Hunter Power Plant

Site Wide Monitoring
&
Sampling and Analysis Plan
Revision 4

Revised By
PacifiCorp
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1.0 INTRODUCTION

This Sampling & Analysis Plan (SAP): 1) provides descriptions of existing monitoring locations; 2) describes sample parameters and frequency for all sample locations; and, 3) provides Quality Assurance/Quality Control (QA/QC) requirements for ground water and surface water monitoring of the Hunter Power Plant which meet EPA and State of Utah requirements.

This SAP is intended as a field guide for personnel who will be conducting water quality monitoring activities for this project, as a QA/QC plan, and as a data management plan. Samples will be collected and analyzed using EPA accepted methods, procedures, and/or protocols. Data will be used to identify areas where impacts to water may be occurring and to determine compliance with discharge permits for the facility.

This revision is meant to modify the plan, as appropriate. Revisions to the plan are intended to further define ground water quality and potential impacts by plant activities.

2.0 SITE DESCRIPTION

2.1 Location

The Hunter Power Plant (HPP) is located east of North Horn Mountain, three miles south of Castle Dale, Utah (Figure 1). The community of Castle Dale is located on Utah State Highway #10, 30 miles southwest of Price, Utah. The plant site is located in the Castle Valley. The HPP property consists of approximately 2,000 acres located at a mean elevation of 5,600 feet above sea level. The latitude and longitude for the HPP is 39^{o} 09' 34" North Latitude; 111^{o} 00' 34" West Longitude.

2.2 Site Activity

The Hunter Power Plant, majority owned and operated by PacifiCorp, is a three unit coal-fired electrical generation plant. The baseload for Units 1 and 2 is 480 megawatts (MW) each, while the Unit 3 baseload is 495 MW. The coal-fired boilers produce steam used to power electricity-producing turbines.

Waste water is generated at the site by normal blowdown from plant processes such as cooling tower circulation water, liquid ash handling systems, boiler blowdown, etc. Water treatment wastes and sewage treatment effluents also contribute to waste water flow, as do storm drains, building roof and floor drains. These combine as mixed waste water and are collected in the Waste Water Ponds, previously called the Irrigation Ponds. This waste water is used to irrigate the Plant Research Farms.

2.3 Site Description

The native soils over which the HPP is sited consist of Chipeta Series soils underlain by Mancos Shale. The Chipeta Series soils are calcareous, well drained, and moderately fine. They consist of saline, silty, clay loam, approximately 10 to 20 inches deep. The underlying Mancos Shale is a gray, consolidated, fissile, calcareous mudstone with interbeds of thin sandstone and siltstone.

Average precipitation is between 6 and 10 inches per year, mainly in late July through October. Ten to twenty inches of snow can be expected in the winter, representing between one and two inches of the annual precipitation. Skies are clear about 225 days per year. Winds are light to moderate in all seasons. The strongest winds normally blow from the south during the spring. Temperature range is normally from a low of 10^{o} (F) in January to the high 80's in July.

2.4 Previous Ground and Surface Water Sampling

Previous ground water sampling at the HPP has occurred at the Hunter Research Farm. Monitoring at the farm has been ongoing since the late 1970's, with new wells installed in 1996.

Analysis of conditions at the farm show that ground water originates from upgradient flow from surrounding privately owned irrigated fields, seepage from surface water, baseflow from bedrock, and infiltration (precipitation and irrigation). Ground water and surface water samples have been collected from the following sources at the Hunter Research Farm: Waste Water Ponds, Rock Canyon Creek, Johnson's Bench Creek, North Farm, West Farm and East Farm. Table I presents the monitoring parameters analyzed at the Hunter Research Farm during sampling events.

Table I. Hunter Research Farm
Analytical Monitoring Parameters

TDS	Nitrate +Nitrite
Sulfate	Potassium
Chloride	Boron
Magnesium	Conductivity
Calcium	pH
Carbonate	Bi-carbonate
Sodium	Selenium

Per the original SAP in 2003, monitoring wells were installed and sampled quarterly at each of the following potential source areas (PSAs): The Coal Combustion Residual Landfill, Scrubber Pond, Coal Storage Area, Plant Site and Waste Water Storage Ponds (see Figure 2.) HPP requested a statistical evaluation of each PSA, however, due to the varying aquifer conditions and the range of water quality concentrations between the shale and alluvial aquifer, statistical analysis of the data does not provide a reliable evaluation of the presence or absence of contamination at each PSA.

2.5 Responsible Person

Implementation of the Sampling and Analysis Plan at the HPP is the responsibility of the Plant's Senior Environmental Engineer.

2.6 Corrective Action

Corrective actions may occur during the implementation of this SAP. Any changes in the sampling schedule, sampling forms, locations, choice of laboratory, sample parameters, SOP's, and methods resulting from ongoing corrective action(s) will be documented and explained by the responsible Person.

