measurement.

4.5 *Total Depth Measurement*

The total depth of each well will be measured prior to sampling by lowering a weighted steel tape or cable (sounding line) from the measuring point at the top of the casing until the weight is felt resting on the bottom of the well. Appropriate weights will be available and used as necessary to provide an accurate definition of the total well depth. The sounding line will be decontaminated before the first measurement and between each well (see Equipment Decontamination, Section 4.8). Alternatively, the total well depth may be measured at the same time that the depth to water measurement is taken by adding a weight to the end of the electric probe.

The total depth measurements will be recorded to the nearest 0.1 feet on the Groundwater-Level Measurement Form (Figure 2). These measurements will be used to confirm that the proper well has been identified and for accurate calculation of the volume of water standing in the well.

4.6 *Well Purging*

The volume of water standing in the well will be calculated by subtracting the depth-to-water measurement from the total depth of the well and multiplying the result by the number of gallons per linear foot of water in the well. Prior to sampling, a minimum of three well volumes will be purged from each well using a non-dedicated submersible pump. After purging, the pump will be removed from the well and decontaminated as specified in Section 4.8.

The pH, specific conductance, and temperature of the discharged water will be measured a minimum of three times during purging, until these parameters have stabilized or until the project engineer indicates that further purging is unnecessary. The pH will be considered stable when two consecutive measurements agree within 0.2 standard units. Temperature will be considered stable when two consecutive measurements agree within 0.2 degrees Celsius, and specific conductance will be considered stable when two consecutive readings are within 10 percent of each other.

The purge water from point-of-compliance wells will be pumped into labeled 55-gallon drums and held on-site pending receipt of analytical results to ensure proper disposition. To date, all collected purge water has been discharged to the POTW after approval by the City of Richland Pretreatment Coordinator.

4.7 *Sample Collection*

Samples will be collected with a disposable polyethylene bailer on clean nylon or Tygon cord. The bailer will be slowly lowered into the well, filled, and raised to the surface. Care will be taken to prevent agitation of groundwater in the well. A removable spigot will be attached to the bottom end of the bailer and the groundwater will be transferred into sample bottles through the bottom-emptying spigot.

The sample container caps will not be removed until the sample is collected, to minimize the potential for contamination. When the cap is removed from the sample container, care will be taken not to touch the lip of the bottle, the inside of the cap, or the mouth of the spigot. The sample bottle will be filled slowly by directing the stream of water, out of the spigot, at an angle so that it drains down the inside of the sample bottle. This will help prevent the loss of preservative and discourage air bubbles from becoming trapped in the sample bottle. Care will be taken to avoid splashing or agitating the water while the bottle is being filled. Each bailer of water will be divided evenly between bottles of a single type of analysis, to provide representative samples.

After each sample bottle is filled and capped, the sample label identifying the sample location, date and time of sampling, and type of preservative will be completed with permanent, water-proof ink. (Alternatively, the sample will be collected in appropriately pre-labeled bottles.) An example of a sample label is provided in Figure 3. Samples will be placed in a cooler with ice or frozen reusable ice packs for transport to the laboratory.

Field parameters (pH, temperature, and specific conductance) will be measured by filling a clean plastic or glass beaker with a groundwater sample and placing the pH and specific conductance meter and a thermometer in the beaker. Measurements will be recorded in the field notebook. The color, odor, and appearance of the sample, and other pertinent sample observations will also be recorded in the field notebook.

Quality control samples to be collected in or carried into the field include equipment rinsate blanks and duplicate samples. One rinsate blank will be collected for each day of sampling. One duplicate sample will be collected during each sampling campaign.

Equipment rinsate blanks will be collected by pouring analyte-free, deionized water through a disposable sampling bailer and filling a full set of sample bottles. Duplicate samples will be collected by filling two sets of sample bottles with groundwater from a single well. Quality control samples and procedures are discussed further in Section 6.0.