3.0 GROUND WATER MONITORING PLAN

Potential Source Areas (PSAs) and Research Farm Units at the HPP have been established as areas to be sampled and monitored (Figure 2.) Ground water at the following PSAs has been monitored and conditions analyzed as follows:

- **Scrubber Settling Basin**: HPP is required to remove sulfur dioxide from flue gas emissions as mandated by State and Federal Regulations. Exhaust gas from the boilers is routed through scrubbers that remove sulfur dioxide. The scrubbers utilize a calcium hydroxide solution which reacts with the absorbed sulfur dioxide to form a calcium sulfate/sulfite solution and precipitate.
- **Coal Storage Area**: Coal is stored on site and burned in the three coal-fired boilers. Potential infiltration through the coal pile of precipitation and waste water applied for dust suppression can result in possible ground water impacts from constituents similar to those at the Combustion Waste Landfill and Scrubber Pond (TDS, sulfate, nitrate, boron, chloride, and selenium), with the addition of bicarbonate. The quality of water downgradient of the coal pile has lower mineral concentrations than the background water quality.
- **Plant Site**: Contamination from the general handling of fuels and industrial compounds at the plant site is possible. Ground water impacts from an organic source have been documented in well EPS-1. Recent results from this well have shown no further organic impacts. Well EPS-3 has not been sampled due to an absence of ground water.
- **Storm Water Retention Ponds**: Retention ponds contain storm water, which may have contacted some of the above contaminant sources. Potential infiltration into the subsurface could result in ground water impacts of major minerals or industrial compounds.
- **Waste Water Storage Ponds**: Waste water is generated at the site by normal blowdown from plant processes such as cooling tower circulation water, liquid ash handling systems and the boiler steam system. Raw water treatment wastes and sewage treatment effluent also contribute to waste water flow, as do storm drains, building roof and floor drains. These waste waters are combined and collected in the Waste Water Ponds. The waste water is used to irrigate the Plant Research Farms. Potential infiltration from these ponds into the subsurface could result in increases of boron, chloride, and phosphorous in the ground water**.**
- **Research Farms**: Land application of waste water could result in accumulation of salts and minerals in the soil. Monitoring of the wells and surface water points will continue on a semi-annual basis for the sample parameters shown in Table I.

3.1 Existing and Proposed Monitoring Network

The monitoring system consists of ground water and surface water sampling of all PSA's throughout the HPP property (Figure 3). Ground water monitoring will be conducted through sampling of existing monitoring wells listed in Table III. Surface water monitoring will be conducted at the locations shown on Figure 3 and listed in Table III

All ground water and surface water sample locations will be monitored for the constituents shown in Table II. All other parameters were eliminated from further monitoring to match the requirements of the permit.

Table II. Field & Analytical Monitoring Parameters
Hunter Power Plant

Field Measurements		
Water Level pH Temperature Conductivity Dissolved Oxygen		
Analytical Data		
Analyte	**Method**	**Detection Limit**
Total Dissolved Solids	E160.1/A2540C	50 mg/l
Conductivity	E120.1/A2510B	1 umhos/cm
Sodium	6010B	10 mg/l
Potassium	6010B	1 mg/l
Magnesium	6010B	1 mg/l
Calcium	6010B	10 mg/l
Sulfate	E300.0	100 mg/l
Bicarbonate	Calculation	20 mg/l
Chloride	E300.0	10 mg/l
Total Alkalinity as CaCO3	E310.1/A2320B	20 mg/l
Nitrate-Nitrite	E353.2	0.05 mg/l
Boron	6010B	0.5 mg/l
Selenium	E6020	0.005 mg/l

Table III lists the existing wells and surface water locations to be included in the ground water monitoring plan for the HPP facility. All existing monitoring well locations are shown in Figure 3.

Table III. Existing PSA Compliance Monitoring Locations
Hunter Power Plant

Potential Source Areas w/ Well IDs	Gradient Location	Justification
Scrubber Settling Basin Wells		
EFGD 1	Up	Characterize up gradient ground water quality of Scrubber Settling Basin and Plant Site
EFGD 2	Down	Downgradient well to detect Scrubber Settling Basin impacts
EFGD 3	Down	Down/Cross gradient well to detect Scrubber Settling Basin impacts
Plant Site Wells		
HPS-1	Down	Down gradient well to detect Plant Site impacts
HPS-2	Down	Down gradient well to detect Plant Site impacts
HPS-3	Down	Down gradient well to detect Plant Site impacts
Farm Land Application Wells		
E17W	Up	Characterize up gradient ground water quality
E22W	Up	Characterize up gradient ground water quality
NE3W	Down	Down gradient well for Land Application
NE4W	Down	Down gradient well for Land Application

Potential Source Areas w/ Well IDs	Gradient Location	Justification
Coal Handling Wells		
ECP-2	Up	Characterize up gradient ground water quality
ECP-3	Down	Down/cross gradient well for coal pile
ECP-5	Down	Down/cross gradient well for coal pile
ECP-6	Down	Down/cross gradient well for coal pile
ECP-8	Down	Down/cross gradient well for coal pile
Waste Water Pond	**Wells**	
EWW-1	Up	Characterize up gradient ground water quality
EWW-2	Up	Characterize up gradient ground water quality
EWW-3	Down	Down gradient well for wastewater pond
EWW-4	Down	Down gradient well for wastewater pond
EWW-5	Down	Down gradient well for wastewater pond
EWW-6	Down	Down gradient well for wastewater pond
Surface Water Sample Locations		
EDL-2		Drain Line 2
UPL-12		Waste Water Pond #2
UPL-12A		Waste Water Pond #1
UPL-5		Up gradient of Scrubber Settling Basin and Plant Site
UPL-6		Down gradient of Scrubber Settling Basin
UPL-11		Down gradient of Plant Site
UPL-7A		Up gradient of Johnson Bench Creek

Sample points will be reduced or eliminated from the monitoring network if, after the evaluation of the sample data:

1. The PSA is not affecting ground water quality;
2. Data from monitoring point is redundant (i.e. other wells provided same or similar information); or
3. The monitoring point only provides information pertaining to a portion of the PSA where impacts are not present. (i.e. only a portion of the coal handling may have impacts; therefore, monitoring of the unimpacted area is not required).