4.8 *Equipment Decontamination*

Reusable sampling equipment, including the equipment used to measure groundwater levels and total well depths, will be decontaminated prior to use and after use at each well to avoid chemical cross-contamination of field samples. Equipment will be decontaminated by washing with a laboratory-grade, nonphosphate detergent and rinsing with distilled or deionized water. Wash and rinse water will be retained with the purge water pending analytical results to ensure proper disposal.

Interior and exterior surfaces of the submersible pump and associated power cord and discharge tubing will be decontaminated after each use by scrubbing and operating the pump in a container filled with a laboratory-grade, nonphosphate detergent solution and then in a container filled with distilled or deionized water.

All field personnel will wear clean nitrile or vinyl gloves when conducting equipment decontamination.

4.9 *Sample Preservation and Shipment*

The types of bottles and preservatives required for each type of groundwater analysis are identified in Table 3. All water samples will be stored in a cooler with ice or frozen reusable ice packs immediately after collection. All samples will be delivered to AREVA's analytical laboratory at the end of each sampling day or locked in a dedicated refrigerator pending delivery. Samples will be delivered to offsite laboratories by the project engineer or delegate.

4.10 *Sample Analysis*

The analytical procedures to be conducted on groundwater samples, along with their associated analytical requirements, are specified in Table 3. Laboratory protocols, quality control procedures, and data reporting requirements are discussed in the following sections. Copies of the QA Plan for any contracted offsite laboratory are kept on file (hard copy or electronically) by the project engineer.

5.0 Data Evaluation and Reporting

This section outlines the procedures to be used to evaluate the data collected under this Plan and the protocol for reporting this information to regulatory agencies.

5.1 *Data Evaluation*

Water-level data will be evaluated spatially by preparing water-table contour maps. The water-table contour maps will be used to determine groundwater flow directions and to depict horizontal gradients.

During the performance monitoring phase, water-quality data will be evaluated qualitatively for selected wells of interest (based on historical/current levels and trends) using temporal trend plots of constituent concentrations. The trend plots will be evaluated for temporal patterns in constituent concentrations at the monitoring wells to determine whether concentrations are increasing, decreasing, or stable through time. Historical water-quality data for point-of-compliance wells will be used in constructing the trend plots to provide a sufficient quantity of data for trend evaluation. Concentrations of fluoride and uranium measured in groundwater will also be compared directly to the cleanup levels (see Section 5.1.1).

Once the observed concentrations of fluoride and/or uranium in groundwater at the point-of-compliance wells (see Section 5.1.3) meet the cleanup levels for at least two consecutive sampling events, the confirmational monitoring phase will begin (i.e. sampling frequency may be increased). Statistical analyses will be performed on the data to evaluate whether groundwater cleanup levels have been attained once sufficient confirmational data have been collected (Section 5.1.2).

5.1.1 Cleanup Levels

Groundwater cleanup levels were established in accordance with MTCA requirements (WAC 173-340-720) and are specified in the Ecology-approved Closure Plan. The cleanup levels applicable to this CGWMP are as follows:

Analyte	Groundwater Cleanup Level, ug/L
Fluoride	960
Total Uranium	30

As described in Section 3.2, gross alpha will be an analyte during the initial four monitoring events. However, there is not an established cleanup level for this parameter. It is a surrogate for uranium, and total uranium concentrations will be compared directly to the cleanup level to evaluate this parameter. Also as described in Section 3.2, nitrate sampling will be conducted on an ongoing basis in conjunction with the uranium and fluoride monitoring, but for informational purposes only.

5.1.2 Statistical Comparison of Groundwater Data to Cleanup Levels

As described above, statistical analyses will be performed once the confirmational monitoring phase begins. Groundwater monitoring data will be compared statistically to the established cleanup levels to evaluate the effectiveness of the remediation project in achieving groundwater cleanup levels. The comparisons will be conducted in accordance with WAC 173-340-720(9)(d).