Sample constituents will also be eliminated from future monitoring if the constituent is repeatedly not detected or if the constituent is naturally occurring and not affected by plant activities.

3.2 Operational Monitoring Schedule

Operational monitoring at the HPP will be completed semi-annually for the monitoring points in Table III. HPP will follow Utah regulations for monitoring protocol.

3.3 Post-Operational Monitoring Schedule

In order to tailor post-operational monitoring plans to adequately monitor ground water conditions at the site, a post-operational monitoring schedule will be determined by the State of

Utah and HPP personnel as plant closure approaches. At that time, State of Utah and HPP personnel will also determine post-operational monitoring points and sampling frequency.

3.4 Reporting Requirements

Analytical results of each sampling event will be submitted to the State of Utah-Division of Water Quality with the ground water monitoring reports.

Copies of all Field Data Sheets used for ground water monitoring will be retained in the Hunter Environmental Department. Field Log books will be comprised of detailed notes, forms and narratives documenting site sampling conditions and procedures to demonstrate the SAP and QA/QC Plan are being followed. Variances from the SAP will be documented and explained in the field notes. Records will be archived for a period of three years. All laboratory data will be maintained in paper and electronic format. All field data and logs will be maintained in paper format.

3.5 Monitoring Well Completion and Development

All of the monitoring network wells at the HPP are constructed in compliance with the State of Utah – Division of Water Rights regulations, specifically Rule R655-4 Water Well Drillers (for monitoring wells). An experienced monitoring well installer in the State of Utah, in accordance with State specifications, installed all monitoring wells. An experienced ground water specialist or hydrogeologist was on-site during the installation of all wells to describe and classify well cuttings, and to direct well completion specifications.

Monitoring wells drilled in 2003 were completed as 2-inch diameter wells constructed of flush threaded schedule 40 polyvinyl chloride (PVC) casing with 0.020-inch slotted screen and blank sections. The annular space between the borehole and the screened portion of the well casing were filled with silica sand to a depth of at least 1-2 ft. above the screen to enable collection of representative ground water samples. The annular space above the silica sand was sealed with bentonite chips. All wells were constructed with protective steel casing extending a minimum of 18-inch above the ground surface. The top of the casing was fitted with a locking cap to maintain monitoring well security. Individual well completion logs for the HPP monitoring network wells were recorded and submitted in the first monitoring report.

Monitoring wells were developed following the completion of well construction. Each well was surged with a surge block and then purged of at least 5 well volumes or until turbidity decreased.

3.6 Monitoring Well Network Maintenance

3.6.1 Monitoring Well Inspections

Monitoring well inspections are conducted and the results reported on the ground water sampling form. Ground water sampling personnel will inspect each well whenever sampling or monitoring activities are conducted. Wells are inspected for the integrity of the locking cap, padlock, steel well protector, PVC well casing riser and cap, and the surface concrete pad.

Any foreign material removed from a well during purging or sampling activities will be described and may constitute a breach of the integrity of the monitoring well. As much as possible, an explanation for the presence of the foreign material will be determined and a recommendation for continued use of the well or its replacement will be provided.

Monitoring well inspections will be recorded in the Field Log book or on the Field Data Sheet during each monitoring event.

3.6.2 Monitoring Well Inspection Reports

Any breach of integrity observed by the ground water sampling personnel will be promptly reported to the HPP Environmental staff. If for any reason a well is destroyed or otherwise fails to function properly or its integrity is determined to be breached, the well will be repaired or replaced

3.6.3 Monitoring Well Abandonment

If the damage to or integrity of the well cannot be repaired, the well may be recommended for and properly abandoned and replaced within 90 days unless otherwise approved in writing by the State of Utah.

Well abandonment procedures are as follows:

1. Break bottom cap with a spear;
2. Pump well full of bentonite grout with a packer to force injection of grout into formation;
3. Let well sit for 24 hours;
4. Refill with grout (if necessary); and
5. Remove surface completion (if possible).

A well log report fully describing all abandonment procedures will be submitted to the State of Utah and included in the annual report.

3.6.4 Installation of Replacement Wells

Replacement wells, if needed, will be installed at locations which allow them to fulfill the intended purpose of the well they are replacing. Replacement wells will be installed and completed as specified in Section 3.5 of this report.

The replacement well will be developed and sampled upon installation. Following the initial sampling event, the well will be included and sampled in accordance with the established schedule for all other ground water monitoring network wells.

3.6.5 Documentation of Well Construction

If a major plan or report is in preparation at the time of new well construction, development or rehabilitation, the lithologic log, well construction logs, and other well construction and development details will be attached as an appendix to the major document. Otherwise, replacement well construction documentation will be submitted to the State of Utah within 90 days.

4.0 GROUND WATER SAMPLING & ANALYSIS PLAN

4.1 Objectives

The objective of this SAP is to provide detailed procedures, which are to be followed during all sampling events at the HPP. These procedures will ensure collection of representative water samples for laboratory analysis and hydrogeologic parameters to provide valid data for characterization of the ground water quality in the vicinity of the HPP.

4.2 Sampling Personnel

HPP personnel will be responsible for assigning personnel trained in proper sampling techniques and familiar with this SAP to conduct the sampling.

4.3 Ground Water Monitoring Locations

The locations of existing monitoring wells at the HPP are shown in Figure 3.

4.4 Ground Water Monitoring Parameters

A summary of the field and analytical data to be collected during each sampling event is detailed in Section 3.1, Table II, and Table III.

4.5 Sampling Schedule

Ground and surface water sampling will be conducted semi-annually with reporting on a semi-annual basis. A certified laboratory will conduct laboratory analysis. Semi-annual reports and accompanying lab data sheets will summarize all ground and surface water sampling results.

4.6 Access Procedures

The HPP is located on property owned by PacifiCorp. Access to the monitoring wells is provided by the Plant road system.

4.7 Safety

It is the sampler's responsibility to obtain, maintain, and operate all equipment in a safe manner during a sampling event. The sampler's personal safety and that of any persons who accompany the sampler must be the primary concern at all times and in all sampling situations. A sampler who encounters a condition that may exceed the protection of their safety equipment or represent a potential hazard to human health should communicate the hazard to nearby workers, leave the area immediately, and contact the Plant Shift Supervisor by calling 5911 on the plant phone system or 748-6251 from an outside phone. Safety equipment may include but is not limited to:

- Safety glasses;
- Hard hat;
- Safety boots;
- Gloves;
- Cell phone;
- Protective clothing.

4.8 Sample Labeling and Shipping

Each sample sent to the laboratory must be labeled on the container in permanent, waterproof marking pen able to withstand long-term exposure to water. The label identification must cross-reference to the chain-of-custody form and the sampler's Field Log Book.

Sample labeling must identify four elements:

1. Day, month, and year;
2. Time;
3. Sample number; and
4. Name or chemical formula of the preservative used.

4.9 Waste Disposal

Solid and liquid wastes generated by field sampling will be disposed of in a proper manner. Any non-hazardous liquid will be disposed of at the sampling site. Solid waste products will be disposed of at an approved waste collection facility.

5.0 QUALITY ASSURANCE/QUALITY CONTROL PLAN

Activities required to produce accurate, precise, and repeatable results are an integral part of field sampling activities and laboratory analytical procedures.

5.1 Field Quality Assurance/Quality Control Plan

A QA/QC Plan depends on meticulous attention to detail and documentation by field personnel. Field sampling personnel are responsible for following standard operating procedures for equipment calibration and decontamination, well monitoring, sample collection including QA/QC samples, sample preservation, labeling, storage, and transportation to the analytical laboratory. All activities must be documented with care to verify correct handling and to permit accurate reporting of results.

5.1.1 Field Sampling Procedures

Field sampling procedures will include the following:

1. Equipment maintenance;
2. Equipment decontamination;
3. Equipment calibration;
4. Sample collection and preservation;
5. Sample storage and handling; and,
6. Field documentation of sampling activities.

5.1.1.1 Equipment Maintenance

Sampling equipment must be properly maintained. Table V lists sampling equipment maintenance procedures.

Table V. Equipment Maintenance

Equipment:	Procedure:
Solinst (or equivalent) Water Level Meter & Graduated Tape	Clean after each field use; Wash with mild detergent; Rinse well, Replace 9-volt battery when the auditory or visual signal weakens or fails.
Horiba Water Quality Checker U-52 or equivalent	Rinse thoroughly after each field use; For long term storage, fill the small rubber cap with water and use it to cover the pH sensor; and If storage is for a prolonged period (>6 months), remove the battery from the main unit.

5.1.1.2 Equipment Decontamination

All equipment, which comes in contact with ground water, will be decontaminated prior to use in a new sampling area (PSA). Table VI lists sampling equipment decontamination procedures.

Table VI. Equipment Decontamination

Equipment:	Procedure:
Solinst (or equivalent) Water Level Meter & Graduated Tape	Wash with mild detergent; Rinse with tap water; and Air dry.
Horiba Water Quality Checker U-52 or equivalent	Turbidity sensor Wash all probes with mild detergent; Do not use abrasives or cleaners; and Rinse all probes with tap water. Conductivity sensor Wash all probes with tap water; and Rinse all probes with tap water.

5.1.2 Field Documentation Procedures

A Field Log Book or Data Sheets will be maintained and prepared prior to the sampling event. Sufficient details including, but not limited to, those listed below will be included to document and permit reconstruction of all sampling events without relying on memory. The records will be completed in waterproof ink and will be legible and complete. The Field Log Book will be a compendium of forms pertinent to the specific field activity. More than one Field Log Book may be in use at one time; however, information will be recorded in only one of the logbooks to prevent duplication or omission of information, except for that required to adequately cross-reference other information.

The first page in the Field Log Book will contain:

- Name of Facility.

For each site visit or sampling event, the following information will be provided:

- Date(s) of sampling;
- Names of persons sampling;
- Weather conditions;
- Field activities conducted and their purposes;
- Sample collection time;
- Sample ID numbers;
- Description of the condition of the protective casing and well cap, if abnormal; and
- Signature and initials of person providing the information.