Following receipt of data from each monitoring event, the data from the most recent eight events will be evaluated for each constituent in each point-of-compliance well (i.e., wells GM-5, GM-6, GM-7, GM-8, GM-10, and GM-12), on a well-by-well basis, as follows:

1. The data will be compared to the cleanup level to determine whether there are any concentrations that exceed twice the cleanup level.
2. The data will be compared to the cleanup level to determine whether 10 percent or more of the data exceed the cleanup level.
3. The upper one-sided ninety-five percent confidence limit (UCL) on the true mean will be calculated and compared to the cleanup level to determine whether the UCL meets the cleanup level.

If these three criteria are met for either uranium or fluoride in each point-of-compliance well, monitoring for that constituent will be terminated. If these three criteria are met for uranium and fluoride in each point-of-compliance well, the cleanup criteria will have been attained in accordance with WAC 173-340-720 and the confirmational monitoring program will be terminated upon receipt of Ecology's concurrence.

Note that for the second criterion to be met, none of the data points can exceed the cleanup level because one exceedance in eight data points will be greater than ten percent. If an exceedance occurs after a series of four or more data points below the cleanup level, the well will be resampled to verify the exceedance. Resampling will be performed within two weeks of receipt of the original analytical report and will be performed only for the constituent and the location of the exceedance.

The opportunity to resample recognizes the potential for a sample to be higher than the cleanup level due to random variability associated with the sampling and analysis process. If the resampling result indicates a concentration below the cleanup level, criterion 2 will be considered satisfied with respect to that sampling event. If the resampling result confirms a concentration above the cleanup level and the other two criteria (i.e., criteria 1 and 3 above) are met with eight sequential data points, the data set will be expanded to include up to twelve sequential preceding monitoring events (thereby allowing for the possibility of one value above the cleanup level); the expanded data set will be evaluated against all three criteria.

5.1.3 Point of Compliance

As defined at WAC 173-340-720(8)(b), the standard point of compliance is "throughout the site from the uppermost level of the saturated zone extending vertically to the lowest most depth which could potentially be affected by the site". As documented during the RI/FS, the only impacted saturated zone is the unconfined aquifer. The plume of impacted groundwater extended downgradient from the former surface impoundments; this zone is monitored by wells GM-5, GM-6, GM-7, GM-8, GM-10, and GM-12. Initially, groundwater quality results for samples collected from each of these wells (i.e., the point-of-compliance wells) will be evaluated to determine whether cleanup levels have been attained.

If groundwater monitoring results indicate that cleanup levels are not likely to be attained throughout the site (e.g., if the trend becomes asymptotic at a concentration above the cleanup level), a conditional point of compliance may be proposed as provided for at WAC 173-340-720(8)(c). In that case, the conditional point of compliance would likely be the northern boundary of the AREVA property, downgradient of the former surface impoundments, which is monitored by wells GM-10 and GM-12.

In the event that a conditional point of compliance is proposed, AREVA will prepare a memorandum for Ecology's review that provides justification as to why it is not practicable to meet the cleanup levels throughout the site within a reasonable restoration time.

5.2 *Reporting*

Results of the performance monitoring program will be reported to Ecology on an annual basis. Results of the confirmational monitoring program will be reported to Ecology annually, and at the conclusion of the program (i.e., when the criteria for demonstration of cleanup level attainment have been met) if that does not coincide with an annual report.

6.0 Quality Assurance/Quality Control

Following is a discussion of quality assurance/quality control procedures that will be implemented under the CGWMP, including chain-of-custody procedures and data validation procedures.

6.1 *Chain-of-Custody Procedures*

Sample custody is a vital aspect of groundwater monitoring activities. The samples must be traceable from the time of sample collection through the time of analysis. To ensure this is the case for each sample collected under this program the following procedures will be observed.

All samples will remain in the custody of the sampling personnel during each sampling day. At the end of each sampling day and prior to the transfer of the samples to the laboratory, chain-of-custody entries will be made for all samples using a Chain-of-Custody Form (Figure 4). All information on the Chain-of-Custody Form and the sample container labels will be checked against the field sample log entries, and samples will be recounted before transferring custody. Upon transfer of custody, the Chain-of-Custody Form will be signed by the project engineer and will accompany the samples to delivery. All Chain-of-Custody Forms received by the laboratory must be signed and dated by the laboratory's sample custodian.