The Field Log Book will be specific to each field event and will be a compendium of forms pertinent to that specific field activity or time period. The Field Log Book for ground water sampling events will include:

- Map of sample locations at the HPP;
- Ordered list of sampling activities;
- Chain-of-custody Record; and,
- Field Data Sheets and Notes

5.1.3 Field Equipment Calibration

Calibration procedures are specific to each instrument. At a minimum each instrument will be calibrated before each sampling day. Table VII lists sampling equipment and its calibration procedures.

Table VII. Equipment Calibration

Equipment:	**Calibration Procedure:**
Solinst Water Level Meter & Graduated Tape	Power instrument, as probe is held vertically or horizontally 10-20 ft. from cable reel, use a steel tape graduated in 0.01 ft. increments to measure distance from the tip of the probe to the sensor level, the sensor to the 1 ft. mark on the graduated portion of the tape, & the sensor to the 10 and/or 20 ft. mark on the graduated portion of the tape.
Equipment:	**Auto-Calibration Procedure:**
Horiba Water Quality Checker U-52 or equivalent	Fill the calibration beaker 2/3 with Autocal solution, fit the probe over the beaker, turn power on, press MODE key which puts unit into MAINT mode, check that lower cursor is in the AUTO sub-mode, press ENT key and the readout shows "CAL", after a few minutes the upper cursor will cycle through all calibration parameters, and when complete, "End" will show briefly and then return to the MEAS mode.

5.1.4 Chain-of-Custody Procedures

A chain-of-custody record supplied by the analytical laboratory will be completed for all samples collected. The record will include or be similar to, depending on the laboratory requirements:

- The project name and number;
- Name of the analytical laboratory destination;
- Sampler's signature;
- Sample identification number, date and time of collection, composite or grab sample;
- Number of containers and type of sample;
- Analysis requested and number of containers provided per analysis; and,
- Any special instructions or warnings.

When sampling is complete, the samples will be packed for transport. A completed chain-of-custody will be enclosed in a Ziploc bag and placed with the cooler. The samples will then be ready for shipping or delivery. Upon delivery, both parties to the exchange will sign and date the record noting the time of the exchange of custody. The sampler will be the first relinquishing signature and the laboratory personnel will be the final receiving signature. Intermediate signatures may or may not be present.

Sampling personnel will retain custody of the samples or assure their integrity between the time of collection and delivery to the analytical laboratory.

5.2 Sample Acquisition Methods

The sampling procedures described herein are designed to obtain representative ground water and surface water samples from the HPP.

<u>Ground Water</u>

Depth to water or static water level measurements will be collected during each sampling event. If previous sampling data is available, and sample collection proceeds from the well with the lowest concentration of TDS to the well with the highest concentration of TDS, decontamination is only required between PSAs. Otherwise, decontamination is required between each well. Before being placed in each monitoring well, the water level probe will be decontaminated by rinsing the end of the probe with distilled water. Depth to water will be measured in each monitoring well. This will allow the calculation of static water ground water elevations for approximately the same time period.

To ensure that a representative sample is collected at each sampling location, the following sampling steps will be followed before sampling. Sampling steps in order of performance at each well include:

- Transport all appropriate equipment to the sampling site;
- Inspect well;
- Don disposable gloves;
- Determine depth to water;
- Calculate water column volume;
- Purge well (three well volumes);
- Measure field parameters at one gallon and at the end of full purge;
- Withdraw sample;

- Field filter (if required); and
- Containerize/preserve sample aliquots.

If a well is purged dry prior to removing three well volumes, that well will be allowed to recover and then sampled. A note of explanation will be included in the Field Log Book. If past data shows that the well will not recover in 24 hours, purge a small amount, then collect sample.

<u>Surface Water</u>
Surface water samples will be collected at locations shown on Figure 3. Grab samples from surface water bodies will be acceptable at the HPP.

- Transport all appropriate equipment to the sampling site;
- Don disposable gloves;
- Measure field parameters ;
- Withdraw sample;
- Field filter (if required); and
- Containerize/preserve sample aliquots.

In order to ensure reproducible sample data, surface water sample points will be clearly marked or located with GPS coordinates.

5.2.1 Transport of All Appropriate Equipment
All appropriate equipment shall be transported to the sampling location prior to commencement of sampling. A checklist of appropriate equipment for sampling at the HPP is presented in Appendix A.

The appropriate sample bottles and preservatives will be obtained from the state approved laboratory immediately prior to each sampling event to assure cleanliness of the sample bottles and correct quantities and reactivity of preservatives.

5.2.2 Equipment Preparation
In order to prevent cross-contamination of monitoring locations, only clean equipment will be taken to the monitoring point. Field instruments will be calibrated prior to use to provide accurate determination of field parameters. Decontamination and calibration procedures are presented in Sections 5.1.1.2, Table VI and 5.1.3, Table VII, respectively.

The water level probe will be calibrated prior to going into the field. The Horiba Water Quality Checker U-10 or U-52 or equivalent can be calibrated in the field or prior to going into the field. Calibrations will be performed prior to the sampling event and at the beginning of each sampling day.

5.2.3 Well Inspection
In accordance with Section 3.6.1, the protective casing will be examined for damage during each monitoring event. The padlock and cap will be inspected and then removed. The riser casing and cap will also be inspected for damage. Observed odors will be noted. Detailed notes of any damage ascertained will be recorded in the Field Log Book.