The sample receiving personnel at the laboratory will note the condition of each sample received as well as questions or observations concerning sample integrity. The laboratory personnel will also maintain a sample-tracking record that will follow each sample through all stages of laboratory processing. The sample tracking records will show the date of sample analysis. These records will be used to determine compliance with holding time limits during data validation.

6.2 *QA/QC Procedures*

The laboratory is responsible for adhering to the QA/QC procedures documented in the QAPP or QA Manual prepared by the laboratory. Laboratory calibration procedures, calibration frequency, and system performance monitoring will be conducted in accordance with the method requirements stated in EPA document SW-846 "Test Methods for Evaluating Solid Waste", as applicable.

6.3 *Reporting Requirements*

To satisfy the requirements of technically sound and legally defensible groundwater monitoring, a list of general and technical requirements has been developed that must be documented and provided with the analytical data package deliverable. The following general information must be submitted with each laboratory report.

- The results of sample analysis
- The parameters of interest
- The methods of analysis
- Analysis detection limits
- A list of laboratory tracking identification numbers correlated with field sample identification numbers and sample batch identifications such that QA samples can be correlated with associated field samples
- Sample collection dates
- Sample preparation/extraction dates
- Sample analysis dates
- Copy of COC Form signed by the laboratory sample receiving custodian
- A narrative summary identifying any QA or sample analysis problems encountered and any corrective actions taken

The required technical QC deliverables are discussed below.

6.4 *Inorganics Analysis*

For inorganics analyses involving the use of atomic absorption (flame or furnace), inductively coupled plasma (ICP), ion chromatography (IC), or any other procedures generally referred to as "wet bench" chemistry, the following QC data must be provided, where applicable.

- Results of laboratory method blanks.

- Results of batch-specific laboratory duplicates or reagent water (blank) spike duplicates (for the compounds or elements of interest); expected value, percent recovery, calculated relative percent differences (RPDs) from sample, and control limits.
- Results of batch-specific matrix spikes; expected value, percent recovery, and control limits.
- Results from a Laboratory Control Sample (LCS) or a reagent water (blank) spike analysis carried through the preparation method with the samples prior to analysis and analyzed along with the samples in the same analysis batch; expected value, percent recovery, and control limits.
- Results of the associated Initial Calibration Verification Standards and all associated Continuing Calibration Verification Standards; expected values, percent recoveries, and control limits.

6.5 ***Non-Reportables***

All raw data developed by the laboratory during sample analysis, and all QC data not included under the reportables listed above must be maintained by the laboratory as a record for a period of three years unless specified otherwise by the project engineer. The laboratory non-reportable information is not required for submittal with the laboratory report, but should be available for review upon 30-days' notice. A copy of reported data must be retained by the laboratory for a period of three years along with the non-reported data.

6.6 ***Data Validation Procedures***

Data validation is the process of reviewing all QA/QC documentation provided by field sampling teams and by the analytical laboratories to determine if QA/QC requirements are satisfied. The objective of data validation is to determine the quality and usability of the data, and to classify the data into one of three categories: usable and quantitative data, usable but qualitative data, and unusable data.

The laboratory is required to submit analytical results that are supported by sufficient QC data to enable data reviewers to conclusively assess the validity of the data. By providing the deliverables specified in the reporting requirements discussed above, data validity can be assessed.

Analytical results will be reviewed by the AREVA project engineer. Appropriate data qualifier codes will be applied to those data for which quality control parameters do not meet acceptable standards. Data quality acceptance criteria are specified in the U.S. Environmental Protection Agency (USEPA) Laboratory Data Functional Guidelines (Reference 5).

6.7 *Field Data Validation*

The field data package includes all of the field records and the measurements developed by the field sampling team. The field data package will be reviewed by the project engineer or designated personnel. Validation of the field data package will include the following:

- A review of field data contained in sampling logs;
- A verification that all QC samples were properly prepared, identified, and analyzed;
- A review of field record documentation including equipment calibration, instrument condition, and decontamination procedures;
- A review of the COC for proper completion

6.8 *Laboratory Data Package Validation*

In addition to the internal QC checks used by the laboratory (Laboratory QAPP or QA Manual), the laboratory must demonstrate the ability to produce acceptable results using the recommended methods. Demonstration of satisfactory performance will be verified during data validation. Appropriate data qualifier codes (R, J, U, UJ, and B) will be assigned to those data for which QC results do not meet acceptable standards. The criteria used to assess data quality are provided in the following section. Based on these criteria, the data is coded.

6.9 *Validation Criteria*

The project engineer will be responsible for the final validation of analytical data received from the laboratory. The data validation criteria as included in USEPA National Functional Guidelines for Inorganic Data Review (October 2004) will be used to standardize the analytical validation process. In addition, laboratory reports are checked for completeness to assure that all requested analyses have been performed on the correct samples, and for obvious transcription errors.

7.0 Implementation Schedule

This CGWMP will be implemented upon approval by Ecology.

8.0 References

1. EMF-2826, Revision 3, "Closure Plan for the Surface Impoundment System," February 2005.
2. Letter, R. Bond to R. Land, "Closure Certification for the AREVA NP Inc. Surface Impoundment System," November 14, 2006.
3. Geraghty & Miller, Inc., Work Plan - Phase I Groundwater Study, Siemens Nuclear Power Corporation, Richland, Washington, September 19, 1991

4. Geraghty & Miller, Inc., Work Plan - Phase II Groundwater Study, Siemens Nuclear Power Corporation, Richland, Washington, February 24, 1992

5. US EPA National Functional Guidelines for Inorganic Data Review. OSWER 9420.1-45. EPA540-R-04-004. October 2004.

Table 1 Monitoring Wells Construction Details

Well ID	Well Diameter (in)	Date Installed	Screened Interval ft bls)	Boring Depth (ft bls)	Measuring Point Elev. (ft msl)+	Concrete Pad Elevation (ft msl)	Well Type
GM-1	2"	Oct. 1991	14.8 – 34.8	35.0	375.44	374.04	SS screen PVC riser
GM-2	2"	Oct. 1991	7.3 – 27.3	28.5	370.09	368.49	SS screen PVC riser
GM-5	2"	Oct. 1991	4.8 – 24.8	25.0	367.65*	NA	SS screen PVC riser
GM-6	2"	Oct. 1991	20.0 – 40.0	40.2	380.87	379.47	SS screen PVC riser
GM-7	2"	Oct. 1991	20.4 – 40.4	40.6	380.08*	NA	SS screen PVC riser
GM-8	2"	Oct. 1991	12.8 – 32.8	33.0	370.12*	NA	SS screen PVC riser
GM-10	2"	Oct. 1991	13.8 – 33.8	35	375.43	374.82	SS screen PVC riser
GM-12	2"	Oct. 1991	29.0 – 49.0	49.2	388.78	387.23	SS screen PVC riser

+ Updated to May 1992 data provided by Bob Stratton Surveying

* Surveyed after modification, circa April 1994
ft Feet
ft msl Feet above mean sea level
ft bls Feet below land surface
NA Not applicable

Table 2 Groundwater Sampling Equipment Checklist

WELL PURGING

- ____ 2" submersible pump
- ____ pump control box
- ____ discharge hose
- ____ portable generator
- ____ solinst w.l. meter
- ____ steel sounding tape
- ____ Calculator
- ____ drum pump
- ____ 55-gallon drum(s)

SAMPLING

- ____ bailer cord
- ____ vinyl/latex gloves
- ____ sampling caddy (2)
- ____ 1000 ml glass beaker (2)
- ____ pH/cond./temp. meter
- ____ extra batteries
- ____ Thermometer
- ____ sample bottles
- ____ sample labels
- ____ Coolers
- ____ ice/ice packs
- ____ waterproof pens
- ____ Sharpies
- ____ disposable bailers

OTHER

- ____ Nanopure water

DECONTAMINATION

- ____ decon tubs (2)
- ____ purge water buckets (2)
- ____ deionized water
- ____ Liquinox
- ____ DI water sprayer
- ____ detergent spray bottle
- ____ scrub brushes (2-3)
- ____ nitrile gloves
- ____ trash bags
- ____ paper towels