5.2.4 Determine Static Water Height

Static water level measurements will be taken at each monitoring well sampled. The steps are as follows:

1. Locate well and note general condition in Field Log Book;
2. Unlock casing and uncap monitor well;
3. Don disposable sample gloves;
4. Measure and record (±0.01 ft.) static water level in Field Log Book;
5. Calculate volume of well water to be removed and record in Field Log Book;
6. Cap and lock well if not sampled immediately; and
7. Rinse water level probe with distilled water.

5.2.5 Well Purging

Well purging will be performed at each monitoring well sampled. The steps are as follows:

1. Purge minimum of 3 well volumes or until well is purged dry,
2. Record total volume of water removed in Field Log Book;
3. Record observations of purged water; and
4. Properly dispose of purge water.

5.2.6 Sample Withdrawal

A representative sample will be acquired using accepted protocols. Sample withdrawal procedures are as follows:

1. Don disposable gloves;
2. Place ice/blue ice in coolers;
3. Label bottles using waterproof marker;
4. Lower bailer or pump to collect ground water samples, add preservative (if required) to the sample bottle;
5. Collect sample for field parameters;
6. Measure and record field parameters;
7. Withdraw sample and fill all sample bottles;
8. Check all sample bottle caps for tightness;
9. Place sample in cooler for on-site storage and transport to the lab;
10. Record sample ID, well ID, date, time, and other observations in Field Log Book;
11. Rinse all equipment with distilled water; and,
12. Cap and lock well, load equipment and supplies.

5.2.7 Sample Containerization, Preservation, and Holding Times

Each sample parameter has a specific container requirement, volume requirement, preservative, and maximum holding time. Table VIII lists sample containerization, preservation, and holding times.

Table VIII. Sample Containerization, Preservation, & Holding Times

Parameter	Container Plastic (P) Glass (G)	Minimum Volume (ml)	Preservative	Maximum Holding Time
Alkalinity	P or G	250*	ice	14 days
Boron	P or G	250*	ice	28 days
Calcium	P or G	250*	ice, unpreserved	6 months
Chloride	P or G	250*	none required	28 days
Metals, except those specifically listed	P or G	500*	ice, Filtered (0.45 micron) nitric acid (HNO_3) to pH 2	6 months
Nitrate-Nitrite	P or G	250*	ice, sulfuric acid (H_2SO_4) to pH 2	28 days
Phosphorus	P ir G	250*	ice, sulfuric acid (H_2SO_4) to pH 2	28 days
pH	P or G	250*	none required	analyze immediately
Sodium	P or G	250*	ice, unpreserved	6 months
Specific Conductance	P or G	250*	none required	analyze immediately
Sulfate	P or G	250*	Ice	28 days
VOC	G (VOA)	40* (2)	HCl to pH <2	14 days
EPH	G	1000*(2)	ice, sulfuric acid (H_2SO_4)	7 days

Reference: *Energy Laboratories Analytical Services, 1998

5.2.8 Field Parameter Measurement

Prior to the first field measurement of the day, the Horiba Water Quality Checker U-52 or equivalent will be calibrated according to the calibration procedures presented in Section 5.1.3, Table VII. The calibration and field parameter measurements will be documented in the Field Log Book.

1. Don disposable gloves;
2. Lower bailer or pump to collect ground water samples;
3. Withdraw sample and place in container large enough to accommodate Horiba;
4. Record field parameters, pH, specific conductivity and temperature, in field log book;
5. Cap and lock well if not sampling immediately; and
6. Rinse Horiba probe with distilled water.

5.3 Shipping and Handling

Sampling personnel will retain custody of the samples or assure their integrity between the time of collection and delivery to the analytical laboratory. Table VIII will be consulted to ensure that samples were properly preserved and submitted within the allowable holding times. Coolers will be packed with ice to ensure they are received with an acceptable cooler temperature of 4ºC. Any transfer of custody will be recorded on the chain-of-custody record. Chain-of-custody procedures are presented in Section 5.1.4.

5.4 Analytical Parameters

The site-specific monitoring parameters for HPP are shown in Section 3.1, Table II, and Table III.

6.0 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL PLAN

6.1 Laboratory Identification

A certified and accredited laboratory will analyze the ground water monitoring samples from the HPP.

6.2 Sample Custody

When accepting custody of the samples, laboratory personnel record them in the sample receipt log and give each container a unique sample-tracking number. Samples that are preserved by the sample collector are checked for proper preservation. Laboratory personnel will check the chain-of-custody for accuracy. If samples are improperly preserved or the maximum holding time has been exceeded, the sampler is notified and resampling is requested.

6.3 Analytical Turn-Around Time

Analytical turn-around time is dependent on the number of samples awaiting analysis and/or by arrangement with the sampler. All samples are analyzed within the holding time period for the specific method. Water quality sampling analysis holding times are different for each individual parameter and are shown in Section 5.2.7, Table VIII.

6.4 Calibration Procedures and Frequency

Analytical laboratories follow instrument and equipment manufacturer's calibration instructions and EPA, ASTM or other published method procedures. Initial instrument calibration curves are generated, verified and routinely monitored by continuing calibration checks throughout the duration of all instrumental analysis. When possible, the laboratory uses certified stock calibration standards. Standard preparation notebooks document the source, purity, content, concentration, data and analyst.