SAMPLE TRANSPORT

- ____ chain-of-custody forms
- ____ chain-of-custody seals
- ____ shipping tape
- ____ shipping labels

MISCELLANEOUS

- ____ well keys
- ____ measuring tape
- ____ straps, bungie cords or extra rope
- ____ field notebook
- ____ toolbox:
- ____ utility knife/scissors
- ____ screwdrivers (phillips & flat head)
- ____ Hammer
- ____ Pliers
- ____ socket wrench & socket set
- ____ first aid kit
- ____ fire extinguisher

Table 3 Summary of Sampling Requirements

Analyte	EPA/ SW-846 Method	Detection Limit	Container	Preservative	Hold Time
Fluoride	300.0	1.0 mg/L	500 ml plastic	None required	28 days analysis
Uranium	ICP-MS	1.0 mg/L	250 ml plastic		6 months
Gross Alpha	900.0	+/- 5 pCi/L	500 ml plastic	HNO3	6 months
Nitrate	300.0	1.0 mg/L	500 ml plastic	Cool 4C	48 hours

Figure 1 Compliance Groundwater Monitoring Plan - Well Locations

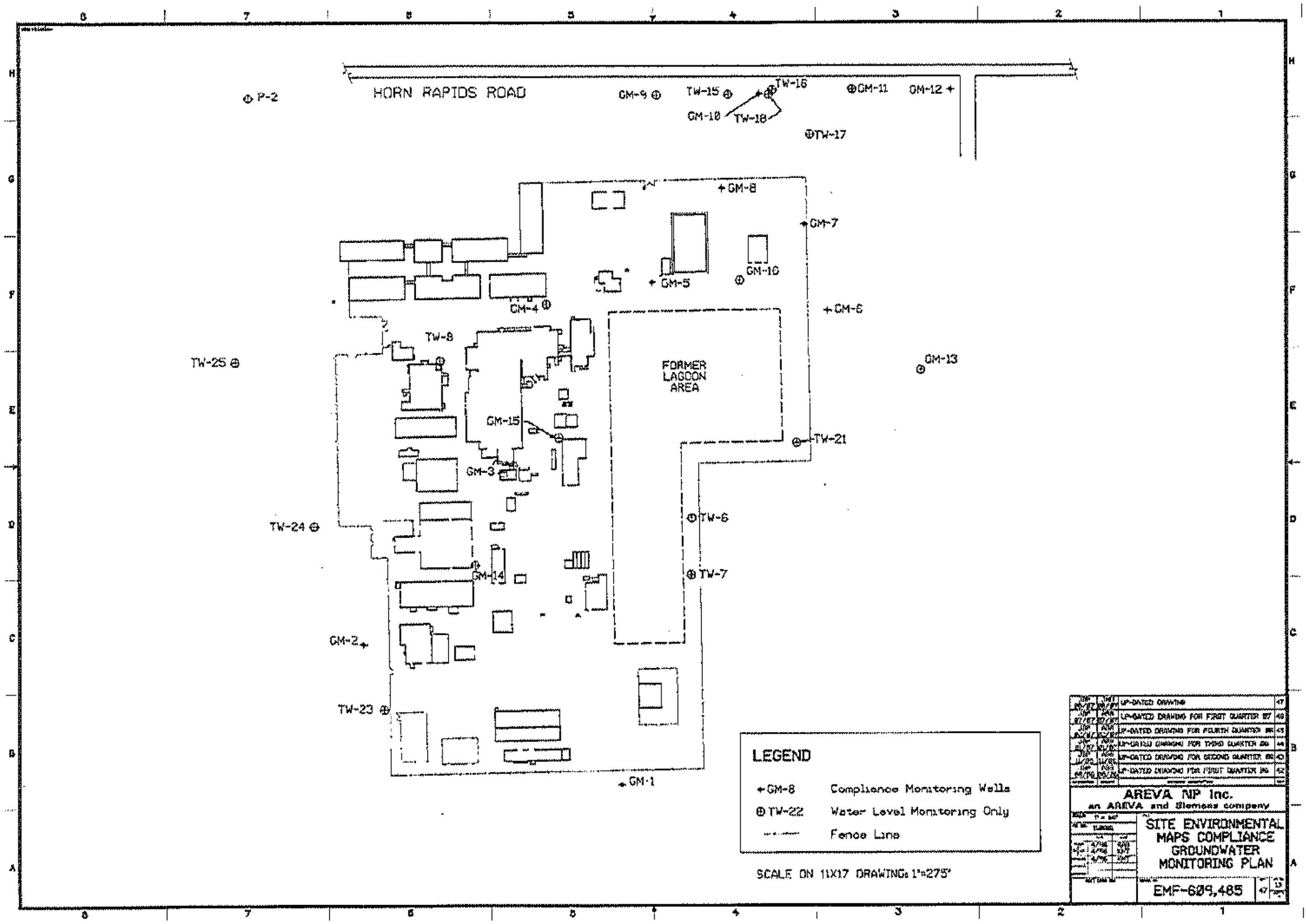

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Figure 2 Water Level and Well Depth Measurements

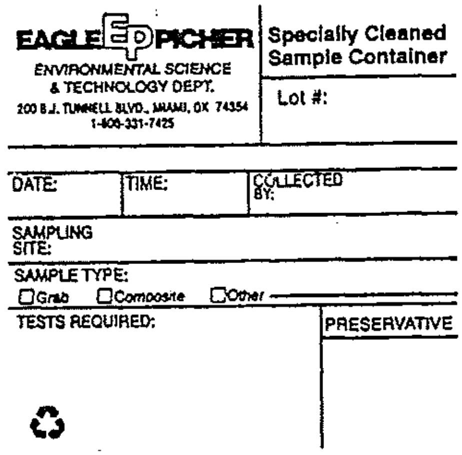
AREVA NP Inc.	**WATER LEVEL AND WELL DEPTH MEASUREMENTS**

Weather	Temp:	Barometer:	Wind:	Date:

Well Number	Time	Depth to Water	Depth of Well	Gallons Purged
GM-1				
GM-2				
GM-3				
GM-4				
GM-5				
GM-6				
GM-7				
GM-8				
GM-9				
GM-10				
GM-11				