Samples are only quantitated within the limits of the response of the calibration standards. Volumetric dilution of high concentration samples is used to bring sample analyte concentrations within the calibration range. Calibrations may occur more frequently as indicated by instrument maintenance activities or out-of-control conditions.

6.5 Data Reduction, Validation and Reporting

Data reduction refers to the process of converting raw data to reportable units. Whenever possible, the analytical instrument is calibrated to read out directly in the reporting units and the values are recorded directly into a laboratory notebook or logbook and onto the raw data forms for review. In cases where calculation is required prior to reporting, raw data is recorded in the appropriate laboratory notebook and on the appropriate laboratory form. In this case, the calculations specified in the method are used to determine the reported value, which is also entered in the laboratory notebook and on the draft of the client report. Most of the calculations are computerized to reduce the potential for arithmetic or transcription errors.

Data validation includes procedures to ensure that the reported values are consistent with the raw data and the calculated values. The data recorded on the draft laboratory report is validated with four steps:

1. The analyst, who submits the report, checks all reported values for omissions and accuracy.
2. The report is reviewed and necessary data reduction is performed by the supervisor.
3. The reports are typed, proofread and reviewed by the word processing staff.
4. The manager or his designee examines the validity of the data and the final report.

One copy of the report is mailed to the client on the day the data is reported and one copy is filed in the separate client file maintained at the analytical laboratory.

6.6 Internal Quality Control Checks

The Quality Control Program at the analytical laboratory includes a demonstration of laboratory capability, a demonstration of the analyst's ability, the analysis of quality control samples and the maintenance of performance records.

Laboratory glassware conforms to National Bureau of Standards (NBS) Class A standards. All mechanical pipetors are calibrated monthly. Distilled and deionized water are used in laboratory analyses. For each procedure, water quality is monitored for acceptability. Chemical reagents and gases are purchased from reliable sources. Laboratory stock and working standards are derived from commercially available primary standards and solvents whenever possible.

Analytical Equipment Standard Operating Procedures (AESOPs) have been developed for each major piece of equipment and instrumentation. The AESOPs detail the sequence of operations involved in instrument start-up, calibration, analyzing and shutdown. AESOPs also include recommended schedules for routine preventative maintenance and identify those parameters, which dictate other types of maintenance. Acceptable instrument response/performance criteria are based upon the manufacturer's analytical method specifications.

Analytical Method Standard Operating Procedures (AMSOPs) have been developed by the laboratory for well-detailed EPA, ASTM and published procedures. Qualified personnel capable of performing each method are on staff at the analytical laboratory. It is the responsibility of each analyst to become thoroughly familiar with methodology and instrument operation before performing the analysis. The performance of each analyst is monitored during the training period by a supervisor until the analyst demonstrated the ability to generate results of acceptable accuracy and precision as required by each method.

Quality control monitoring requires that five to ten percent of all samples analyzed be fortified (spiked) with a known concentration of the analytes stipulated by the method. Percent recovery is calculated as a means of monitoring method accuracy. Where appropriate, the use of surrogates is included in the method to monitor method performance on each sample. The method may also require duplicate samples to be prepared and analyzed when possible. When duplicate samples are analyzed, relative percent difference is calculated and used to monitor precision of the method. In the instances where there are no specific method requirements, it is the policy of the laboratory to analyze five to ten percent of all samples in duplicate. Matrix Spike duplicates replace duplicates for certain methods. Continuing calibration checks of the established calibration curves are included for the appropriate methods.

All quality control monitoring is recorded on the appropriate quality control form, graph or chart as required by the individual AESOPs. This data is filed and is available for internal inspection and assessment.

6.7 Performance System Audits

The Quality Assessment program at the analytical laboratory includes performance evaluation samples, quality control check samples and quality control audits.

Performance Evaluation (PE) samples are supplied by an outside agency and contain known amounts of constituents. Typically the analyst does not have access to the known values prior to the analysis. Results of the PE analyses are sent to the outside agency for evaluation. Established procedures must be followed regarding the timeliness of analysis and the return of results.

Quality Control (QC) reference samples may come from a commercial source or may be prepared in-house as required by the specific method. QC samples are processed through the system in the same manner as any other sample.

The analytical laboratory conducts internal Quality Control Audit inspections on a quarterly basis to monitor adherence to quality control requirements. Samples, which have been previously submitted and reported, are chosen at random for the audit. The audit checks general laboratory operations, adherence to QA program goals, sample tracking procedures, holding times, storage requirements, adherence to procedures during analysis, calculations, completion of required quality control samples within the group surrounding the sample, and proper record keeping. The audit results are reported to management personnel with recommendations for corrective action if any discrepancies are found. A follow-up audit is conducted to determine that problems have been corrected.

6.8 Records and Reporting

The laboratory maintains several different kinds of notebooks, including but not limited to: project notebooks, instrument/equipment use and maintenance logbooks, standard preparation logbooks, sample receipt logbooks, and a safety logbook. The general purpose of maintaining each of these notebooks is to record the activity details, which may be pertinent to repeating a procedure, interpreting data or documenting certain operations. It is the responsibility of each analyst to maintain a laboratory notebook. The analyst's notebook is particularly important in documenting analyses, which deviate in any way from routine or standard practices.