GM-12				
GM-13				
GM-14				
GM-15				
GM-16				
P-1				
P-2				
TW-6				
TW-7				
TW-15				
TW-16				
TW-17				
TW-18				
TW-21				
TW-23				
TW-24				
TW-25				

Notes:

Figure 3 Sample Label



EAGLE PICHER
ENVIRONMENTAL SCIENCE
& TECHNOLOGY DEPT.
200 B.J. TUNNELL BLVD., MIAMI, OK 74354
1-800-331-7425

Specially Cleaned
Sample Container

Lot #:

DATE:	TIME:	COLLECTED BY:

SAMPLING SITE:

SAMPLE TYPE:
☐Grab ☐Composite ☐Other

TESTS REQUIRED:	PRESERVATIVE

Figure 4 Chain of Custody Form

AREVA

AREVA NP INC.

2101 Horn Rapids Road
Richland, WA 99354

Customer contact:		Project ID	Order ID:	Requested Tests
Business name:				
Address:				
Phone:	FAX:			
Regulatory Authority:	NPDES: ☐ Solid waste: ☐	Drinking water: ☐ Other: ☐		

Lab Use Only	Customer Sample ID (Unique identifier or code)	Collection Date	Collection Time	Matrix	Number of bottles											Comments

Signature	Date/Time	Signature	Sample Conditions at receipt:
Collected/ Relinquished by:		Received by:	Temperature (circle): Ambient Cold Frozen
Relinquished by:		Received by:	Containers intact/Lids tight: ☐ VOC vials without headspace: ☐ Labels match custody: ☐
Relinquished by:		Signature	Date/Time
Laboratory receipt:		Pre-log storage:	

Page ________ of ________

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