Records of chemical analyses including all quality control records are kept by the laboratory for a minimum of five years. The records include chain-of-custody forms, sample submittal and analysis dates, person responsible for performing analyses, analytical technique/method used, results of analysis, quality control results, laboratory notebooks, electronic instrument data files, and a copy of the final report.

Corrective action is taken when quality control checks indicate that an analysis is not within the established control limits. The appropriate corrective action is dependent on the specific method and/or instrument. If a duplicate or spike analysis fails to fall within control limits, the analysis is repeated to verify that a problem exists. If the repeated analysis is not within control limits, the instrument and/or method procedure is checked according to specific protocols outlined in the AESOP and/or AMSOP. Once results are within control limits, analysis of all samples that were analyzed while the procedure was out of control is repeated. If the analyst is unable to achieve acceptable results after following the guidelines detailed in the AESOP and/or the AMSOP, supervision may determine that the instrument requires repair, or it is possible that the problems cannot be corrected to satisfy QC criteria. If all possible solutions are examined and the sample results appear to be valid, comments are attached to the sample report describing the non-compliance to QC and the probable cause. If a QC audit or other informational review shows an analysis report to be incorrect or incomplete, a written corrected report is submitted to the client with details of the correction, an explanation of the error and an assessment of the accuracy of the amended report.

6.9 Method Detection Limits and Instrument Detection Limits

Method Detection Limits (MDLs) will be calculated and reported by the analytical laboratory for each applicable analytical instrument and procedure. The MDL is defined as the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The MDL is determined from analysis of a sample in a given matrix containing the analyte. It is based on a specific, well-defined analytical method and is calculated from the results of seven or more replicate analyses of samples with analyte levels at or near the detection limit of the method. Typically MDLs are calculated using prepared samples in a relatively clean matrix. Instrument Detection Limits (IDLs) are similar to MDLs, but are based on instrument detection limits independent of the method used to prepare the extract. Actual IDLs and MDLs may increase due to interferences found in samples and sample extracts. When MDLs are limited by analytical instrument sensitivity, IDLs are used to estimate MDLs.

7.0 DATA AND REPORTS

7.1 Data Entry

Data will be entered correctly, following established procedure for documenting and correcting data entry errors.

7.2 Data Archiving

The groundwater sampling data collected is required to be archived. Table IX lists data archiving details.

Table IX. Data Archiving

Data Item	Data Format Paper (P) Electronic(E)	Backup Copy & Format	Location	Retention Time
Chain-of-Custody forms	P	none	HPP, PacifiCorp	Inactive plus 5 years
Equipment calibration logs	P	none	PacifiCorp	Inactive plus 5 years
Field data sheets	P	none	HPP, PacifiCorp	Inactive plus 5 years
Field Log Books	P	none	PacifiCorp	Inactive plus 5 years
Laboratory test results	P & E	disk	HPP, PacifiCorp	Inactive plus 5 years
Spreadsheet	P & E	disk	HPP, PacifiCorp	Inactive plus 5 years
Statistical analyses	P & E	disk	PacifiCorp	Inactive plus 5 years
Final report	E	disk	HPP, PacifiCorp	Inactive plus 5 years
Photographs	P & E	disk	PacifiCorp	Inactive plus 5 years

7.3 Semi-Annual Report

Reports will be written and submitted to the State of Utah, Division of Water Quality on a semi-annual basis. The contents will include all sampling and monitoring data as mentioned in Sections 3.1, 3.6.1, and 4.5. The reports will be a summary of ground water sampling activities conducted during each sampling event.

8.0 REFERENCES

National Handbook of Water Quality Monitoring, Natural Resources Conservation Services, May 1998.

Manual of Standard Operating Procedures for Sample Collection and Analysis, Wyoming Department of Environmental Quality, Water Quality Division, Watershed Program, March 2001.

National Oceanic & Atmospheric Administration (NOAA), 2000.

U.S. EPA "Guidance for Quality Assurance Project Plans," EPA QA/G-5 (EPA/600/R-98/018, February 1998.

U.S. EPA "Test Method for Evaluating Solid Waste" Publication SW-846.

Hunter Power Plant-Ground Water Analysis Hunter Farms Report, August 2000.

FIGURES

SAP figures 1,2 and 3.pdf

APPENDIX A
GROUND WATER EQUIPMENT CHECKLIST

Ground Water Sampling Checklist

Monitoring Equipment

- ☐ Electronic Water Tape (Backup)
- ☐ pH Meter
- ☐ DO Meter
- ☐ SCT Meter
- ☐ Sample/Purge Pump
- ☐ Disposable Tubing
- ☐ Replacement Batteries

Decon Equipment

- ☐ Decon Buckets
- ☐ Brush, Mild Detergent
- ☐ Distilled Water
- ☐ Sample Gloves

Miscellaneous Equipment

- ☐ Tool Box
- ☐ Well Keys
- ☐ Map
- ☐ Well List
- ☐ Last Round Water Levels
- ☐ Extra Bailers
- ☐ Bailer String

PPE

- ☐ Rain Gear
- ☐ Steel Toe Boots
- ☐ Safety Glasses
- ☐ Hardhat
- ☐ Cold Weather Gear

Sample Containers

- ☐ Sample Bottles and Preservative
- ☐ Coolers
- ☐ Plastic Bags
- ☐ Ice
- ☐ Permanent Marking Pens
- ☐ Field Book